MYANMAR's AGRIFOOD SYSTEM

Historical Development, Recent Shocks, Future Opportunities

EDITED BY
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ABBREVIATIONS AND ACRONYMS

ACLED	Armed Conflict Location & Event Data Project
AEZ(s)	agroecological zone(s)
AFS	agrifood system(s)
AMD	Agricultural Mechanization Department
AQSIQ	General Administration of Quality Supervision, Inspection and Quarantine, People's Republic of China
ASEAN	Association of Southeast Asian Nations
ASFs	animal-source foods
BACI	Base pour l'analyse du commerce international
CERP	COVID-19 Economic Recovery Plan
CGE	computable general equilibrium (model)
CSO	Central Statistical Organization
EAO	ethnic armed organization
EAR	estimated average requirement
f.o.b.	free on board (type of price for a traded commodity)
FAFH	food (consumed) away from home
FAO	Food and Agriculture Organization of the United Nations

GDP	gross domestic product
GIS	geographic information system
IHLCA	Integrated Household Living Conditions Assessment
LIFT	Livelihoods and Food Security Trust Fund
MADB	Myanmar Agricultural Development Bank
MAF	Myanmar Armed Forces
MAPS	Myanmar Agricultural Performance Survey
MAPSA	Myanmar Agriculture Policy Support Activity
MFSPP	Myanmar Food Security Policy Project
MHWS	Myanmar Household Welfare Survey
MLCS	Myanmar Living Conditions Survey
MOALI	Ministry of Agriculture, Livestock, and Irrigation
MPLCS	Myanmar Poverty and Living Conditions Survey
NEET	not in employment, education, or training
QUAIDS	quadratic almost ideal demand system
RIAPA	Rural Investment and Policy Analysis (data and modeling system)
RRR	relative risk ratio
RUFSS	Rural Urban Food Security Survey
SAM	social accounting matrix
SD	standard deviation
SE	standard error
SLORC	State Law and Order Restoration Council
UNDP	United Nations Development Programme
USDA	United States Department of Agriculture
USDP	Union Solidarity and Development Party

VFV	vacant, fallow, and virgin (land)
VMS	vessel monitoring system
WFP	World Food Programme
WTO	World Trade Organization

FOREWORD

Following the economic and political reforms initiated in 2011, Myanmar experienced notable progress, including an increase in foreign investment and improved economic performance, marked by important advances in the agrifood sector. However, the recent crises, including political instability and the COVID-19 pandemic, have affected these gains severely. To restore and enhance the agrifood system's potential, comprehensive efforts are needed to improve its institutions and infrastructure, boost productivity, and ensure food and nutrition security. These measures are critical to reducing poverty and fostering long-term economic development in Myanmar.

This book is the culmination of a decade of rigorous empirical research on Myanmar's agrifood system, and provides critical insights into its evolution, current state, and future opportunities. The book offers a comprehensive overview of the agrifood system's development and its economic role before and during recent crises, measures welfare outcomes in terms of poverty and nutrition, and examines the performance of various system components such as input supply, mechanization services, farm-level production, processing, retailing, and international trade. It also explores the regional dynamics of rural livelihoods through the lenses of gender and youth and identifies necessary investments and policies to enable the agrifood system to drive recovery and long-term economic development.

The insights presented here are valuable not only for guiding immediate humanitarian assistance but also for designing future growth strategies, once a resolution to the current crisis is found that ensures lasting peace and good governance. Myanmar's recovery from the multiple crises it has faced since 2020 will require a robust combination of effective humanitarian interventions, sustained policy reforms, and overall development support. Only through concerted efforts to address institutional, infrastructure, and productivity constraints can the agrifood system fulfill its potential as a driver of inclusive and sustainable development.

The authors provide a roadmap for stakeholders at all levels—policymakers, development practitioners, researchers, and civil society—who are committed to fostering a resilient and prosperous agrifood system in Myanmar. Their insights and recommendations should serve as a valuable resource in the collective effort to achieve food security, economic stability, and social equity in Myanmar. Broadly, this work also offers unique insights into the functioning of agrifood systems during periods of rapid growth and transformation, as well as under stress, and provides examples of pathways for recovery in fragile and conflict-affected economies, where most of the global poor and food-insecure populations reside.

Johan Swinnen
Director General, IFPRI
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Chapter 1

INTRODUCTION

Duncan Boughton, Ben Belton, Isabel Lambrecht, and Bart Minten

A decade of rapid, albeit uneven, progress in Myanmar's economic development was thrown into reverse by a series of shocks that began with the COVID-19 pandemic in early 2020. The pandemic was followed by the military coup of February 2021 and the global food, fuel, and fertilizer supply crisis spurred by the armed conflict in Ukraine that began a year later. The coup led to a surge in conflict around the country, hampering and often devastating the livelihoods of the population at large while also causing the internal displacement of about 2.3 million people by the end of 2023, adding to those displaced during prior conflicts (UNHCR 2024). The sharp depreciation of Myanmar's currency since the coup multiplied the inflationary impact of international price increases for fuel, fertilizer, and imported vegetable oils, causing inflation to spiral upward even as employment opportunities withered. By late 2023, over 70 percent of the population was estimated to be in poverty (MAPSA 2024), more than double the 2017 poverty rate of 25 percent (CSO, UNDP, and World Bank 2019).

Though Myanmar's agrifood system was not left unscathed by these shocks, it has proved resilient. Agriculture and the rural economy are essential to Myanmar's development, as 70 percent of the population and 87 percent of the country's poor live in rural areas (MOPF and World Bank 2017a). Agriculture and its associated agro-industries form a key sector of the national economy, employing half of the total labor force and contributing one-third of national GDP—about 23 percent directly in farm incomes and another 11 percent in agro-processing, distribution, marketing, exports, and food retailing (Chapter 2). Ekanayake, Ambrosio, and Jaffee (2019) estimate that nearly half of Myanmar's poverty reduction between 2005 and 2015 was attributable directly to progress in agriculture. Therefore, a well-functioning agrifood system is crucial to the welfare and food security of Myanmar's residents.

The analyses presented in this book fill an important knowledge gap for one of Southeast Asia's major agricultural economies—one largely closed to empirical research for several decades. Myanmar is better endowed with land and water resources than many countries in the region, with considerable arable land per person, much of it irrigable, and generally reliable seasonal precipitation patterns that are suited for crop production. However, the performance of its agrifood system lags behind those of neighboring countries. The contributors to this book combine data from standard household and enterprise surveys conducted during the 2015–2020 period with more recent phone surveys and a mix of analytical approaches to provide empirical insights into patterns of rural transformation over the succession of recent crises and to examine how the impacts of disease, conflict, international commodity price surges, and domestic policy changes have interacted to unravel livelihoods and dramatically worsen welfare. This understanding is useful for guiding near-term humanitarian assistance interventions and, if there is a resolution to the current crisis that ensures lasting peace and good governance, the design of future inclusive and sustainable growth strategies.

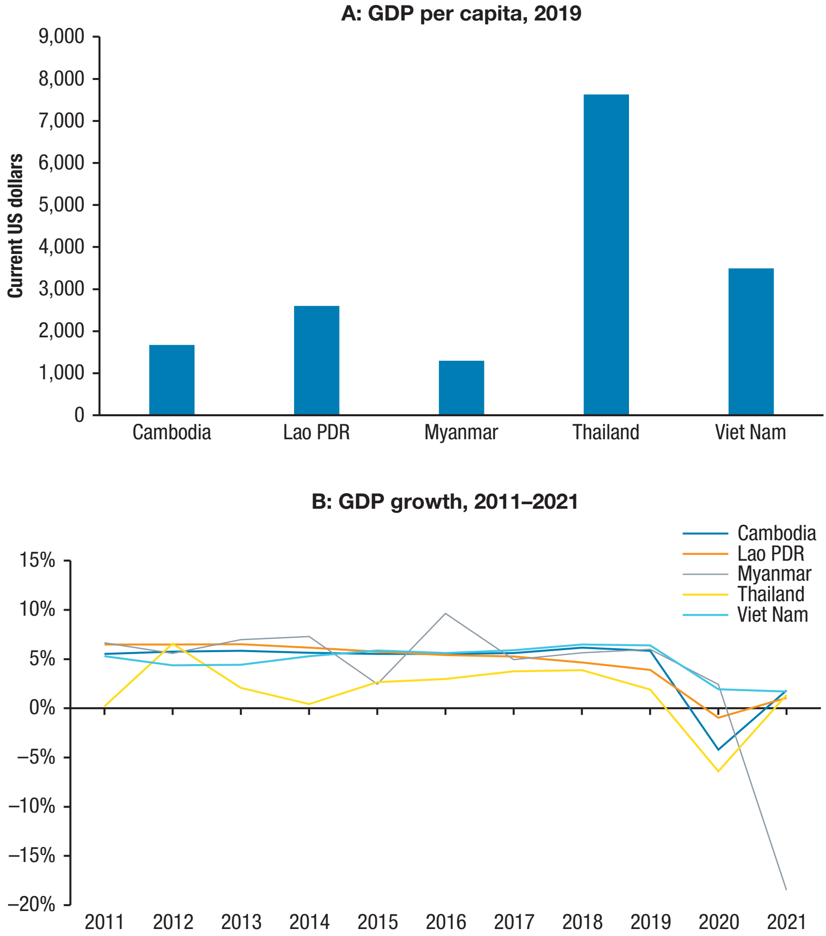
This introductory chapter places Myanmar's development in a regional context and describes the timeline and nature of the crises that later chapters will explore in depth. We then outline the specific objectives of the book and its organization, concluding with a brief overview of the data sources used for the analyses presented in the following chapters.

Myanmar's development in regional context

Independent since 1948 and known as Burma until renamed by the military junta in 1989, Myanmar has yet to evolve into a unified national state (Myint-U 2019). Its economic development has also been held back by decades of military rule, ethnic conflict, and centralized planning (Brown 2012; Fujita and Okamoto 2009). In 2019, Myanmar's per capita GDP was just under $1,300. By comparison, Cambodia, Myanmar's poorest neighbor, had a per capita GDP of almost $1,700, Lao People's Democratic Republic (PDR) was almost double at $2,600, and Viet Nam at almost $3,500 and Thailand at more than $7,500 were even higher (Figure 1.1, panel A).

Myanmar's low per capita GDP reflects the delayed structural transformation of its economy. At the turn of the millennium, agriculture, forestry, and fishing combined accounted for the largest share of its GDP at 57 percent. Comparable shares for Myanmar's poorest neighbors, Cambodia and Lao PDR, were 34 percent and 33 percent, respectively. The figure for Viet Nam was just 23 percent, while in Thailand, the share of its economy made up

FIGURE 1.1 Myanmar's GDP, 2019, and GDP growth, 2011–2021, in a regional context



Source: Data from World Bank (2024a).
Note: Lao PDR = Lao People's Democratic Republic.

by agriculture had fallen to single digits a decade before. As discussed in Chapter 3, Myanmar's agriculture sector was underperforming due to low productivity, high inequality in land access, and underinvestment in transport infrastructure.

Although it took catastrophic Cyclone Nargis in 2008 to trigger meaningful change,[1] Myanmar's development policies finally turned a corner under the quasi-civilian Union Solidarity and Development Party (USDP) government beginning in 2011. In contrast with earlier economic reforms during which market liberalization efforts were accepted as a macroeconomic necessity, these were now fully embraced to promote foreign direct investment and spur economic growth. From 2011 to 2019, Myanmar's economic growth was among the highest in Southeast Asia (Figure 1.1, panel B). The opening of the country to international mobile phone service providers; relaxation of import restrictions on nearly all goods, including vehicles; reform of the banking sector; loosening of restrictions on internal movement and migration; and expansion of education opportunities combined to dramatically change the economy. Major investments in road and energy infrastructure were also made—although these were geographically biased toward Bamar-majority regions of the country (Chapter 18 discusses regional development patterns). A national land use policy was also formulated with broad engagement by civil society, focusing on more equitable and secure access to land resources (Chapter 6).

The transition that took place in Myanmar was not without its limitations. The USDP administration arguably laid much of the groundwork for continued reform under the National League for Democracy government that took office in 2016. The poverty headcount fell dramatically from 48.2 percent in 2005 to 24.8 percent in 2017. However, there was a large gap between rural and urban poverty headcounts of 30.2 percent and 11.3 percent, respectively (MOPF and World Bank 2017b). Moreover, the rate of poverty reduction was modest relative to its economic growth and, therefore, less pro-poor and inclusive than it might have been (World Bank 2019).

The transition also failed to establish a fully democratic system. The Myanmar Armed Forces (MAF) continued to play a large role in ruling the country; it still controlled the security forces, key cabinet positions, and 25 percent of the seats in the national and regional legislatures (Crouch 2020; Thawnghmung 2019). Further, conflict continued in many ethnic states, and in Rakhine State it flared up significantly in 2016 and 2017 (Thawnghmung 2019).

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1 See Warr and Aung (2019) for an analysis of the impact of Cyclone Nargis on poverty and inequality.

Multiple shocks, multiple consequences

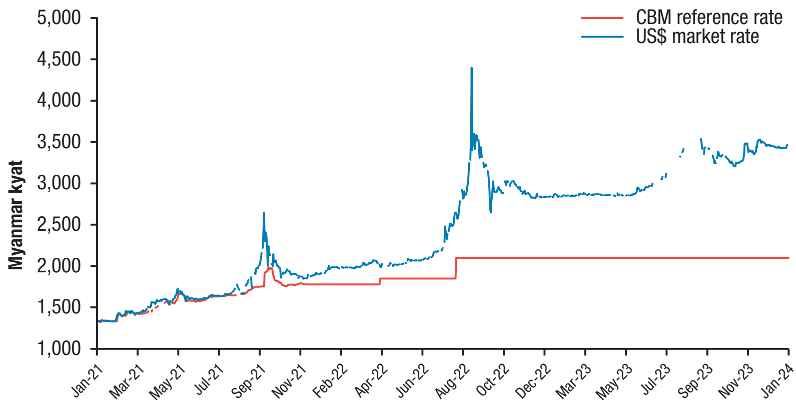
Myanmar has endured three types of shocks since early 2020: the COVID-19 pandemic, economic and social disruption following the military coup and subsequent widespread conflict, and international commodity price surges. These led to dramatic declines in economic growth, resulting in an estimated 18 percent contraction of Myanmar's economy in 2021, as measured by GDP per capita (Figure 1.1). These shocks have overlapped in time, magnifying their economic effects. For example, the rapid depreciation of the Myanmar kyat after the military coup multiplied the impact of international commodity prices on domestic inflation. Figure 1.2 illustrates the fast depreciation of the Myanmar kyat against the US dollar since the beginning of 2021. While the kyat was traded at around K1,300/$1.00 at the beginning of 2021, its official value had declined by 60 percent by September 2022 to K2,100/$1.00. Informal market rates were K3,500/$1.00 at the end of 2023.

The earliest reports of COVID-19 coincided with the beginning of the 2019/20 tourist season, resulting in large-scale trip cancellations. Social distancing measures were introduced as awareness grew of the potential for disease spread. Wet markets remained open to maintain access to food. However, the closure of international borders and uncoordinated road closures by local authorities led to the loss of perishable produce. In early April 2020, the government ordered a three-week nationwide shutdown to coincide with the annual water festival and traditional New Year celebrations, cognizant of the country's very constrained health system resources and the population's reliance on public transport during these holidays.

The pandemic response had an immediate impact on Myanmar's economy, as well as on poverty. Closures and reduced operations in industries and small and medium nonfarm businesses led to significant reductions in household incomes (Diao and Mahrt 2020; World Bank 2024b). Further, border closures and lockdown measures reduced out-migration, while at the same time many internal and international migrants decided to return home. Remittance flows decreased significantly, reducing household income and cutting off an important social safety net (ILO 2020).

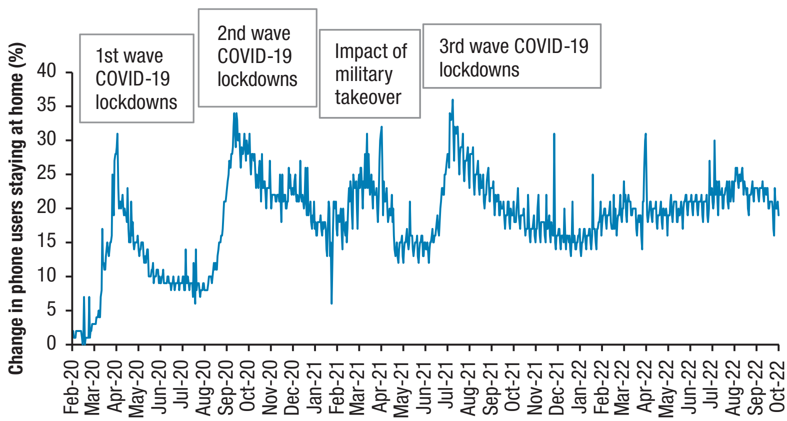
One way to visualize the effects of successive waves of COVID-19 is to use Google Community Mobility data, made publicly available from the inception of the pandemic until October 2022. Figure 1.3 shows changes in the percentage of phone users who stayed at home from early 2020 to late 2022 relative to a five-week baseline period at the beginning of 2020 prior to the widespread emergence of COVID-19.

FIGURE 1.2 Myanmar kyat, official and market exchange rates to US dollar, 2021–2023



Source: Data from CBM (2023), private money changers.
Note: CBM = Central Bank of Myanmar.

FIGURE 1.3 Shocks to Myanmar's economy, 2020–2022



Source: Based on data from Google (2022).
Note: Y-axis measures the percentage change relative to February 2020 in the extent to which phone users stayed at home.

The government moved quickly to establish a COVID-19 Economic Recovery Plan (CERP) to mitigate the economic consequences of the pandemic (GoM 2020). CERP focused initially on COVID-19's impact on urban sectors of the economy, such as the closure of garment factories, which employed more than half a million workers. However, with the nation's rice supply dependent on the monsoon growing season and concerns about the potential effects of lost migrant worker remittances on farm household input purchases, CERP expanded the seasonal loans provided through the Myanmar Agricultural Development Bank. As a result of such proactive measures to support the economy, combined with effective public health campaigns, the economic effects of shutdowns on the agrifood system were relatively transient during the initial COVID-19 wave and during a second wave from September to December 2020 (Boughton et al. 2021).

The impacts of the military coup on February 1, 2021, had consequences of an entirely different scale and duration. Although the first few weeks saw little bloodshed, widespread protests and the emergence of a national Civil Disobedience Movement resulted in a shutdown of the health and education sectors, manufacturing, and the banking system. Given that the economy, especially the informal sector, depends heavily on cash transactions, the banking shutdown quickly and widely disrupted economic activity. Large queues formed at automated teller machines, withdrawal amounts were limited, and tokens were allocated to ration access to cash. The Myanmar kyat depreciated rapidly (Figure 1.2).

In mid-2021, a third wave of COVID-19—the highly contagious and lethal Delta variant—began during this political and economic chaos (Figure 1.3). Most civilian hospitals were closed or seriously understaffed, and the country also had extremely limited domestic supplies of medical oxygen. While accurate statistics on total infections and deaths are unavailable, reported cases and deaths soared in July and August 2021 (WHO 2023). Compared to earlier COVID-19 waves, the financial resources of affected households were heavily drained by medical and funeral expenses and by lost work opportunities for family members who had to care for sick relatives. Whereas previous waves had primarily affected urban centers, the breakdown of public health services and lack of adherence to disease prevention measures, combined with the much more contagious nature of the variant, meant that rural areas saw more severe impacts during this third wave.

Russia's invasion of Ukraine on February 24, 2022, just over a year after the military coup in Myanmar, resulted in a further surge in international commodity prices. By mid-April, the US dollar price of urea fertilizer, crucial for agricultural production, was 180 percent higher than a year earlier (Baffes and Koh 2023). Price increases of imported fertilizer were further exacerbated by international freight rates, which more than doubled because of COVID-19 disruptions to shipping. Increased international fuel prices—approximately 60 percent higher in US dollars in April 2022 compared with a year earlier—added to in-country distribution costs (Trading Economics 2023). The domestic price of fertilizer was further affected by the depreciation of the kyat following the coup. In the year to August 2022, it lost more than half its value on the parallel market.

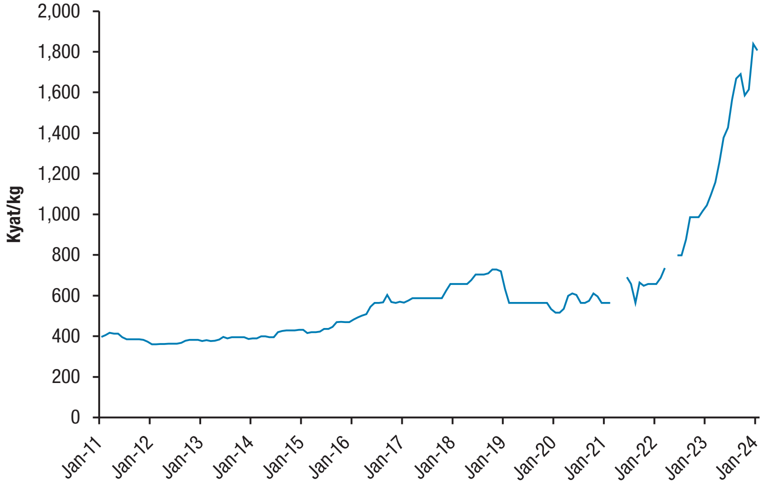
Myanmar's consumers were also negatively affected by food price inflation, which peaked at an annual rate close to 40 percent a year after the coup (MAPSA 2022a). The price of rice—the country's basic staple—increased steadily from 2021 through 2023. By December 2023, its price in Yangon's retail markets was three times higher than before the coup (Figure 1.4). International rice prices increased by 30 percent over the same period.[2] Farmgate prices for rice did not change as much. However, increased transaction costs contributed significantly to the rise in retail prices (Minten et al. 2023). Retail prices for other commodities also rose dramatically. Myanmar depends heavily on imported vegetable oil, so the combination of international price increases and disruptions to palm oil imports from Indonesia led to a quadrupling of domestic vegetable oil prices (MAPSA 2022b).

Adding to the economic disruption, violent conflict widened geographically as armed resistance to the coup expanded in the wake of regime crackdowns on street protests. Myanmar has long been plagued by repressive military rule and armed conflict—often, but not limited to, conflicts between the MAF and ethnic armed organizations (EAOs). In the two decades prior to the 2011 transition, MAF tried to contain EAOs through military offensives, ceasefires, and clientelism (Stokke et al. 2022). The strategy was largely the same after 2011 but was carried out within the new political context. The result was continued ethnic conflict across the country. Figure 1.5 gives an overview of the change in the number of fatalities because of violent events since 2014. While ceasefires slowed conflict in Kayin and Shan States, negotiations failed in Kachin and northern Shan States, where hostilities resumed with significant clashes in 2015 and 2019 (ACLED 2022). The August 2017 spike in fatalities in Figure 1.5 reflects violence between MAF and the Rohingya in Rakhine State.

However, the course of these conflicts altered after the February 2021 military coup. The tenuous ceasefire agreements that had held conflict at bay during civilian government rule collapsed, and violence resumed or intensified between MAF and EAOs (Stokke et al. 2022). The ousted leaders of the civilian government, as well as activists from ethnic groups, formed the People's Defense Force and declared war on the MAF. Figure 1.5 shows a sharp increase in fatalities in 2021 and a further spike in 2022. In this period, the

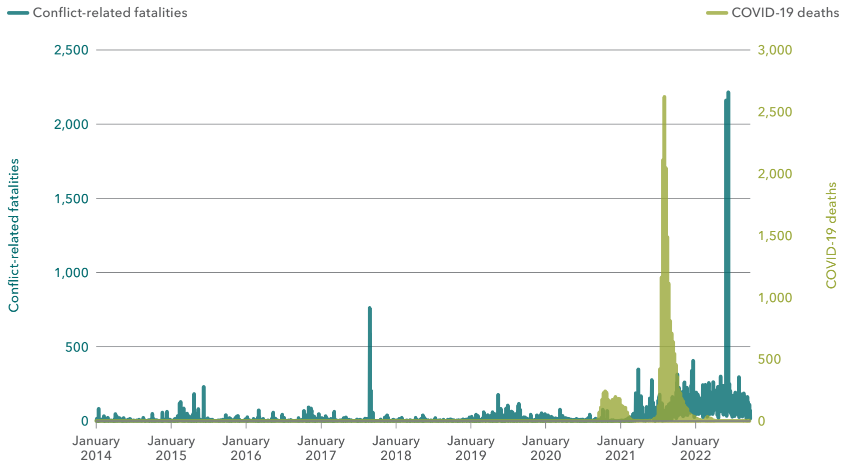
2 The Indica rice price index was 118.5 in December 2020 and 154.3 in December 2023 (FAO 2023a).

FIGURE 1.4 Retail price of rice in Yangon (Emata variety, medium), 2011–2023



Source: Data from FAO (2023b).

FIGURE 1.5 Security and health shocks per month in Myanmar, 2014–2022



Source: ACLED (2022); WHO (2023).

Myanmar military bombed and burned hundreds of villages, reprising the tactics it had used previously in confrontations with ethnic minority groups and that had provoked a mass exodus of Rohingya in 2017. This also led to a surge in internal displacements during 2022.

Conflict erupted in townships that war had touched since Myanmar's independence, as illustrated in Figure 1.6 (ACLED 2022). In March 2021, fighting broke out in Sagaing and Mandalay Regions. By May 2021, this conflict had spread to Chin State and Magway Region. In the southeast, fighting broke out in Bago Region in March 2021 and Kayah and Kayin States in May 2021. Fighting commenced in Mon State, Tanintharyi Region, and southern Shan State in September 2021, though at a comparatively lesser scale. In Kachin, intense fighting began right after the coup and then picked up again in mid-2022. Additionally, tensions between MAF and the Arakan Army are growing in Rakhine State and southern Chin State. Intermittent fighting has been recorded in those areas since June 2022 (OCHA 2022).

In addition to these recent shocks, Myanmar is susceptible to climate shocks, including cyclones, erratic monsoons, irregular rainfall, droughts and floods, and high winds. It is already experiencing the negative consequences of climate change. Globally, the country is ranked among the three countries most vulnerable to climate change and extreme weather events because of the large proportion of its population that lives in hazard-prone areas, its geographic location, and its socioeconomic conditions (UNDRR 2015). Between 2000 and 2019, the country had 14.4 fatalities related to climate shocks per 100,000 inhabitants—10 more fatalities than the next most affected territory, Puerto Rico (Eckstein, Künzel, and Schäfer 2021).

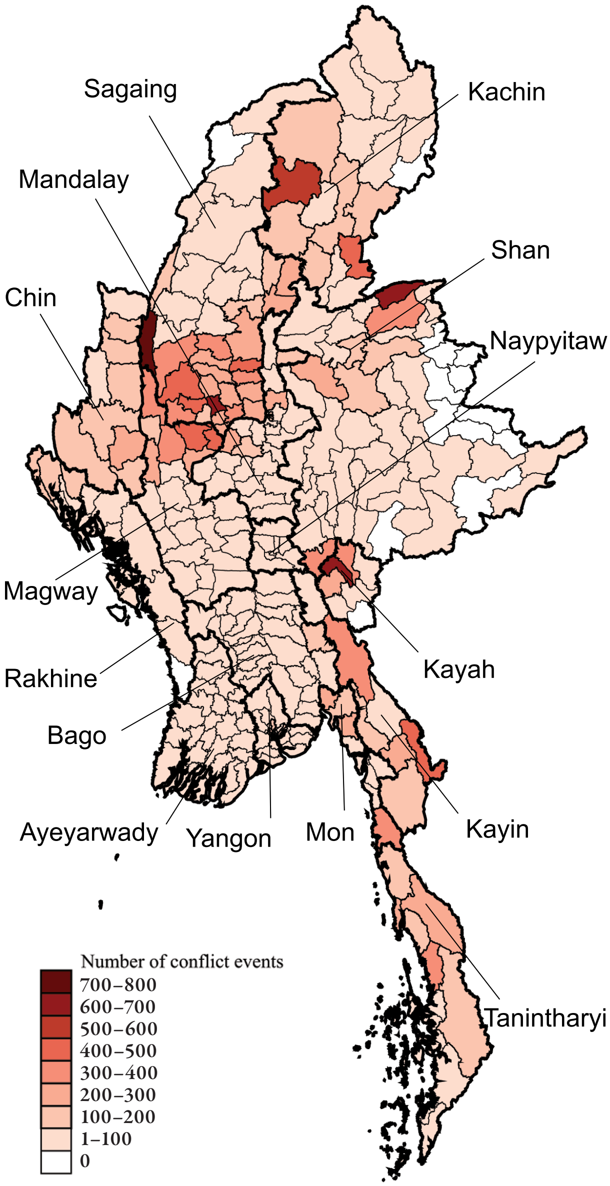
The most extreme climate event in Myanmar's recent history was Cyclone Nargis in 2008, which killed more than 138,000 people in the Ayeyarwady Delta (Thawnghmung 2019). The country has been fortunate to avoid a major negative weather event amid the succession of recent shocks, but one (or more) could occur at any time. Given the erosion of household resilience since 2020, another cyclone like Nargis would cause devastation on a scale that neither the country nor its development partners are in any position to manage.

Objectives and roadmap for the book

A decade of empirical research on Myanmar's agrifood system enables us to address the following objectives in this book:

- To provide an overview of the evolution of Myanmar's agrifood system and its role in the economy prior to and during the recent crises (Chapters 1–3).
- To measure welfare outcomes in terms of poverty and nutrition for different household types and the factors associated with them (Chapters 4 and 5).

FIGURE 1.6 Conflict events reported by township, 2021–2022



Source: ACLED (2022).

Note: Number of battles, violent incidents, or explosions reported.

- To examine the performance of specific components of the agrifood system: farm-level production, upstream input supply and mechanization services, downstream processing, retailing, and international trade (Chapters 6–14).
- To understand, through gender, youth, and ethnicity lenses, the regional dynamics of rural livelihoods and the interaction between land access, migration, and farm and nonfarm employment (Chapters 15–18).
- To identify investments and policies needed for Myanmar's agrifood system to serve as a springboard for recovery and long-term economic development (Chapter 19).

Addressing the first objective, Chapter 2 measures the contribution of the agrifood system as a whole to economic growth and employment in Myanmar. The authors use economywide modeling to identify which agricultural value chains have the potential to drive inclusive economic growth and improved nutritional outcomes in the future. Chapter 3 takes a retrospective look at agricultural performance to identify structural impediments and policy and investment gaps on the supply side that have prevented the agrifood system from fulfilling its potential.

Addressing the second objective, Chapter 4 examines household consumption and nutrition, focusing on how recent food price inflation and income losses have undermined food and nutrition security. Possible interventions to mitigate the potentially serious long-term consequences are identified. Chapter 5 examines the impact of different kinds of shocks—conflict, climate, health, and economic—on household income and welfare and how household coping strategies have evolved in response. These chapters reveal a high degree of fragility in livelihoods in the face of multiple shocks that affect the demand side of the agrifood system, despite a relatively resilient supply side.

The following four chapters characterize the farm production components of the agrifood system. Chapter 6 analyzes the distribution, tenure, and use of agricultural land across the main agroecological zones in Myanmar and evaluates the influence of successive land policy regimes on land access. Chapter 7 documents the rapid rise of agricultural mechanization in Myanmar in the decade prior to 2020 and analyzes the factors associated with this dramatic change and its implications for agricultural households and workers. The chapter also addresses changes in access to mechanization services since the onset of COVID-19. Chapter 8 examines the regional distribution, productivity, profitability, and extent of technology adoption in Myanmar's major crops, including rice, pulses, and maize, highlighting reasons for underperformance and recommendations for improvement. Chapter 9 documents the characteristics of livestock and fisheries, two of Myanmar's most dynamic high-value agrifood sectors, assessing both traditional small-scale producers and more specialized production systems and their contributions to rural employment and national nutrition security.

The next five chapters examine upstream and downstream linkages connecting farm production to the rest of the agrifood system. Chapter 10 examines changes in farm commercialization over time, giving close attention to fertilizer (the most important purchased input in value terms), marketed crop surpluses, and the factors associated with farmer marketing decisions. Chapter 11 focuses on the structure and performance of the rice value chain. Chapter 12 contrasts the dynamism of the maize–poultry–fish value chain nexus with challenges facing the oilseeds and pulses value chains in a context of market liberalization. Chapter 13 drills down into the food processing sector, which accounts for more than half of all registered industrial enterprises in the country, analyzing the underlying drivers of domestic and international demand for processed food products. Chapter 14 examines trends in international trade for Myanmar's agricultural products broadly, noting the constraints imposed by the unpredictable trade practices of the country's larger neighbors. An overall picture emerges of a sector struggling to realize its potential for adding value to farm produce due to internal and external constraints.

The final chapters examine rural and urban livelihoods more broadly, applying a gender lens and considering how migration and off-farm employment complement regional agrifood system constraints and opportunities. Chapter 15 provides insights into the widespread phenomenon of rural out-migration using data collected in different parts of the country between 2015 and 2019 and through phone surveys during the recent crises. Migration has been and continues to be critical in sustaining or improving rural livelihoods in Myanmar. Chapter 16 looks beyond farming as the main livelihood in rural areas and shows a vibrant rural nonfarm economy, though one that is inevitably affected by the ongoing crises. Chapter 17 spotlights women and youth, using nationally representative data to demonstrate their importance to the country's agricultural production. Chapter 18 provides a more detailed synthesis of the regional diversity of rural development and livelihoods, emphasizing the uneven development paths seen both across and within regions.

Chapter 19, the concluding chapter, points to implications from the analysis for future policy and public investment priorities to enable the agrifood system to support recovery and economic growth.

Data sources

The analysis in this book uses a wide range of primary sources (Table 1.1). Research between 2015 and 2019 was undertaken using household surveys in purposefully selected townships in four agroecological zones. These were combined with stacked value chain surveys for several important agricultural commodities. The data, survey instruments, and related documentation are publicly available on Harvard Dataverse under the Myanmar Food Security Policy Project (MFSPP) data series (Harvard Dataverse 2020).

From the onset of COVID-19 in early 2020, non-random phone surveys of actors at all stages in the agrifood system were conducted at frequent intervals. In addition, a 12-round panel phone survey of 2,000 households was conducted over the same period.

Beginning in late 2021, a multi-round nationally and regionally representative phone survey of approximately 12,000 households, the Myanmar Household Welfare Survey (MHWS), was launched under the Myanmar Agriculture Policy Support Activity (MAPSA). A multi-round survey of approximately 5,500 farm households belonging to the same sample, the Myanmar Agricultural Performance Survey (MAPS), was also launched. These data, survey instruments, and related documentation are publicly available on Harvard Dataverse under the IFPRI Dataverse data series (Harvard Dataverse 2024).

We also rely on secondary data, including from national household surveys conducted by the Central Statistical Organization (CSO) (Table 1.1). The Myanmar Living Conditions Survey (MLCS), fielded in 2017, is a comprehensive household survey that provides information on the living conditions of the people of Myanmar and agricultural practices across the country (CSO 2019). It provides data representative of the country and at the level of its states and regions. In total, 13,730 households participated in the survey. We also rely on the food consumption module of the nationally representative Myanmar Poverty and Living Conditions Survey (MPLCS), fielded in 2015 (MOPF and World Bank 2017a, 2017b; World Bank 2024b). MPLCS is a cross-sectional household survey that contains data from 3,658 households interviewed between January and April 2015.

TABLE 1.1 Major data sources used in this book

Dataset	Year	Zone
Myanmar Food Security Policy Project (MFSPP)		
Aquaculture	2016	Delta
Pulses and oilseeds	2017	Dry Zone
Maize	2018	Shan
Poultry and pigs	2019	Yangon
Myanmar Agriculture Policy Support Activity (MAPSA)		
Value chain agents	2020–2022	National
Social Accounting Matrix (SAM)	2021	National
Myanmar Household Welfare Survey (MHWS)	2022	National
Myanmar Agricultural Performance Survey (MAPS)	2022	National
Central Statistical Organization (CSO)		
Myanmar Poverty and Living Conditions Survey (MPLCS)	2014–2015	National
Myanmar Living Conditions Survey (MLCS)	2017	National

Source: Compiled by authors.

Together, these primary and secondary datasets provide a strong foundation for analyses to address the book's objectives. More details on these surveys are provided in the Appendices.

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Chapter 2

THE AGRIFOOD SYSTEM: STRUCTURE AND CONTRIBUTION TO DEVELOPMENT GOALS

Xinshen Diao, Ian Masias, Karl Pauw, James Thurlow, and Duncan Boughton

As countries develop, agrifood systems (AFS) are expected to evolve beyond primary agriculture (Diao, Hazell, and Thurlow 2010; Timmer 1988). The earliest stages of development are typically characterized by subsistence farming; as agricultural productivity rises, farmers begin to supply surplus production to markets, which creates employment opportunities for workers in the off-farm economy (Haggblade, Hazell, and Dorosh 2007). Rising rural incomes generate demand for more diverse products; this leads to more nonfarm activities such as processing, packaging, transporting, and trading. In the early stages of transformation, the agriculture sector serves as an engine of rural—and even national—economic growth. Eventually, urbanization, the nonfarm economy, and nonagricultural incomes play more dominant roles in propelling AFS development, with urban and rural nonfarm consumers creating most of the market demand for agricultural outputs via value chains that connect rural areas to towns and cities (Dorosh and Thurlow 2013). The exact nature of this transformation process varies across countries because of the diverse structure of their economies and the unique growth trajectories of their various agrifood and nonfood subsectors. A focus solely on primary agriculture without an understanding of its linkages to off-farm components of the economy masks the importance of AFS to the overall economy and its potential contribution as a driver of development going forward.

In this chapter, we first measure the size, structure, and historical contribution of the AFS to economic growth and transformation in Myanmar. Second, we assess the potential for AFS growth led by productivity gains in different agricultural value chains to contribute to development outcomes in Myanmar using the Rural Investment and Policy Analysis (RIAPA) model (IFPRI 2023b). We measure AFS using national accounts and employment statistics to either track or simulate growth and employment changes over time. We disaggregate AFS into several value chain groups, which allows the analysis to offer a unique and useful perspective on the drivers of AFS growth and transformation. Finally, we discuss the implications of the recent crises for the future of the AFS and propose both short- and long-term policy recommendations to help steer recovery.

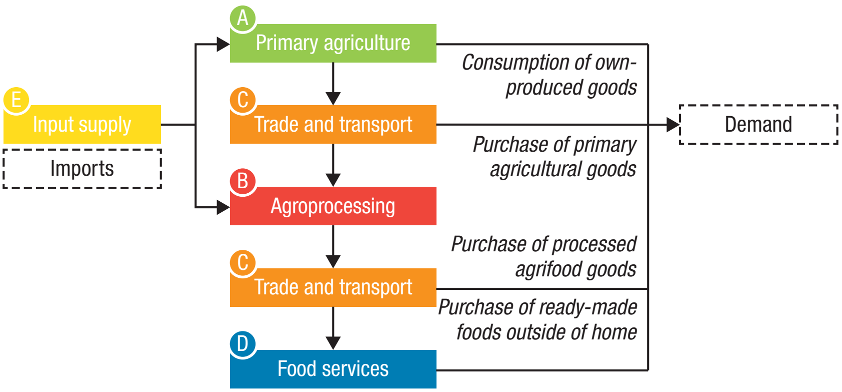
Myanmar's agrifood system

A simple conceptual framework

A country's AFS is a complex network of actors connected by their differing roles in supplying, using, and governing agrifood products (Fanzo et al. 2020). Figure 2.1 provides a simplified conceptual framework of AFS made up of five components, A to E (Thurlow et al. 2023). Primary agriculture (A) comprises the supply and demand of all agricultural products, including crops, livestock, fisheries, and forestry products. Agro-processing (B) is part of the manufacturing sector and includes those subsectors that process agriculture-related food or nonfood products. Trade and transport services (C) include those associated with transporting, wholesaling, and retailing agrifood products among farms, firms, and final points of sale. Food services (D) includes services such as meals prepared at restaurants, food stalls, or hotels. Finally, input supply (E) is the portion of domestically produced intermediate inputs used directly in agricultural and agro-processing production, such as fertilizers and financial services.

Using this conceptual framework, a social accounting matrix (SAM), and complementary national accounts and statistics, it is possible to measure the size and structure of an AFS from a supply-side perspective. Following the definitions of Thurlow et al. (2023), AFS gross domestic product (or AgGDP+) is the sum of the value added from the five components (A to E), while AFS employment (or AgEMP+) is the total number of jobs across those components. As the economy grows and transforms over time, changes will occur in the relative contributions of the various on-farm and off-farm components of AFS to total AgGDP+ or AgEMP+. A transforming economy, for example, will typically be characterized by more rapid growth in the off-farm components of AFS; there will thus be an increased contribution from off-farm components to AgGDP+ and AgEMP+ and a relative decline in the contribution of primary agriculture. By disaggregating AgGDP+ and AgEMP+ into distinct agricultural value chains, we can further assess the contribution of each of those value chains to AFS growth and transformation.

FIGURE 2.1 A simple conceptual framework of the agrifood system



Source: Thurlow et al. (2023).

Structure of Myanmar's agrifood system in 2019

Table 2.1 presents the structure of the AFS in 2019. GDP figures for the total economy and aggregate economic sectors, such as primary agriculture, total manufacturing, and total services, come from the latest national accounts data for Myanmar, while employment figures were obtained from the International Labour Organization (ILO 2020). The breakdown in Table 2.1 of the non-farm components of AFS (corresponding to components B, C, and D of Figure 2.1) is based on the 2019 SAM for Myanmar (IFPRI 2023a), which includes disaggregated economic activities and the input-output relationship between economic subsectors. The SAM triangulates subsectoral employment data from the 2014 population census (MoLIP 2015), household budget and labor force surveys (MNPED 2011; ILO 2017), and additional international databases containing sectoral employment time series (de Vries et al. 2021).

Table 2.1 presents the value and shares of GDP and employment (i.e., AgGDP+ and AgEMP) for the total economy, the entire AFS, and the rest of the economy outside AFS. AFS is further broken down into on-farm (primary agriculture) and the four off-farm components. Furthermore, it provides information on total manufacturing and services, including the trade and transport services subsector, encompassing activities in both AFS and non-AFS sectors. This offers insights into the relative size of the off-farm AFS components within the overall manufacturing and services sectors.

TABLE 2.1 Structure of Myanmar's agrifood system and economy, 2019

Category	GDP		Employment		
	Value (US$ billions)	Share (%)	Workers (millions)	Share (%)	Average GDP per worker ($)
Total economy	69.4	100.0	23.3	100.0	2,975
Agrifood systems	32.2	46.3	14.9	64.0	2,155
Primary agriculture (A)	15.2	22.0	11.5	49.2	1,328
Off-farm agrifood systems	16.9	24.4	3.4	14.8	4,909
Processing (B)	5.7	8.2	0.6	2.5	9,626
Trade and transport (C)	7.8	11.2	2.0	8.7	3,811
Food services (D)	2.3	3.3	0.7	2.9	3,392
Input supply (E)	1.2	1.7	0.2	0.7	7,787
Rest of economy	37.3	53.7	8.4	36.0	4,431
Total manufacturing	15.2	21.9	1.5	6.6	9,903
Total services	30.9	44.5	8.8	37.6	3,520
Total trade and transport	23.3	33.6	6.4	27.4	3,652

Source: Authors' calculations based on 2019 Myanmar SAM (IFPRI 2023a).

Note: GDP in the 2019 Myanmar SAM is in Myanmar kyat and converted to US$ using the 2019 exchange rate of 1,518.3 kyat to 1.00 US$ from the World Development Indicators database (World Bank 2024). A to E correspond with the five agrifood system components from Figure 2.1.

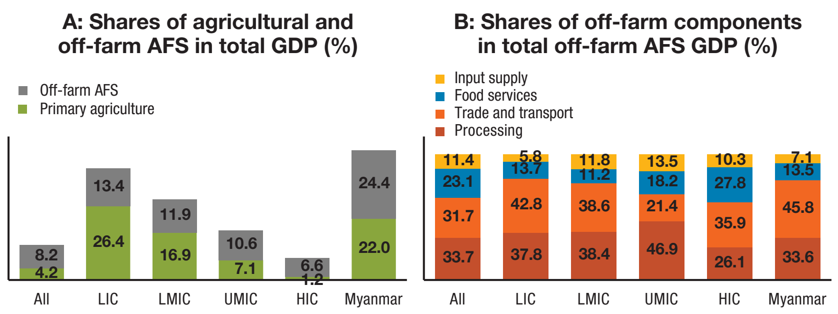
In 2019, AFS was the primary contributor to national GDP (46.3 percent) and the economy's largest employer (64 percent). Primary agriculture alone contributed 22 percent to GDP and represented almost half of all employment. In contrast, the four off-farm components collectively represented 24.4 percent of the GDP, surpassing primary agriculture, while accounting for 14.8 percent of employment and 23 percent of AgEMP+. The comparison of on- and off-farm GDP and employment shares shows that labor productivity is significantly higher in the off-farm components. Consequently, the transition of farm workers into these off-farm components, a natural evolution in agricultural transformation, raises economywide labor productivity and would potentially enhance household incomes.

AgGDP+ amounted to $32.2 billion, more than double the $15.2 billion generated by the primary agriculture sector. This implies that for every $1.00 of GDP generated on-farm, an additional $1.12 of GDP is generated off-farm in the AFS. Trade and transport was the largest contributor to off-farm GDP. However, labor productivity, measured as GDP per worker, was highest in agro-processing, likely because the sector is more capital intensive and uses relatively less labor than other components in the off-farm AFS. In general, the off-farm labor productivity of $4,971 aligns with the average in the broader economy outside AFS ($4,440) and is significantly higher than on-farm labor productivity ($1,322).

Comparing Myanmar's agrifood system to other countries

The structure and economic contribution of the AFS vary across different stages of a country's development. Figure 2.2 illustrates this by comparing the AFS structures of low-income, lower-middle-income, upper-middle-income, and high-income countries with Myanmar's AFS in 2019. Both the on- and off-farm composition of Myanmar's AFS and its contribution to national GDP are larger than those of its peer lower-middle-income countries (panel A). However, within the four off-farm components of AFS, the trade and transport component is relatively larger in Myanmar compared to other lower-middle-income countries (panel B). This reflects the delayed transformation of Myanmar's AFS as well as high transport costs due to poor infrastructure (discussed in Chapter 3).

FIGURE 2.2 Comparing Myanmar's agrifood system to other countries, 2019



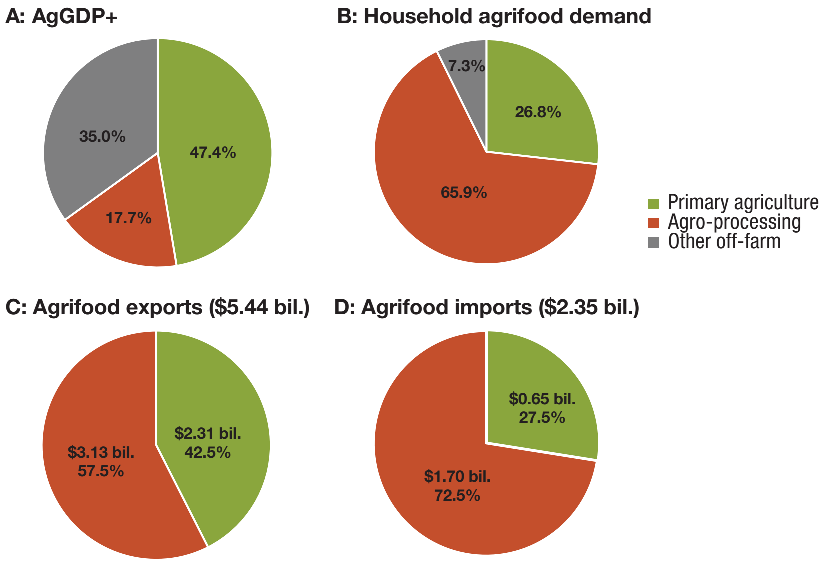
Source: IFPRI's Agrifood System Database (Thurlow et al. 2023) and 2019 Myanmar SAM (IFPRI 2023a).

Note: AFS = agrifood system. HIC = high-income countries. LIC = low-income countries. LMIC = lower-middle-income countries. UMIC = upper-middle-income countries.

Unpacking the demand side of Myanmar's agrifood system

Panels A and B of Figure 2.3 compare the supply side of Myanmar's AFS, as measured by AgGDP+ (panel A), with the demand side, as gauged by household consumption of agrifood products (panel B). While primary agriculture contributed 47.4 percent to AgGDP+, its products make up only 26.8 percent of household demand. Conversely, processed agrifood products represent

FIGURE 2.3 Composition of Myanmar's agrifood system GDP, household demand, and trade, 2019



Source: Authors' calculations based on 2019 Myanmar SAM (IFPRI 2023a).
Note: AgGDP+ = agrifood system GDP. bil. = billion.

65.9 percent of total agrifood demand despite accounting for only 17.7 percent of AgGDP+. This bias toward processed agrifood products is also reflected in the high share of agrifood imports, with 57.5 percent of exports being processed commodities (panel C), while 72.5 percent of imports are processed goods (panel D). Nevertheless, the agrifood export value is more than double the total value of agrifood imports and almost three times that of primary agricultural imports. Due to the significant surplus in its commodity trade balance, Myanmar has considerable potential for boosting agricultural exports.

Moreover, the value of exports from agro-processing surpasses processing imports. However, as detailed in Chapter 13, many exported agro-processing goods involve minimal manufacturing activities. For instance, milled rice and rubber are important export commodities. Although categorized as agro-processing exports, the value addition to paddy rice and raw rubber materials is minimal. In essence, the value of agro-processing exports predominately reflects the value of primary agricultural products.

Disaggregating the agrifood system across value chains

Decomposing AFS across major product groups enables us to understand the structural and historical growth patterns of the AFS and track the value added by each of its five components. The 2019 Myanmar Social Accounting Matrix (SAM) includes 33 primary agricultural subsectors and 19 agro-processing subsectors/commodities organized into 13 groups (Table 2.2). The agro-processing subsectors are grouped based on their association with each of the 33 primary agricultural subsectors. However, two processed agricultural subsectors that manufacture highly processed food products—processed foods and beverages—are classified as "unattributable" and are not shown in Table 2.2, due to their complex linkages back to primary agriculture. More than 90 percent of Myanmar's off-farm AFS can be mapped to these 13 distinct product groups, excluding the two omitted subsectors. We refer to these product groups as value chains, delineated by their primary agricultural products.

On the basis of their trade orientation, we further classify the 13 value chain groups into three subgroups—exportable, importable, and less traded. Exportable and importable value chains are defined by export–output and import–consumption ratios that exceed the national average, respectively, considering trade in both primary and processed agrifood products. The remaining value chains are classified as less traded. Table 2.3 shows the breakdown of these value chain groups by trade orientation and their contribution to AgGDP+, primary agricultural GDP, and GDP in the off-farm components of AFS.

Consistent with Figure 2.3, Table 2.3 shows Myanmar's comparative advantage in exports, as evidenced by the 9.7 percent export–output ratio exceeding the 4.4 percent import–consumption ratio. Together, the seven exportable value chains account for 58.1 percent of Myanmar's AgGDP+, 51.3 percent of the off-farm share of GDP, and 65.7 percent of primary agricultural GDP. Milled rice, the largest exportable commodity, accounts for more off-farm GDP (32 percent) than primary agricultural GDP (22 percent), given its value addition through activities such as milling, storage, trade, and transport. Additionally, the off-farm component of the horticultural value chain is significant. Therefore, expanding the exports of rice and horticultural products and enhancing their value addition could effectively propel agricultural transformation and off-farm employment.

It is noteworthy that many export-oriented products are widely consumed in the domestic market, while oilseeds and other cereals, which include sorghum, millet, wheat, and barley, hold potential for import substitution. The four less-traded value chains collectively represented 25.2 percent of AgGDP+.

TABLE 2.2 Value chain groups and their corresponding agricultural subsectors

Value chain group and share of Myanmar's AgGDP+	Individual value chains or agricultural subsectors in the group (share of group's AgGDP+)
Maize (1.7%)	Maize (100%)
Rice (27.2%)	Rice (100%)
Other cereals (2.9%)	Sorghum & millet (78.7%), wheat & barley (14.1%), other cereals (7.2%)
Oilseeds (5.8%)	Pulses (100%)
Pulses (3.7%)	Groundnut (46.3%), other oilseeds (53.7%)
Roots (2.6%)	Cassava (47.4%), Irish potatoes (17.8%), sweet potatoes (34.8%)
Horticulture (12.5%)	Leafy green vegetables (14%), other vegetables (24%), bananas (18.1%), other fruits (43.9%)
Other export crops (1.0%)	Nuts (73.8%), cut flowers (3.2%), rubber (23%)
Other crops (9.7%)	Sugarcane (29%), tobacco (25.8%), cotton & fibers (0.8%), leaf tea (9.5%), coffee (19.2%), other crops (15.7%)
Cattle & dairy (9.1%)	Cattle meat (56.8%), raw milk (43.2%)
Other livestock (3.8%)	Poultry meat (28.9%), eggs (9.9%), small ruminants (23.6%), other livestock (37.6%)
Fish (9.6%)	Aquaculture (43.6%), capture fisheries (56.4%)
Forestry (2.4%)	Forestry (100%)

Source: Authors' calculations based on 2019 Myanmar SAM (IFPRI 2023a).
Note: AgGDP+ = agrifood system GDP.

Moreover, crops like sugarcane, tobacco, coffee, tea, cattle, and milk have substantial off-farm components, contributing similar shares to both on- and off-farm GDP (25.0 and 25.4 percent, respectively).[1]

The information provided in this section is valuable in comprehending linkages between the AFS and the broader economy and implications for further structural changes. For instance, the off-farm AFS exhibits considerably lower labor intensity than farming, necessitating significant off-farm expansion to absorb workers transitioning out of agriculture as the sector transforms. However, off-farm labor productivity is higher, suggesting that transitioning workers to other sectors could enhance overall labor productivity across the economy and raise incomes for rural households. Last, breaking down AgGDP+ across value chains enables us to anticipate how different sources of agricultural growth may impact agricultural transformation differently, favoring either on-farm or off-farm growth.

1 Though livestock is categorized as less tradable in Table 2.3, this classification is influenced by an export ban on livestock that was temporarily eased in October 2017 but then effectively reinstated in 2019.

TABLE 2.3 Myanmar's agrifood system composition by value chains trade orientation, 2019

Value chain	Share of GDP (%) AFS (AgGDP+)	Share of GDP (%) Primary agriculture	Share of GDP (%) Off-farm AFS	Exports / output (%)	Imports / demand (%)
Total	100.0	100.0	100.0	9.7	4.4
Exportable	58.1	65.7	51.3	16.8	1.1
Maize	1.7	2.2	1.3	35.1	3.9
Rice	27.2	22.0	32.0	10.6	0.3
Pulses	3.7	6.8	0.9	45.4	0.0
Horticulture	12.5	16.3	9.0	10.4	1.7
Export crops	1.0	1.8	0.3	37.5	0.1
Fish	9.6	14.7	5.1	27.1	1.2
Forestry	2.4	2.0	2.8	33.7	11.2
Importable	8.7	9.3	8.1	1.6	19.4
Other cereals	2.9	1.4	4.2	0.1	23.4
Oilseeds	5.8	7.9	3.9	2.6	16.6
Less tradable	25.2	25.0	25.4	1.1	4.2
Roots	2.6	3.9	1.4	0.0	0.0
Other crops	9.7	4.5	14.3	2.6	2.0
Cattle and milk	9.1	9.8	8.6	0.1	8.3
Other livestock	3.8	6.8	1.1	0.4	0.4

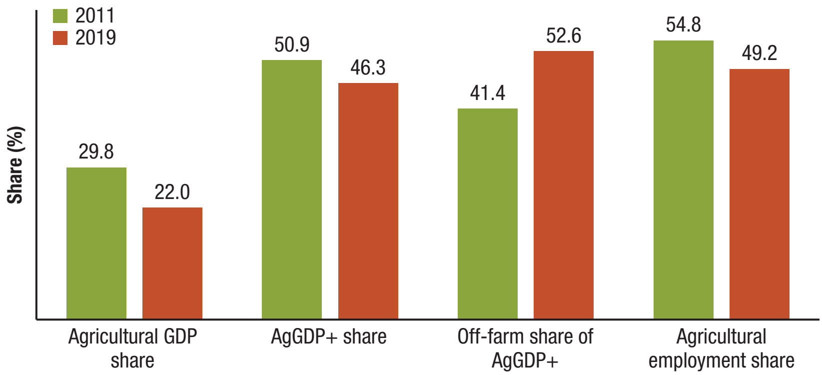
Source: Authors' calculations based on 2019 Myanmar SAM (IFPRI 2023a).
Note: AFS = agrifood system. AgGDP+ = agrifood system GDP.

Recent growth and transformation

In this section, we assess the performance and structural transformation of Myanmar's AFS from 2011 to 2019. AgGDP+ and AgEMP+ were derived from two SAMs—one for 2011 and another for 2019—to illustrate growth trends between the two periods. The SAMs were constructed to align with official GDP estimates at both the national and sectoral levels. Although SAMs are typically measured in current prices, the estimates were adjusted to constant prices to facilitate comparisons over time, using GDP deflators from Myanmar's most recent GDP series.

Typically, labor productivity is lowest in primary agriculture but higher in off-farm activities, such as agrifood processing, food services, or sectors outside the AFS. Economic growth and urbanization correlate with relatively faster expansion in these nonagricultural sectors, potentially generating higher-paying employment opportunities for both rural and urban households.

FIGURE 2.4 Agriculture GDP and agrifood system GDP as share of total GDP, off-farm share of agrifood system GDP, and agricultural share of total employment, 2011 and 2019



Source: Authors' estimates using IFPRI's Myanmar 2011 and 2019 SAMs (IFPRI 2023a).
Note: AgGDP+ = agrifood system GDP.

Consequently, even smallholder farm households with family members securing off-farm employment could benefit from structural transformation.

Figure 2.4 shows for 2011 and 2019 the share of national GDP made up by agricultural GDP and AgGDP+, the off-farm component's share of AgGDP+, and agricultural employment as a percentage of total employment. During the period from 2011 to 2019, there was a notable decline in the share of agricultural GDP and AgGDP+ in total GDP and in the share of total employment made up by agricultural employment. In contrast, the share of AgGDP+ made up by the off-farm component experienced a rapid increase. The significant structural changes witnessed in the broader economy during this period of rapid economic growth have led to the transformation of AFS. The fact that by 2019 the share of AgGDP+ generated off-farm surpassed that of primary agriculture confirms this transformation. However, primary agriculture still maintains a substantial portion of employment despite its lower labor productivity compared to the off-farm components of AFS.

Table 2.4 assesses the growth performance across AFS value chains between 2011 and 2019. The value chains remain categorized based on their trade orientation. Overall, AFS grew at a 4.3 percent annual rate in total AgGDP+, with the off-farm component growing significantly faster (7.5 percent per year) than primary agriculture (1.6 percent per year). Agrifood

TABLE 2.4 Agrifood system GDP growth rates by value chain, 2011–2019

	Average annual GDP growth rate (%)			
Value chain	Total AFS	Primary agriculture	Off-farm AFS	Agro-processing
Total AFS	4.3	1.6	7.5	10.0
Exportable	3.3	0.9	6.8	8.6
Maize	2.1	3.1	0.8	8.5
Rice[a]	6.6	3.5	9.1	10.3
Pulses	–4.7	–4.5	–5.8	NA
Horticulture	1.6	–1.1	8.1	14.2
Export crops	1.9	1.7	2.7	10.4
Fish[a]	4.3	3.6	6.6	17.5
Forestry	–2.4	–1.7	–2.8	–5.9
Importable	3.2	–0.2	8.2	6.9
Other cereals[a]	10.1	–3.1	21.0	22.3
Oilseeds	0.9	0.4	1.8	3.3
Less traded	5.7	4.4	7.0	11.1
Roots	–3.1	–3.5	–2.0	NA
Other crops[a]	5.9	2.4	7.0	10.3
Cattle and milk[a]	9.7	10.3	9.1	11.8
Other livestock[a]	6.2	5.7	9.2	14.1

Source: Authors' analysis using IFPRI's 2011 and 2019 Myanmar SAMs (IFPRI 2023a).

Note: [a] Value chains that experienced above-average AgGDP+ growth over the period 2011–2019 (that is, higher than 4.3 percent). AFS = agrifood system. AgGDP+ = agrifood system GDP. NA = not applicable.

processing, a subcomponent of the off-farm segment, expanded at an impressive rate of 10.0 percent annually.

Growth varied significantly across value chains. Among the 13 value chains, six exceeded the 2011–2019 average of 4.3 percent per year. These are indicated by an asterisk in Table 2.4. Three value chains experienced negative growth rates, including pulses, Myanmar's primary agrifood export commodity. Among the importable and less-traded value chains, cereals (mainly wheat) and the two livestock value chains had growth rates surpassing the AFS average. Conversely, growth stagnated in oilseeds and declined in root crops.

In all the rapidly growing value chains, the off-farm components of AFS experienced substantially higher growth rates than the primary agricultural component. Moreover, the processing components exhibited rapid growth in both high-growth and slower-growing value chains. This pattern in the value chains is consistent with the broader pattern of growth and structural change observed in AFS as a whole, in which off-farm component growth outpaced that of primary agriculture and agro-processing expanded particularly rapidly.

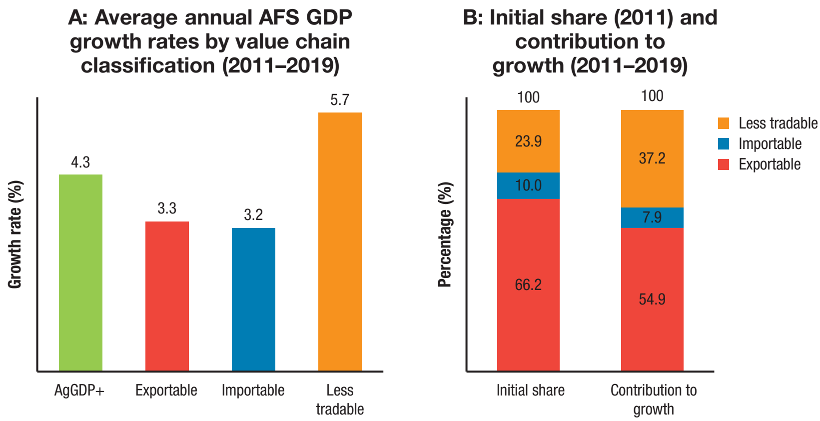
Figure 2.5 illustrates the key growth trends in Table 2.4. On average, less-traded value chains (5.7 percent) exhibited faster growth compared to the national average growth in AgGDP+ (4.3 percent) (panel A). However, given that exportable value chains constitute a significant portion of AFS (66.2 percent), they contributed the most to growth at 54.9 percent, followed by the less-traded value chain group at 37.2 percent (panel B).

Furthermore, as a country develops, it is expected that the share of employment in primary agriculture will decrease. Increases in economywide labor productivity, closely tied to economic development, typically arise through two channels. First, productivity can increase among workers within their respective sectors of employment. Second, economywide productivity rises when workers transition to more productive sectors. These two channels are commonly referred to as the "within-sector" and "between-sector" (or "structural change") drivers of labor productivity growth. As previously mentioned, GDP per worker in agriculture is lower than in other segments of AFS and the broader economy. Hence, a shift away from agriculture toward other sectors generally enhances economywide labor productivity.

The distinct contributions of these structural drivers of growth can be estimated using a decomposition approach outlined by McMillan, Rodrik, and Verduzco-Gallo (2014). Panel A of Figure 2.6 illustrates that economywide labor productivity, as measured by GDP per worker, expanded at an average annual rate of 4.54 percent between 2011 and 2019. Roughly 80 percent was driven by within-sector labor productivity growth from both agriculture and nonagriculture sectors. Notably, the within-sector labor productivity growth in agriculture accounted for 11.7 percent of the total labor productivity growth. This is likely due to rapid mechanization during this period (see Chapter 7) and growth in high-value chains such as poultry and aquaculture (see Chapters 9 and 12).

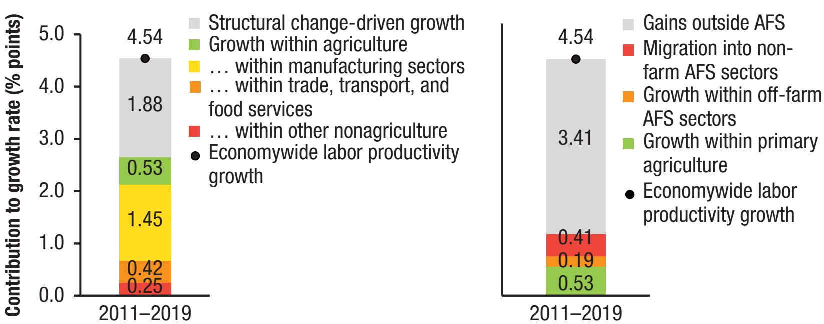
The agriculture sector accounted for 29.8 percent of total GDP in 2011. While agricultural productivity did not necessarily grow faster than economywide productivity, agricultural productivity made a significant contribution to economywide productivity growth due to the large size of the sector. However, the most substantial contribution to economywide labor productivity growth between 2011 and 2019 stemmed from within the manufacturing sector, accounting for 1.45 percentage points, 31.9 percent of the total growth registered. Overall, Figure 2.6 (A) suggests that nearly all sectors experienced

FIGURE 2.5 Drivers of Myanmar's agrifood system GDP growth, 2011–2019



Source: Authors' analysis using IFPRI's 2011 and 2019 Myanmar SAMs (IFPRI 2023a).
Note: AFS = agrifood system. AgGDP+ = agrifood system GDP.

FIGURE 2.6 Decomposition of average annual labor productivity growth rate, 2011–2019



Source: Authors' analysis using IFPRI's 2011 and 2019 Myanmar SAMs (IFPRI 2023a) and employment database.
Note: AFS = agrifood system.

productivity improvements within sectors during this period, indicating a promising phase for Myanmar's economic performance. Equally important, the structural change-led growth, which reflects shifts in employment trends aligned with workers transitioning from low-productivity sectors, like agriculture, to higher-productivity sectors, explains 1.88 percentage points of economywide labor productivity growth between 2011 and 2019.

Panel B of Figure 2.6 demonstrates the estimated contribution of AFS to economywide labor productivity growth. The within-sector contribution from agriculture remains consistent across both panels (0.53 percentage points). The migration of workers from the agriculture sector to a set of nonagriculture sectors—defined as structural change-driven growth in panel A—is disaggregated into two subcomponents in panel B. The labor mobility from primary agriculture to AFS's off-farm components, which are part of the nonagriculture sectors, accounted for 0.41 percentage points in panel B, equivalent to 21.8 percent of the structural change-led growth during this period—specifically, 0.41 percentage points out of a total of 1.88 percentage points shown in panel A. This structural change-led growth within AFS is in addition to the annual increase in labor productivity among workers already engaged in the off-farm sectors (0.19 percentage points). Consequently, the growth from the three components associated with AFS, as shown in Figure 2.6 (B), contributed to 24.9 percent of total labor productivity growth between 2011 and 2019.

The remaining 75.1 percent of total labor productivity growth originated in two sources outside AFS:

- Within-sector productivity growth in the rest of the economy—that is, 1.45 + 0.42 + 0.25 in panel A minus 0.19 in panel B, which equals 2.17, equivalent to roughly 42.6 percent of total labor productivity growth rate of 4.54 on the top of both panels.
- Migration of farm workers into sectors outside AFS—that is, 1.88 in panel A minus 0.41 in panel B, which equals 1.47, equivalent to roughly 32.5 percent of total labor productivity growth rate of 4.54 on the top of both panels.[2]

Between 2011 and 2019, Myanmar's economy experienced a swift structural transformation. The combined impacts of within-sector productivity improvements and structural change-driven growth in labor productivity, alongside the notable expansion of GDP and employment in the off-farm segments of AFS, indicate a steady progression in agricultural transformation. As a result, identifying opportunities to expedite growth beyond agricultural

2 The percentage of within-sector productivity growth is the sum of the within-nonagriculture productivity growth (panel A) minus the growth within the off-farm AFS (panel B), divided by the annual average economywide labor productivity. The percentage of migration of farm workers into sectors outside AFS is the structural change-driven growth (panel A) minus the migration to nonfarm AFS sectors divided by the annual average economywide labor productivity.

activities and bolster transformation remains a priority for both AFS and the broader economy.

Future drivers of inclusive agricultural transformation

Policymakers typically seek multiple development outcomes. These often include increased economic growth, higher employment, poverty reduction, and improved food security and nutritional status of the population. Understanding how productivity growth in different agricultural value chains can contribute to these developmental outcomes is useful for allocating public sector investment in the agriculture sector, as well as for policies to encourage private sector investment. This is especially important for Myanmar, where rice production has historically been prioritized by the government to the neglect of almost all other value chains. In this section, we use IFPRI's Rural Investment and Policy Analysis (RIAPA) model to simulate the impact of productivity growth in 11 agricultural value chain groups on development outcomes. We considered five developmental outcomes:

- Poverty reduction, which is assessed by a poverty–growth elasticity that measures the percentage-point change in the poverty head count per unit of agricultural GDP growth generated within the targeted value chain.
- Growth effect, which is assessed by a growth multiplier that measures the change in GDP per unit of increase in agricultural GDP in the targeted value chain.
- Job creation, which is assessed by an employment multiplier that measures the change in the number of jobs created per unit of increase in agricultural GDP in the targeted value chain.
- Nutrition/diet effect, which is assessed by a diet-quality indicator that measures the percentage change in a diet quality index per unit of agricultural GDP growth generated within the targeted value chain.
- A hunger-growth elasticity that measures the percentage-point change in the rate of undernourishment per unit of agricultural GDP growth generated within the targeted value chain.

The model simulates an exogenous increase in on-farm productivity for 11 of the original 13 value chains, excluding other cereals and forestry, and measures the impact of these productivity increases on five development outcomes. Although the exogenous productivity increase is imposed solely on the primary agriculture component of each value chain, spillover effects occur into the off-farm components of each value chain, as well as into other agricultural value chains or sectors outside AFS. A core element of RIAPA is a computable general equilibrium (CGE) model, an economywide model. In the CGE part of RIAPA, commodity prices and returns to labor, land, and capital are endogenous variables. Also, as a dynamic model, capital accumulation and capital allocation across sectors occur endogenously. With such endogenous changes in a general equilibrium model, production, exports and imports of all sectors, and household incomes and demand for all commodities also endogenously change. A detailed description of the CGE model can be found in Diao and Thurlow (2012). We focus more on the insights into the transformation effects from agricultural productivity growth within different AFS value chains on the broader economy and other development outcomes.

A microsimulation model is another core element of RIAPA. It is linked to the CGE model through a top-down approach such that the development outcomes for poverty, nutrition/diet, and hunger can be measured at the household level. The microsimulation model is built on the data from the 2017 Integrated Household Living Conditions Survey (IHLCS) for Myanmar, and all sample households in the survey are used in the analysis. All sample households are mapped into the 15 household groups defined in the CGE model. The groups are classified by income level (five income quintiles) and whether they are rural or urban. The rural households are further distinguished by whether the household obtained any nonfarm income, resulting in 10 rural household groups in the CGE model. The initial poverty status for all sample households in the microsimulation model is consistent with the IHLCS poverty analysis (CSO, UNDP, and World Bank 2019); the initial households' hunger status in the microsimulation model is consistent with an assessment by the Food and Agriculture Organization of the United Nations (FAO); and the initial diet quality measure for each household is based on the Reference Diet Deprivation index developed by Pauw and colleagues (2023).

With detailed agriculture and nonagriculture sectors in the model, factor intensity and the input-to-output relationship differ across the simulated 11 value chains, which creates unique links to other sectors as suppliers or users of intermediate inputs across value chains. Moreover, sources of income and demand structure differ within the 15 groups of households in the CGE model, and the demand structure further differs among all sample households in the microsimulations. All these differences alter the impact of on-farm agricultural productivity growth through varying connections to rural or urban households across different income groups and then different sample households within groups. This complexity results in differential impacts being seen from on-farm productivity growth in the 11 value chains across the development outcomes considered.

We expect each value chain growth scenario to have a distinct impact on development outcomes, with some value chains being more effective than others in attaining specific outcomes. As a result, there may be trade-offs due to differential effects among the development outcomes and resource competition across value chains. The RIAPA model helps to unpack these complex effects, offering information to governments or development partners that can be used to prioritize resource allocations across different value chains, depending on the development outcomes they value most.

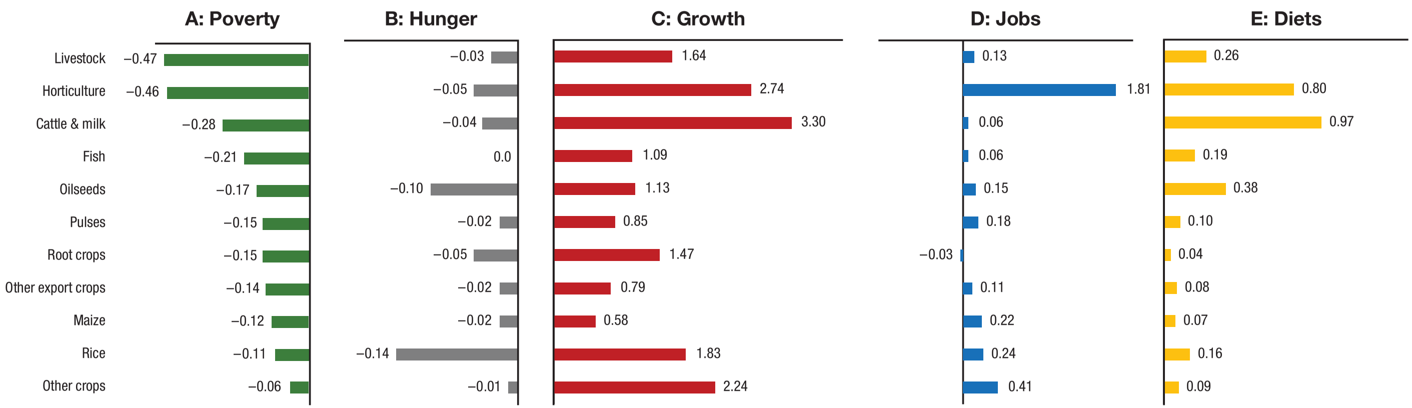
It is important to acknowledge that this analysis is rooted in a period of stability in Myanmar before the COVID-19 pandemic and recent political instability. Although the situation has changed drastically since 2020, identifying priority value chains remains essential for the long-term recovery of Myanmar's economy.

Comparing development outcomes associated with growth driven by agrifood value chains

Figure 2.7 depicts the scores of each value chain across the five development outcome indicators. We have arbitrarily ranked the value chains based on their poverty score. Notably, value chains exhibit significant differences in their efficacy in enhancing various development outcomes. For instance, while the other livestock value chain demonstrates strong poverty-alleviating effects, its impact on improving diet quality or generating employment is comparatively limited. Conversely, the cattle and milk value chain boasts a growth multiplier of 3.36, the highest among all value chains. This implies that for every US$1 increase in GDP within the cattle and milk value chain due to enhanced on-farm productivity, an additional US$3.36 is generated in total GDP. However, despite its economic impact, the cattle and milk value chain ranks lower in job creation outcomes.

While there is a degree of correlation between the AgGDP+ and AgEMP+ outcome indicators, the value chains most effective in generating growth are not necessarily the most effective in job creation. The sole exception is the horticulture value chain, which consistently demonstrates strong employment and GDP impacts within AFS, alongside its positive effects on poverty alleviation and dietary outcomes. This is likely attributed to high domestic consumption of fruits and vegetables coupled with moderate exports. The

FIGURE 2.7 Impact of value chain growth on development outcomes in Myanmar



Source: RIAPA model results.

Note: Panel A is the percentage-point changes in the poverty rate associated with a 1 percent increase in agricultural GDP; panel B is the percentage point changes in the hunger rate associated with a 1 percent increase in agricultural GDP; panel C is the change in total GDP (in US$ millions) associated with a US$1.0 million increase in agricultural GDP from the targeted value chain; panel D is the change in total economywide employment (in thousand persons) associated with a US$1.0 million increase in agricultural GDP from the targeted value chain; and panel E is the percentage improvement in diet quality associated with a 1 percent increase in agricultural GDP. The figure is ordered by the poverty rate outcome.

demand side plays a pivotal role in the horticulture value chain's pronounced growth multiplier effect in AgGDP+.

On the contrary, the three export-oriented value chains—pulses, maize, and other export crops—exhibit a modest growth multiplier effect in AgGDP+, as they are exported in minimally processed form (e.g., sorted and graded), resulting in limited value addition from AFS beyond the farmgate. Additionally, as export crops, their growth exerts less influence on their prices, which are predominantly determined by international markets.

The significant differences in the efficacy in enhancing various development outcomes across value chains first come from differential general equilibrium effects of productivity growth from different value chains. Generally speaking, agricultural supply is met mainly by domestic demand. With agricultural productivity growth, domestic prices generally fall because the income elasticity of food demand is inelastic, especially among staple foods. The more income-inelastic the demand for a food item is, the more negative is the impact on this product's price when its production increases. This implies that, while consumers increase their consumption of this food item with a falling price and increasing incomes from its productivity growth, demand for other food and nonfood commodities also increases. The supply response to the change in relative prices and increased demand across consumption goods leads to resources moving out of the sector with a productivity growth shock into other sectors, where consumption demand increases as a result of the shock. Increased demand and, hence, value-added generated from other sectors becomes a GDP growth multiplier. The more such increases in value added are generated from the nontargeted sectors, the higher the GDP growth multiplier effect. In Figure 2.7, that the cattle and milk value chain has the highest GDP growth multiplier of 3.36 implies that a 1 unit increase in cattle and milk value added from its productivity increase creates 2.36 units of value added in total from other sectors, including some value added from the nonfarm part of the cattle and milk value chain.

Differential impacts on poverty, hunger, and diet quality depend not only on such different general equilibrium impacts across value chains in the CGE model, but also on the distribution patterns of households in their consumption structure. If there are many poor households whose total expenditure is only slightly below the poverty threshold and whose income increases rely more on livestock-led growth, increased total expenditure of these households resulting from livestock productivity growth will allow many of them to move out of poverty, resulting in a larger poverty reduction elasticity for growth led by livestock productivity. The same applies to the differential impacts on hunger and diet quality indicators. That is, it is the changes in the consumption structure of poor households with a total calorie intake just slightly below the thresholds for the hunger measure or with a diet quality measure slightly below the national threshold indicator that determine the changes in hunger and diet quality levels nationwide.

The results in Figure 2.7 suggest that households whose total expenditure is slightly below the poverty line often rely on livestock or horticulture for their income. Similarly, households whose calorie intake is slightly below the hunger threshold measure are likely to rely on rice production for their income. Meanwhile, improvements to the dietary quality indicator are driven by increased consumption of horticulture and cattle and milk products.

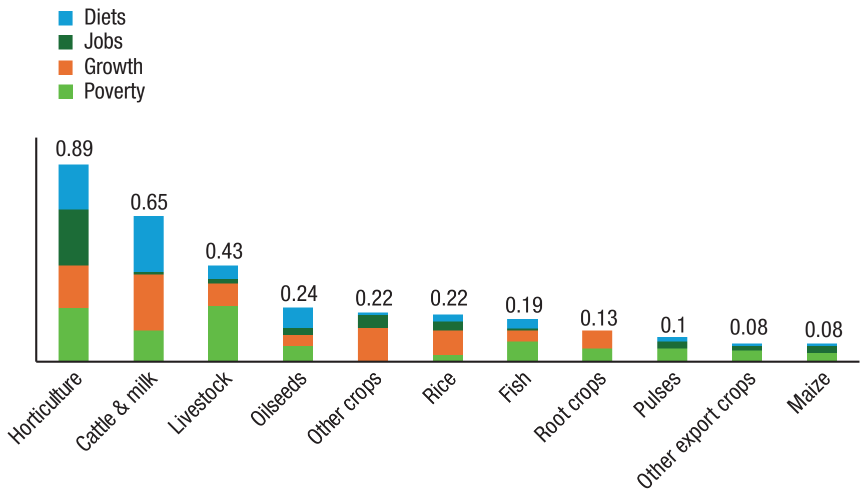
While these findings are not easy to fully understand due to the complexity of general equilibrium effects in the CGE model and the distribution effects on poor households' income and consumption patterns in the microsimulation model, the findings underscore the potential trade-offs that may arise when prioritizing individual value chains—there exists no single value chain that excels in achieving all development objectives. By promoting a prioritized selection of value chains collectively, not only can agricultural growth be diversified, but multiple development objectives can be pursued concurrently.

Prioritizing value chains

To identify priority value chains, a composite score encompassing various outcome indicators is devised (Figure 2.8). Given the strong correlation between poverty and hunger impacts across value chains, the hunger score is excluded from the composite score. Additionally, as the outcome indicators have different underlying units, they are normalized to ensure comparability while preserving their ranking within each outcome category. Normalization involves assigning a score of one to the most effective value chain within an outcome category, and zero to the least effective. Value chains with adverse effects on an outcome, such as those with a growth multiplier below one or with a negative employment effect, are also assigned a score of zero. The remaining value chains receive a score between zero and one proportional to their original score relative to the highest-ranked value chain. These individual normalized scores for the outcomes are then amalgamated into a composite score for each value chain. Each component in the bars denotes the relative contribution of a particular outcome indicator to the final score.

The approach in Figure 2.8 assumes equal importance for each of the four outcome indicators, so an equal weight is assigned to each score. However,

FIGURE 2.8 Composite score of value chain growth on development outcomes in Myanmar, equal weights



Source: RIAPA model results.

Note: The composite score is a simple average (equally weighted) of the scores for each of the four outcome categories. The figure is reordered according to the highest composite score.

policymakers can adjust the weights assigned to specific outcome scores based on their priorities.

Horticulture and the two livestock value chains have the highest scores. In the case of horticulture, the highest-ranked value chain, all four outcome components significantly contribute to the composite score. In contrast, in the second-ranked cattle and milk value chain, productivity growth plays a minor role in job creation, despite its significant impact on other development outcomes. While ranking the impacts of value chains on multiple development outcomes based on composite scores aids in identification and prioritization, it is evident that trade-offs exist regarding which outcomes are most significantly influenced by productivity-led growth in each value chain.

Discussion and policy recommendations

Although Myanmar's AFS transformation stalled following the military coup, the preceding analysis provides importance guidance on policies and investment priorities for recovery:

- Both the primary and downstream components of the AFS are very important parts of the economy for achieving economic growth, increased employment, poverty reduction, and dietary diversity. A restored democratic government and development partners should prioritize investment in the AFS for growth and poverty reduction.
- Accelerated diversification of the system, especially promoting fruits, vegetables, and livestock, will have a high payoff for nutrition-sensitive growth. This requires relaxing restrictions on the conversion of paddy land to permanent alternative agricultural uses (Boughton et al. 2022).
- Expanding downstream value-added processing for minimally processed exports, such as maize and pulses, could improve their contribution to the development impacts of agricultural productivity growth.
- Access to improved genetic material and management practices could substantially improve productivity in primary agriculture. At the same time, transport and electricity infrastructure improvements could result in comparable gains in the downstream value-added components of AFS.

Taken together, early investments and policy innovation in Myanmar's AFS will provide a valuable springboard for rapid poverty reduction, nutritional gains, and further structural transformation of the economy.

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Chapter 3

A HISTORICAL AND REGIONAL PERSPECTIVE ON MYANMAR'S AGRIFOOD SYSTEM

Duncan Boughton, Steve Haggblade, and Bart Minten

Agriculture and the related input supply, processing, trade, and retail distribution activities that make up national food systems are a major driver of rural economic transformation in low- and middle-income countries (Mellor 2017). As Chapter 2 shows, in addition to directly contributing to rural employment and GDP in Myanmar, the growth of the agrifood system has high multiplier effects on the broader rural economy. Yet in Myanmar, as Warr (2016) argues, lack of agricultural productivity growth combined with dependence on extractive sectors, such as jade, teak, and natural gas, has held back the transformation of the economy.

After almost five decades of narrowly prioritizing rice production and foreign exchange earnings, the Myanmar government began to shift its policy focus to promoting farmer welfare and rural development in 2011. A decade later, in early 2020, the COVID-19 pandemic not only demonstrated the resilience and adaptability of Myanmar's agrifood system but also highlighted its structural vulnerabilities. The military coup in February 2021 greatly exacerbated the stress on the agrifood system and weakened the state's capacity to contain the third (and deadliest) wave of COVID-19, resulting in a major humanitarian crisis.

An understanding of the strengths and weaknesses of Myanmar's agrifood system and rural economic transformation over the past decade—and particularly during the COVID-19 pandemic and since the military coup—is important to ensure the resilience of recovery and development efforts in Myanmar, as well as in transforming countries in Asia and other regions. To capture these lessons, this chapter addresses the following questions:

- How has Myanmar's agrifood system transformed over past decades, and to what extent have COVID-19 and the military coup disrupted this transformation?
- How does the performance of Myanmar's agrifood system compare with that of other countries in the region?

- What are the drivers of, and constraints to, agrifood system transformation in Myanmar?

Myanmar's agrifood system: A historical perspective

Agrifood system changes from the colonial era until 2020

Historically, agriculture has formed the backbone of Myanmar's economy, employing the majority of its workforce and accounting for more than half of export earnings and GDP. Beginning in 2011, a series of major policy reforms sought to promote industrial growth based on foreign direct investment and relaxation of the prior tight controls on foreign trade and investment. Even so, only by 2019 did the share of primary agriculture in total GDP fall to that of manufacturing (World Bank 2024), while the share of the agrifood system as a whole was close to half (46.7 percent—see Chapter 2). Today, however, Myanmar's agriculture sector still reflects the imprint, and some would argue the scars, of policies dating back to the colonial era.

During the colonial period, the Burma Land and Revenue Act of 1876 introduced formal land titling, offering rights of permanent tenure, inheritance, and transfer and permitting the use of land as collateral to access credit. The resulting land registration system became operational in British-controlled Burma, principally the lowland areas dominated by Bamar populations. In contrast, land in the ethnic hill regions, which account for about one-third of Myanmar's total area, was governed primarily by customary and communal land tenure systems (Chapter 6). Paddy production for export became the primary goal of colonial agricultural policy, and by the 1920s, Myanmar was well established as the world's largest rice exporter. The global depression of the 1930s led to a collapse in rice prices, widespread loan defaults, land seizures by moneylenders, and rising landlessness. There was a large-scale emergence of absentee landlords in the aftermath of the Japanese invasion during World War II (Brown 2012). Following the war, the failure to adopt a federalist constitution triggered more than 60 years of armed resistance by ethnic minorities, which lasted until a ceasefire agreement in 2012. In the face of this long-running conflict, land administration in the ethnic highlands remains primarily under customary tenure systems today (Lau 2014).

Following independence in early 1948, the newly constituted Burmese government quickly modified the colonial land policies. The Land

Nationalization Act of 1948, as amended in 1953, declared all land to be property of the state. The government, in turn, leased land to farmers for specific agricultural uses under nontransferable land use agreements. Specifically, suitable lowlands designated as paddyland could be used only for this purpose. Failure to grow paddy rice or to meet state-mandated production quotas resulted in the revocation of land use rights.

Throughout the military socialist era, from 1962 to 1988, Myanmar's agricultural policy facilitated a state-controlled agricultural system. This system was built around government land ownership and farmer lease agreements tied to government-designated production quotas. Three primary policy tools governed agricultural production: (1) state landownership, (2) production quotas for specific crops, and (3) compulsory sales to government agents at fixed prices (Okamoto 2020). Under nationalized land ownership, government agricultural officers treated farmers as tenants of the state, with tillage rights but no ownership or long-term guarantee of control and, consequently, little incentive to invest in land leveling or other improvements. Compulsory cropping plans, production quotas, and mandatory sales to government marketing agencies, often at below-market prices, eroded farmer incentives and led to long-term stagnation of agricultural productivity and competitiveness. By 1970, Thailand had surpassed Myanmar's rice exports, and by 1980, Viet Nam had as well. Low productivity led to supply shortages and intermittent rice price spikes, provoking political protests in 1967, 1974, and 1988 (Okamoto 2017). As a result, agricultural policy aimed to control key staple food supplies and stabilize food prices at low levels to quell urban dissent.

Following the protests of 1988, the change to a nonsocialist military government precipitated a gradual loosening of agricultural production and marketing controls. Liberalizing pulse production and marketing rapidly and radically improved profitability in this subsector. The government dropped production quotas on pulses, liberalized domestic marketing, and opened export marketing to private traders (Okamoto 2008). While production quotas on paddy continued until 2003, the government gradually relaxed its monopoly on rice exports, fully opening exports to the private sector in 2012.

The 2010s saw two successive governments attempt to invigorate agricultural growth and transform rural economies. From 2011 to 2015, the government of President Thein Sein sought to modernize rice production through mechanization and the promotion of hybrid rice by the Ministry of Agriculture and Irrigation (MOAI). A new Ministry of Livestock, Fisheries, and Rural Development (MLFRD) was established to encourage farm income growth through diversification and investment in rural infrastructure. A new

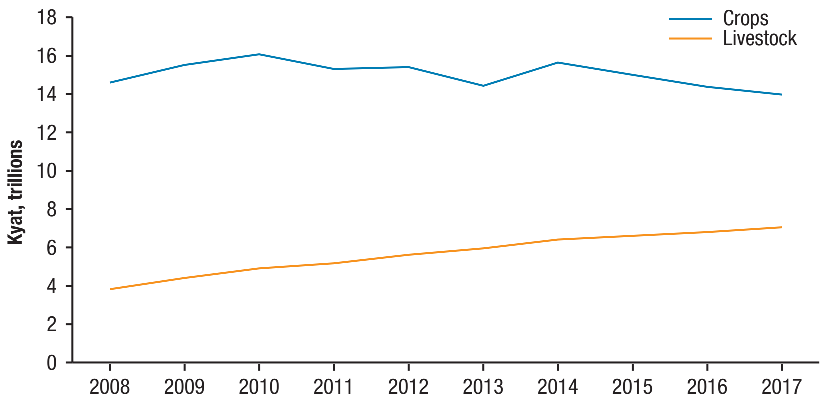
Farmland Law allowed farmers to buy, sell, and mortgage land while maintaining zoning restrictions on its use. Only rice could be cultivated on land designated as paddy land, for example.

From 2016 to 2020, the National League for Democracy–led government sought to further these reforms, emphasizing higher incomes for smallholders and improved competitiveness of value chains. MOAI and MLFRD merged with the Ministry of Cooperatives to form the Ministry of Agriculture, Livestock, and Irrigation (MOALI). A new agricultural strategy was formulated to support these objectives, emphasizing diversification, productivity growth, and value chain efficiency (MOALI 2018). The rural economy also benefited from the opening up of the telecommunications sector to foreign investment, with rural mobile phone access increasing from approximately 21 percent in 2014 to 82 percent of rural households by 2019. Almost 50 percent of rural households also had internet access by the same year (MoLIP 2015; 2020).

Despite apparently strong domestic political support for agriculture, overall sector growth was slow, and the major drivers of change between 2011 and 2020 had little to do with public initiatives. Primary agriculture GDP grew at just 0.5 percent per year in 2013–2017, down from 2 percent per year in the previous five-year period. These disappointing overall growth figures mask important differences among subsectors. Livestock and fisheries grew robustly, at 5.3 percent per year, propelled by expansion in poultry and egg production and aquaculture (Figure 3.1). In contrast, crop production fell, reflecting stagnant yields and declining cultivated area for some labor-intensive industrial crops (for example, cotton).

In recent years, growth in the value of fish production has varied by type of production. Aquaculture grew rapidly, while wild capture fishing decreased significantly because of overexploitation. Overall, in the three years from 2015/16 to 2017/18, the value of fish production slowed to just 1.6 percent per year. In contrast, value added in crop farming fell by 1.4 percent per year over the five years from 2013 to 2017, down from essentially flat annual growth (0.2 percent) in the previous five-year period (Figure 3.1). While weather- and trade-related price shocks can affect year-on-year changes, the growth trend in the crop subsector reflects a long-term decline in area cultivated (1.3 percent per year on average between 2008 and 2019), combined with limited improvement in yields for most crops (Table 3.1). Yields of monsoon paddy, which accounts for three-quarters of Myanmar's cereal area, decreased by 0.1 percent per year over this period, while post-monsoon irrigated paddy, which accounts for half the remaining cereal area, increased by only 0.4 percent per year. The

FIGURE 3.1 Trends in agriculture sector GDP, 2008–2017



Source: Mather et al. (2020).

TABLE 3.1 Average yield and trends for cereals, oilseeds, and pulses, by five-year period, 2008–2019

	Average yield (kg/acre)			% change in yield		
Crop	2008–2019	2008–2013	2014–2019	2008–2019	2008–2013	2014–2019
Dry paddy	1,915	1,883	1,933	+0.4	+0.2	+0.7
Wet paddy	1,548	1,560	1,534	–0.1	–0.4	+0.2
Maize	1,450	1,382	1,497	+1.2	+1.0	+1.4
Wheat	744	722	758	+1.6	+2.5	+0.7
Groundnut	1,386	1,407	1,373	+0.0	+1.2	–0.7
Sesame	226	234	221	–0.5	+1.4	–2.0

Source: Mather et al. (2020).

only exceptions to stagnant yield growth were maize, for which expanded use of hybrid seed was linked to annual average yield growth of 1.2 percent over the same period, and some of the pulses (for example, black gram), for which new, disease-resistant varieties had been introduced.

Stagnant yield growth is surprising given that yields in Myanmar are already significantly below potential and those of many neighboring countries. While crop yields in Myanmar have stagnated, unfortunately increased labor wage rates and greater use of inputs, including fertilizer and pesticides, have further reduced profitability for farmers (Belton et al. 2020). Rural household livelihood surveys undertaken in each of the four main agroecological zones of Myanmar between 2015 and 2019 found accelerating migration out of rural areas (Chapter 15), rising daily labor wages (Chapter 18), and an agricultural mechanization revolution fomented largely by the private sector (Chapter 7). Farmers have strong incentives to adopt mechanized land preparation and harvesting, given the increasing scarcity and higher cost of hired labor, along with the machines improving the timeliness of crop operations and farmers' ability to manage weather risks. On the supply side, the expansion of financing from commercial banks, encouraged by partial loan guarantees from the donor sector, led to a rapid expansion in mechanization service providers (Chapter 7).

At the policy level, MOALI pursued the objectives of inclusive and competitive agriculture and food and nutrition security through the Agriculture Development Strategy (ADS) and its accompanying investment plan. After extensive regional consultations, ADS was officially launched on June 7, 2018. In parallel with these consultations, MOALI underwent a major internal reorganization, merging into one the three former ministries of Agriculture and Irrigation (MOAI); Livestock, Fisheries, and Rural Development (MLFRD); and Cooperatives. During the first year of ADS implementation, MOALI also faced the challenge of integrating its commitments with the government's Multi-Sectoral Nutrition Plan of Action, which was developed through a separate process under the leadership of the Ministry of Health and Sports (MoHS 2018). The combination of internal reorganization and complex cross-department and cross-ministry strategic planning absorbed almost half the timeline of the ADS's five-year mandate.

Once approved, ADS implementation proceeded quickly. In 2018/19, the first year of implementation, MOALI spent 92 percent of its budget of just over K1 trillion ($710 million) (MOALI 2022). In terms of budget allocations across departments, MOALI made progress on implementing recommendations from the first agricultural public expenditure review (World Bank 2017a). Reducing the expenditure shares of irrigation and mechanization enabled underfunded public services to expand their activities. The main constraints to ADS implementation were technical and organizational capacity—internally, across Union ministries, and in linkages to regional governments and stakeholders (MOALI 2020). As MOALI continued to move from the former MOAI's top-down focus on rice production to facilitating and regulating a modern, market-oriented agrifood system, it lacked a unified policy process supported by strong technical analysis capacity.

Myanmar's agrifood system during the crisis years between 2020 and 2022

Myanmar experienced several waves of COVID-19, and strict lockdowns were ordered to reduce the spread of the disease (Chapter 1). The first wave occurred just as farmers, input suppliers, and mechanization service providers began preparing for the main 2020 agricultural season, the monsoon season. The second and third waves occurred at the midpoints of the 2020 and 2021 monsoon seasons. Even though the timing of the second and third waves in the agricultural calendar was similar, the challenges facing the agrifood system were very different.

Beginning in March 2020, transportation restrictions to curb the spread of COVID-19 caused significant disruptions throughout Myanmar's food supply chain. Restrictions during the first wave, which were often implemented at the local level without coordination, hindered deliveries of agricultural inputs ahead of the monsoon planting period. Input retailers reported longer lags on fertilizer orders, and mechanization service providers reduced their service areas (Boughton et al. 2021). Both sectors recovered quickly through a combination of business adaptation and less rigorous enforcement of travel restrictions. Monsoon crop production declined in some areas, partly because of pests and irregular rainfall, but overall, the production of important crops did not decline severely. National production estimates for rice and pulses declined by less than 4 percent in 2020 compared with 2019, while maize production increased by 2 percent over the same period (USDA 2021).

Although COVID-19 policy responses had a minimal effect on production, there were widespread disruptions in crop trading. Farmers faced challenges marketing their harvests, as crop traders had to contend with closed commodity exchange centers and border crossings. However, the supply chains adjusted again, and frictions diminished over time as trade resumed both domestically and internationally. With commodity exchange centers closed, crop traders relied on mobile phones to coordinate transactions and avoid curfew violations. Additionally, border gates reopened temporarily to exports, particularly for rice and maize. Ultimately, prices of the main commodities remained mostly stable during the 2020 monsoon harvest period and without the severe disruptions seen in previous years (Goeb et al. 2022; MAPSA 2021a; Oo et al. 2020). One of the more persistent impacts of COVID-19 is related to credit repayment by farmers. Input retailers, crop traders, and rice millers all extended credit to farmers, but repayment rates were slower during COVID-19. In response, many agribusinesses planned to offer less credit in the future.

Although COVID-19 policies did not have seismic effects on food prices or availability, they were a harbinger of the disruptions caused by the coup. During the most stringent lockdowns that accompanied the first two waves of COVID-19, disruptions were large and widespread. Agrifood system actors were able to adapt as restrictions were lifted, marketing continued, and key services like banking and mobile internet went uninterrupted. However, in the absence of these key services following the coup, food system actors faced a different set of challenges.

Shocks to the agrifood system after the February 2021 coup were larger and more lasting than those posed by the first two waves of COVID-19 in 2020. Curfews, safety concerns, and rising fuel costs following the coup led to even larger transportation disruptions than in the COVID-19 lockdowns. Phone surveys were conducted with crop traders, agricultural input retailers, and rice millers at the beginning of 2021 and 2022. At the beginning of 2021, more than 60 percent of each sample reported increased transportation costs; for crop traders, transportation costs increased by an average of 22 percent within their state or region and by 39 percent outside their state or region (MAPSA 2021b, 2021c, 2021e). Increased transportation costs drove a widening wedge between farmgate prices and consumer prices (MAPSA 2022c). Survey data from rice millers showed lower prices paid to farmers for their summer paddy in 2021 compared with 2020, while a survey of food vendors showed rice prices had risen by 11 percent over a similar period. Pulse prices increased in May 2021, mainly because India removed import quotas. However, farmers did not benefit from price gains, as the main harvest period had occurred three months earlier. Further, the coup removed several tools that traders had used to maintain their business activities during COVID-19. Notably, cellphone and internet shutdowns made it difficult to find price and other market information and initiate mobile bank transfers.

Transportation and internet communications challenges affected every level of the agrifood system, from farmers to consumers. However, banking sector disruptions had the most impact on agribusinesses: 86 percent of rice millers, 57 percent of crop traders, and 41 percent of input retailers cited the banking sector as their largest disruption at the beginning of 2021 (Table 3.2). Without access to in-person banking services or the internet for mobile transfers, agricultural trade was heavily reliant on cash. Even when businesses could access a branch, daily and weekly cash withdrawal limits posed a significant

TABLE 3.2 Perceptions of most important business disruption at beginning of 2021 and 2022

	Share of respondents (%)					
	Crop traders		Rice millers		Input retailers	
Business	March 2021	March 2022	March 2021	March 2022	March 2021	March 2022
Banking	57	16	86	8	41	7
Telecommunications	14	0	6	0	28	1
Transportation[a]	21	76	2	4	22	68
Import/export	4	1	0	0	7	4
Electricity/fuel problems	0	6	0	81	0	10
None or none of these	4	1	6	7	2	10
Total	100	100	100	100	100	100

Source: MAPSA 2021a, 2021f, 2021g, 2022c, 2022g, 2022e.
Note: [a] For crop traders, this category includes transportation costs, mobility restrictions, and curfews in 2022.

challenge. Crop marketing firms, therefore, had less available working capital than a year earlier and had to reduce their purchase volumes.

In 2022, the main business constraints reported by crop traders, input retailers, and rice millers changed substantially from the previous year. High fuel costs and electricity outages replaced banking system problems as the most important cause of business disruptions (Table 3.2). Rice mills reported that the quantity of monsoon season paddy processed in 2021 declined by 15 percent on average compared with 2020. The leading factor behind this decline was that households were withholding more rice and marketing smaller volumes, though reduced milling time from electricity cuts and diesel shortages also contributed substantially (MAPSA 2022a). More than 90 percent of crop traders reported increased transport costs, up by 74 percent on average over a year earlier, driven by fuel price increases of 168 percent. Transport cost increases were aggravated by curfews and checkpoints related to the security situation. Consequently, 30 percent of traders reported difficulty in contracting transport services (MAPSA 2022f).

Similar market disruptions were seen at the farm level. Table 3.3 shows how access to agricultural services evolved during 2021 and 2022. Access to agricultural extension dropped off significantly following the military coup. During the monsoon season of 2020—during the first two COVID-19 waves—41 percent of crop farmers in Myanmar reported receiving advice on crop agriculture from any source (public, private, nongovernmental organization [NGO], or by phone/internet). One and a half years later, in the 2022 dry season, this share had dropped to 29 percent. The use of all information sources declined, but the most substantial decrease was for public extension

TABLE 3.3 Access to agricultural extension and credit by crop farmers in 2020, 2021, and 2022

Characteristic	2020 Monsoon	2021 Dry season	2021 Monsoon	2022 Dry season
Access to agricultural extension				
Share (%) of farmers who received advice related to crop agriculture from:				
Public extension agent	20.7	17.5	14.8	15.7
Private sector agent	24.8	23.1	18.5	21.6
Nongovernmental organization (NGO)	12.8	10.7	8.8	8.8
Cellphone application or internet	15.7	13.8	15.2	14.9
Any source	41.3	29.0	34.4	28.6
Access to agricultural credit				
Share of farmers who took any credit for farm production (%)	59.6	45.7	46.4	43.7
If not taken, what was the reason? (% of farmers)				
Not needed (buy input in cash)	74.6	69.8	61.2	66.7
Tried to take credit but could not find	12.0	12.1	10.4	12.8
Conditions for credit not good	4.3	2.4	3.8	2.7
Did not pay back last year's credit	3.3	5.3	17.5	7.6
If credit taken, sources of credit (%)				
Private moneylender	10.2	10.4	12.2	11.1
Relative/friend	13.7	17.6	16.3	18.4
MADB (COVID-19 fund and others)	60.0	49.3	49.5	47.7
Department of Cooperatives (MOALI)	4.1	2.1	4.4	2.0
Microfinance institution/NGO	14.8	14.2	15.3	14.0
Rice or oil mill	0.5	0.4	1.0	0.4
Agricultural input supplier	6.4	8.1	7.0	9.2
Agricultural trader	3.6	2.5	4.2	2.8
Agricultural machine supplier	0.0	0.1	0.0	0.1
Private bank	1.3	0.6	1.2	0.7
Revolving fund (Mya Seing Yang)	11.5	8.6	13.2	8.9

Source: Authors' calculations using Myanmar Agricultural Performance Survey (MAPS) (IFPRI 2023) data.
Note: MADB = Myanmar Agricultural Development Bank. MOALI = Ministry of Agriculture, Livestock, and Irrigation.

agents—in part due to a high share of MOALI extension agents who participated in the Civil Disobedience Movement following the military coup (Chapter 1). Between the monsoons of 2020 and 2021, farmers reduced their use of public extension by 6 percentage points (Table 3.3). The use of advice from the private sector and NGOs also declined. Access to agricultural advice through the internet or smartphone applications, such as Facebook, Htwet Toe, Greenway, and Golden Paddy, stayed relatively stable over the four seasons and even increased between the dry seasons of 2021 and 2022.

Access to timely credit is important for farmers to acquire inputs. Access to credit declined significantly over the four seasons between 2020 and 2022 (Table 3.3). While 60 percent of farmers took credit for farm production in the 2020 monsoon season, this declined to 44 percent in the 2022 dry season. While 75 percent of farmers who did not take credit indicated that they did not need it during the monsoon season of 2020, that share dropped to 67 percent in the dry season in 2022, likely indicating an increasing shortage of good sources of credit. The Myanmar Agricultural Development Bank (MADB) is typically a major provider of agricultural credit, especially for rice-producing areas (MADB issued almost $1 billion in monsoon loans from May to September 2020, in addition to the 600 billion kyat [$400 million] issued from a COVID-19 special relief fund). However, given the issues with loan repayments from the previous season and the difficulties with financial service delivery in rural areas, MADB credit provision has been substantially less than normal. The portfolios of most microfinance institutions are typically less geared toward agriculture, but the further reduction in their activities—linked to lack of liquidity (owing to low collection and saving rates) and constraints posed by withdrawal limits—also hampered credit availability for the agriculture sector and the rural sector more broadly (MAPSA 2021e). Over time, given the lack of available formal sources, informal credit became increasingly important for farmers—mostly from relatives and friends but also from input suppliers (Table 3.3).

In 2022, conflict-related security issues in rural areas became an increasing problem for farmers. A survey of more than 5,000 farmers from August 2022 to September 2022 found that 27 percent reported feeling "very insecure" or "insecure" during that period, an increase of 9 percentage points compared with the beginning of the year (MAPSA 2022g). One in four farmers reported that they could not move around without serious security concerns, while 8 percent reported that some agricultural fields in their area could not be cultivated because of conflict. Conflict-affected areas suffered substantially more from problems with agricultural input accessibility.

A combination of sharp increases in input costs and decreased liquidity led to reduced investment by farmers in production inputs. International inorganic fertilizer prices and shipping costs increased substantially in 2021 compared with a year earlier, which resulted in significantly higher border prices for fertilizer in Myanmar. The impacts of the political crisis on the local transport sector and the depreciation of Myanmar's currency further increased domestic fertilizer prices. Urea prices—the most important chemical fertilizer in the country—were 68 percent higher in the monsoon season of 2021 compared with a year earlier. Prices continued to rise by a cumulative 143 percent by the dry season, when farmers usually apply higher rates to their irrigated rice crop. This was a significant development because fertilizers are the largest purchased input for Myanmar farmers, constituting 30 percent of the value of all inputs purchased. Furthermore, prices charged for land preparation also increased in the 2021 monsoon season and the 2022 dry season (an approximate increase of 20 percent per year).

In contrast to input prices, farmgate prices for crops initially changed little after the harvest of the monsoon season of 2021, resulting in a squeeze on farmer returns. A year later, the situation was quite different, when farmgate prices for paddy, for example, rose 45 percent higher in August/September 2022. Table 3.4 further shows that retail prices increased much more rapidly than farmgate prices. The cost of the food basket for an average

TABLE 3.4 Input, farmgate, and retail prices, 2020, 2021, and 2022

		Levels (median)				% change compared with a year earlier	
Farm input prices	**Unit**	**2020 Monsoon**	**2021 Dry season**	**2021 Monsoon**	**2022 Dry season**	**2021 Monsoon**	**2022 Dry season**
Urea	kyat/kg	740	1,200	1,240	1,800	67.6	50.0
Male wages	kyat/day	6,000	6,000	6,000	6,000	0.0	0.0
Female wages	kyat/day	5,000	4,000	5,000	5,000	0.0	25.0
Cost of plowing	kyat/acre	25,000	33,000	30,000	40,000	20.0	21.2
Farmgate prices		**March 2021**	**Aug./Sept. 2021**	**March 2022**	**Aug./Sept. 2022**	**March 2022**	**Aug./Sept. 2022**
Paddy	kyat/kg	335	330	359	478	7.2	44.8
Green gram	kyat/kg	1,223	1,223	1,223	1,468	0.0	20.0
Sesame	kyat/kg	1,837	1,837	2,041	3,061	11.1	66.6
Groundnut	kyat/kg	1,053	1,053	2,041	1,754	93.8	66.6
Retail prices		**May 2021**	**Aug./Sept. 2021**	**March 2022**	**Aug./Sept. 2022**	**March 2022[a]**	**Aug./Sept. 2022**
Cost of food basket—average diet	kyat/day/adult woman	871	915	1,089	1,476	25.0	61.4
Cost of food basket—healthy diet	kyat/day/adult woman	1,255	1,276	1,495	2,080	19.1	63.0

Source: Authors' calculations using MAPS data for farm input and farm output (farmgate) prices; MAPSA (2023) for costs of food baskets.

Note: [a] For retail prices, comparison month for March 2022 changes compared with a year earlier is May 2021.

diet and for a healthy diet in August/September 2022 was 61 and 63 percent higher, respectively, than a year earlier, indicative of a high food price inflation rate. Increases in retail prices in 2022 and 2021 were generally higher than farmgate prices, indicative of increasing marketing margins after the military coup.

Regional benchmarking of Myanmar's agrifood system

Agricultural production and productivity

To assess agricultural production performance in Myanmar from a regional perspective, we look first at the adoption of improved agricultural technologies. A critical input for improved performance is the use of improved seeds. Unfortunately, up-to-date and statistically reliable data are not available at the national level. Based on a survey carried out in 2013, the World Bank (2019b) estimated that less than 7 percent of farmers used certified seeds. It also estimated that the supply of certified rice seeds would satisfy less than 1 percent of potential demand. Boughton and colleagues (2020) conducted a large survey in the Dry Zone in 2019. They found that the adoption of improved varieties in their study area was relatively low—the highest adoption of improved seeds was 41 percent for sunflower; it was lowest for pigeon pea at 8 percent. In contrast, for the same crops in Bangladesh, China, India, Thailand, and Viet Nam, adoption rates were estimated to be more than 90 percent. Limited access to quality seed is problematic in Myanmar, and most farmers therefore rely on their own saved seeds or informal trusted channels, inhibiting the spread of improved varieties (Boughton et al. 2020).

Although international comparative data—for example, the World Bank's World Development Indicators database—put chemical fertilizer use at low levels in the past, it is currently significantly higher (Chapter 10). Based on a large survey conducted in 2013, the World Bank (2019b) compared the fertilizer use of Myanmar's farmers with that of farmers in other Asian countries (Table 3.5). It found that Myanmar's chemical fertilizer use was significantly below that of peer countries—21 percent of China's, 43 percent of Viet Nam's, 45 percent of India's, and 59 percent of Thailand's. It also identified the use of improper combinations of chemical fertilizers as a major issue. This is linked to a lack of knowledge in the area and leads to lower returns on fertilizer use than in other countries in the region. Major changes have occurred since the World Bank study, though, and Myanmar may have partly closed the gap,

TABLE 3.5 **Fertilizer use by macronutrient, Myanmar and neighboring countries, 2013**

Fertilizer	China	India	Myanmar	Thailand	Viet Nam
			Nutrient use (kg/hectares)		
Nitrogen (N)	198	105	53	88	99
Phosphorus (P)	29	21	15	22	31
Potassium (K)	110	33	3	10	35
			Share in total use (%)		
Nitrogen (N)	59	66	75	65	60
Phosphorus (P)	9	13	21	16	19
Potassium (K)	33	21	4	19	21

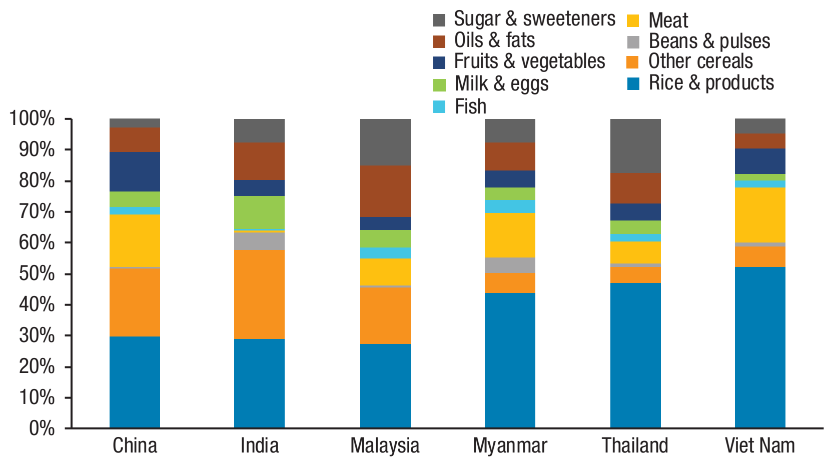
Source: World Bank (2016).

as fertilizer imports in 2019 were more than double the quantities imported in 2013.

To assess agricultural diversification, we look at the importance of different crops and products in agricultural output in Myanmar compared with Asian peer countries. Figure 3.2 shows the high share of rice in total food calories per capita. However, the shares in Thailand and Viet Nam are still higher. Other cereals beyond rice are relatively less important in Myanmar. The livestock and fisheries sectors are also shown to be relatively important, but less so than in China and Viet Nam.

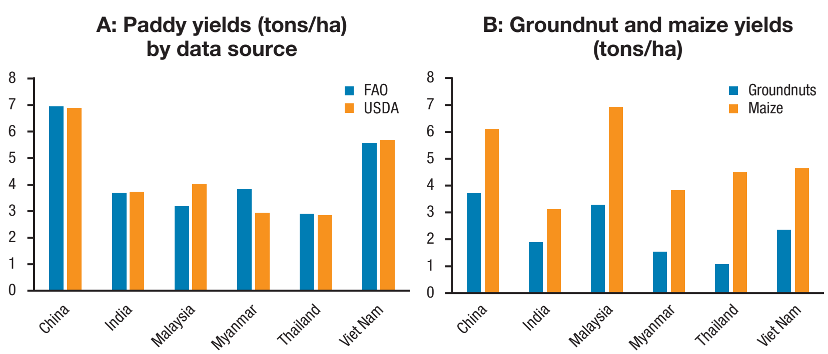
Using data from the Food and Agriculture Organization of the United Nations (FAOSTAT 2023) and the United States Department of Agriculture (USDA), we further compare yields of three of Myanmar's major crops—rice, groundnut (as a crop representing the important oilseeds sector), and maize—to those of its neighbors (Figure 3.3). Among these countries, this effort shows that Myanmar is typically among the worst performers for each crop. For rice, Myanmar's most important crop in terms of area planted, we see that yields (using the more reliable USDA estimate) are at the same level as in Thailand but much lower than in other countries. Rice yields are almost twice as high in Viet Nam and more than twice as high in China compared with Myanmar. In the case of groundnut, Myanmar performs better than Thailand but still lags other countries. Groundnut yields are more than 50 percent higher in Viet Nam. For maize, where Myanmar has recently seen some improvements through the widespread adoption of hybrid seeds, yields are higher than in India but lag all other countries, although not by much compared with Thailand and Viet Nam. China and Malaysia top the list, with average yields of about 6 and 7 tons per hectare, respectively.

FIGURE 3.2 Shares of different food groups in total agricultural output (expressed in calories per capita), Myanmar and neighboring countries, 2017



Source: Data from FAOSTAT database (FAO 2023).

FIGURE 3.3 Crop yields, Myanmar and neighboring countries, 2017



Source: FAOSTAT (FAO 2023) and USDA for paddy; FAOSTAT for groundnuts and maize.

Note: FAO = Food and Agriculture Organization of the United Nations. USDA = United States Department of Agriculture.

Consumption

One major driver of agrifood system change is rapidly changing food consumption, often driven by urbanization and income growth. As consumers become wealthier, they typically shift away from low-priced cereals to more expensive preferred foods, such as fish, meat, dairy, eggs, fruits, and vegetables—all generally healthy—and to more processed foods and food away from home (FAFH)—both generally unhealthy.

Figure 3.4 shows the share of rice and animal-source foods (ASFs) in household food expenditures for five Asian countries, including Myanmar, in 2015. We note the high share of ASFs in the budget of Myanmar consumers compared with Asian peers and the already relatively low share of rice. Whereas all the urban areas in Asia spend relatively more on ASFs than on rice, the rural areas in Myanmar are doing so as well, which is unique among the Asian countries reported. While the share of rice in food expenditures is relatively low compared with other countries, its contribution to calories is still predominant—that is, 51 percent and 60 percent in urban and rural areas, respectively, in 2015 (Chapter 4).

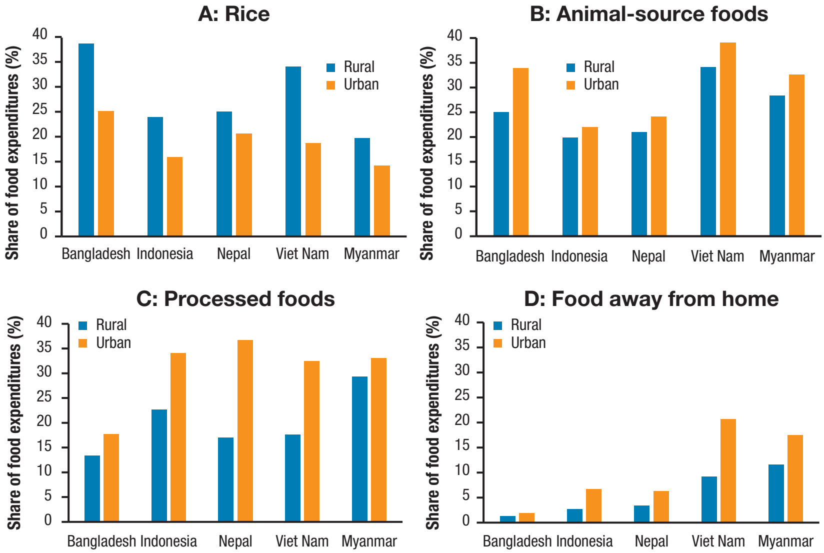
Another important global change in food consumption patterns is the increasing importance of processed foods and FAFH. Figure 3.4 shows the importance of these two categories in food baskets in Myanmar and other Asian countries. The consumption of processed foods is already important in Myanmar—in 2015, the share of processed food in the value of food consumption among urban households was 31 percent, while among rural households, it was 26 percent. Myanmar's share of processed food consumption in rural areas is the highest among all Asian countries. For urban areas, the share is higher than in Bangladesh but lower than in the other three countries. We also note the important share of FAFH. Except for urban areas of Viet Nam, Myanmar's share of FAFH in total food consumption is the highest of all Asian countries, at 12 percent in rural areas and 18 percent in urban areas.[1] This large share of processed foods and FAFH in total food consumption has important implications for the off-farm segment of the agrifood system, be it for employment or value addition (Chapter 13). It may also have important implications for the gender division of tasks. Higher consumption of FAFH and processed foods implies that women's time is potentially freed up for other activities.

Food value chains

Food markets are the main source of food for Myanmar's consumers, even in rural areas, and thus their efficiency affects affordability. Figure 3.5 shows what share of food is purchased in the total value of food consumed, with the difference being food consumed from a household's own production. It shows

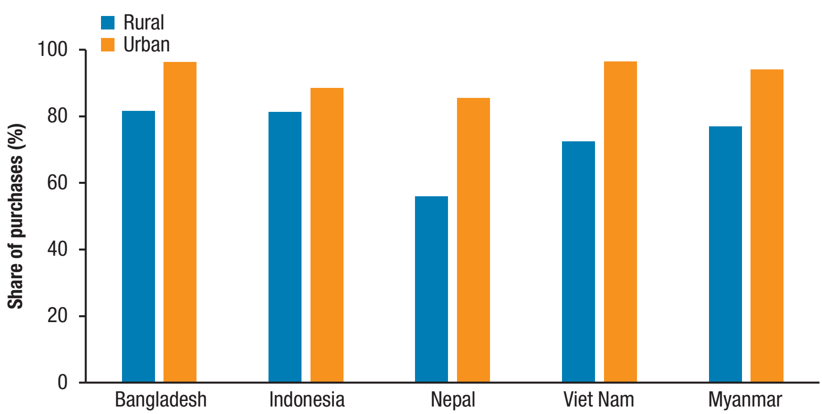
1 For processed foods, we follow the definition of Reardon et al. (2014). Three criteria are considered: (1) food with multiple ingredients added (like cookies with several ingredients); (2) alteration of form with additional processing steps added (cooking, extruding, freezing, adding chemicals or flavors, and so on, as with potato chips); and (3) complex packaging like a bottle or can. Any item with two or three of the above characteristics is categorized as processed.

FIGURE 3.4 Share of rice, animal-source foods, processed foods, and food away from home in total value of food consumption, Myanmar and neighboring countries



Source: Authors' analysis using MPLCS (2015) in Myanmar; Reardon et al. (2014) for other countries.

FIGURE 3.5 Share of food purchases in value of food consumed, Myanmar and neighboring countries



Source: Authors' analysis using MPLCS (2015) in Myanmar; Reardon et al. (2014) for other countries.

that purchased food shares total more than 50 percent in the five countries, even in rural areas. In Myanmar, based on the 2015 national household survey, the share of purchased food was, on average, 77 percent in rural areas and 94 percent in urban areas. These shares are comparable to those of other countries in the region—except for Nepal, which shows less reliance on food markets—and indicates the importance of food value chains in delivering food to consumers in Myanmar.

When agricultural produce is marketed and sometimes processed, the additional costs and profits result in a difference in price between producers and consumers, known as a price "wedge" or margin. The size of these margins may indicate how well agricultural value chains function. Table 3.6 shows the share that farmers received of wholesale and export market prices for rice in several Asian countries—the lower the share, the higher the margin. Two factors can explain the relatively larger margins in Myanmar compared with other countries. First, the milling sector in Myanmar often operates with obsolete processing units, leading to quality and quantity losses of 15 to 20 percent during milling, much higher than in other countries. Second, marketing costs are higher than in other countries, often linked to high transport and export costs (World Bank 2019b).

Finally, a comparative overall assessment of agrifood system performance was carried out for 113 countries using indexes based on 34 indicators (Table 3.7). In this assessment, the affordability index measures the ability of consumers to purchase food, their vulnerability to price shocks, and the presence of programs and policies to support them when shocks occur. The availability index measures the sufficiency of the national food supply, risk of supply disruption, national capacity to disseminate food, and research efforts

TABLE 3.6 Farmers' share in final rice prices at different market levels, Myanmar and neighboring countries

		Cambodia	Myanmar			Thailand	Viet Nam
Farmers' share (%)	Year		Overall	High quality	Low quality		
… of wholesale market in capital city rice price	2013	53	47	—	—	77	64
… of free on board rice price	2013	48	49	—	—	70	63
… of average wholesale market rice price	2017	—	—	60	55	76	79

Source: World Bank (2016); Ekanayake, Ambrosio, and Jaffee (2019).
Note: — = data not available.

TABLE 3.7 Global Food Security Index, Myanmar and neighboring countries, 2019

Index	Unit	China	India	Malaysia	Myanmar	Thailand	Viet Nam
Availability	Score	66.9	58.4	67.7	57.2	58.7	59.7
	Rank (113 countries)	27	61	26	69	59	55
Affordability	Score	74.8	64.2	81.7	59.1	77.1	75.1
	Rank (113 countries)	50	70	28	78	42	48
Quality and safety	Score	72.6	47.0	70.6	51.3	52.6	51.7
	Rank (113 countries)	38	85	42	78	75	77

Source: Economist Intelligence Unit (2019).

to expand agricultural output. The quality and safety index measures the variety and nutritional quality of average diets as well as the safety of food. While Myanmar's quality and food safety score is similar to the scores of India, Viet Nam, and Thailand—in all cases being relatively low—it ranks worse than all peer countries for food availability and affordability (Table 3.7).

Drivers of and constraints to the transformation of Myanmar's agrifood system: Insights from history and peer countries

Drivers of change

Drivers of agricultural growth can be divided into those affecting the demand side of the market and those affecting the supply side. The demand side is the sum of export and domestic demand. Population growth, income growth, and urbanization affect the amount and type of food people purchase and consume. While population growth leads to increases in the amount of energy and protein needed to sustain the population, income growth results in an increase in the demand for diversified diets (that is, an increased share of food expenditures on meat, fish, eggs, dairy products, and fruit relative to staple cereals such as rice), and urbanization results in greater demand for convenience (that is, labor-saving value addition, packaging, and prepared meals).

Meeting these demands requires important changes on the supply side of the agrifood system. Agricultural production needs to diversify, the value produced per farm worker (labor productivity) needs to increase, and expanded investments need to be made in the cold chain (refrigeration), agro-processing, and wholesale and retail food distribution sectors. Farmers and businesses also need additional investment in science-based innovations, such as high-yielding, disease-resistant crop varieties; infrastructure, such as irrigation, roads, electricity distribution, and wholesale markets; and regulations and laboratory facilities to ensure food safety and hygiene. When the domestic agrifood system is unable to adapt quickly enough, prices rise, and food demand is increasingly met through imports rather than domestic production. We examine the extent to which these drivers have shaped the agrifood system in recent years, first on the demand side and then on the supply side. We also briefly consider international trade.

DOMESTIC DEMAND-SIDE DRIVERS

Income or the lack of it—that is, poverty—is a key factor affecting the amount and composition of demand for food. While the poverty head count in Myanmar fell from 48 percent of the population to 25 percent between 2005 and 2017, this rate is still very high (CSO, UNDP, and World Bank 2019). Poverty is an overwhelmingly rural phenomenon in Myanmar. Spatial variations in rates of food poverty (the inability to purchase a minimum amount of food) are stark. More than twice as many households in the Coastal and Hills and Mountains agroecological zones (19 percent and 16 percent, respectively) are estimated to be food poor, compared with 7 percent in both the Dry Zone and Delta. Nevertheless, malnutrition indicators have improved with poverty reduction: wasting rates decreased from 10.7 percent in 2000 to 7 percent in 2016, and stunting rates fell from 40 percent in 2000 to 29 percent in 2015 (MoHS and IFC 2017).

Approximately 30 percent of Myanmar's population lives in urban areas. Growing at 2 percent per year, the urban population is expected to increase by an additional 7.1 million people by 2050 (World Bank 2019a). Urban households typically spend smaller shares of their food budget on rice and larger shares on poultry, eggs, meat, seafood, dairy, fruit, and FAFH than rural households (Table 3.8). Across consumption expenditure quintiles, similar patterns are seen. As per capita expenditure increases, households' share of food expenditure on rice falls dramatically, from 31 percent to 12 percent, as do their expenditure shares on vegetables, oils, and condiments. In contrast, sharp increases emerge in FAFH, which quadruples from 5 percent of total food expenditure in the poorest quintile to 20 percent in the top expenditure quintile. As incomes rise, similar increases occur in expenditure shares on processed foods, poultry, other meats, fresh fruit, and fish (Table 3.8).

Similar patterns emerge over time. Between 2010 and 2015, rural and urban households of all income levels reduced their share of expenditure on rice in food consumed at home from 23.6 percent to 20.7 percent, averaged

TABLE 3.8 **Expenditure shares for different food types, by quintile of total household food expenditure, 2017**

	Expenditure share by consumption expenditure quintile (%)					Expenditure share by location (%)		
Food groups	Q1 (poorest)	Q2	Q3	Q4	Q5 (richest)	Rural	Urban	National
Rice	31	25	20	16	12	20	14	18
Other cereals	1	1	1	1	1	1	1	1
Tubers and roots	2	2	2	1	1	2	1	1
Dark green leafy vegetables	2	2	2	2	1	2	2	2
Other vegetables	11	10	10	9	7	10	8	9
Fruits	3	4	4	5	7	5	7	5
Poultry	4	6	6	7	7	6	8	6
Other meat	4	6	7	7	8	7	7	7
Eggs	3	3	3	3	3	3	3	3
Milk and milk products	0	0	0	0	1	0	1	0
Fish and other seafood	11	12	13	13	14	13	14	13
Legumes, nuts, and seeds	4	4	3	3	3	3	3	3
Oils and fats	7	6	5	5	4	5	4	5
Sweets	2	3	4	4	4	4	4	4
Spices, condiments, beverages, other	9	9	9	7	5	8	5	7
Alcohol	1	1	1	2	1	1	1	1
Food away from home (FAFH)	5	7	10	14	20	12	17	13
Total	100	100	100	100	100	100	100	100
Processed foods	17	20	25	28	34	26	31	28

Source: Authors' calculations using 2017 Myanmar Population and Living Conditions Survey data (CSO 2019).

across all households. Despite changes in food expenditure shares over time, most households do not consume sufficiently diversified diets. Only 38 percent of households consume the recommended quantities of protein-rich foods and fats and oils, 16 percent the recommended quantities of vegetables, and 9 percent of fruits. The primary constraint to achieving a nutrient-rich diet is the high cost of protein-rich foods relative to household food expenditure (Chapter 4). Meanwhile, increases in the consumption of processed foods high in refined sugar are likely to result in a higher incidence of diabetes.

DOMESTIC SUPPLY-SIDE DRIVERS

The following discussion first examines factors underlying changes in crop production and then turns to changes in the livestock sector. Increases in the value of crop output per worker can potentially come from reallocating land to higher value crops, increasing yields from irrigation, or using improved varieties and crop management practices that can expand the area cultivated per worker or reduce labor use, such as through use of agricultural machinery or herbicides. Among these potential sources of change, only one has made a significant contribution in the recent past: the substitution of labor by mechanization as a response to out-migration of labor and, hence, increasing real wages.

Migration, rural wages, and mechanization. Migration has accelerated rapidly over the past 10 years, becoming a key driver of rural change. In Mon State, almost one out of two households has at least one migrant member, most often in neighboring Thailand (Filipski et al. 2020). The outflow of young, economically active workers has led to a tightening of rural labor markets, which, in turn, has led to higher wages. In both the Dry Zone and Delta, for example, real rural wages (adjusted for inflation) jumped by more than one-third over the five years from 2011/12 to 2016/17. However, real wages have declined substantially in the recent crisis years (Chapter 16).

The association between the rate of out-migration and rural wages is demonstrated in Mon State, where townships closer to Thailand have greater numbers of migrant households and significantly higher local wage rates than townships farther from the border (Filipski et al. 2020). The recent growth in the number of secondary schools may have helped reduce children's participation in the workforce, further contributing to wage increases. These real wage increases have declined since the beginning of 2021, likely adding to further migration.

Real wage increases of this magnitude have positive implications for the welfare of the many households that depend on off-farm employment, but they also create new vulnerabilities. Welfare gains are undermined by a large gender wage gap in all locations surveyed. In both the Dry Zone and Delta, for example, women earn between 15 percent and 35 percent less on average than men for casual agricultural or nonfarm work. This gap does not appear to have changed over time. The growth in dependence on remittance income also puts households at risk of income shocks if migrants lose employment, such as from crises like the COVID-19 pandemic.

Demand for agricultural mechanization services has increased rapidly in response to rising wages and labor shortages. On the supply side, three factors have encouraged the availability of such services: (1) the expansion since 2013 of financing from private banks to purchase agricultural machinery, (2) the ability of farmers since 2012 to use land use certificates as loan collateral, and (3) the falling real cost of imported machines. However, mechanization providers now struggle to provide the same services as before the current crisis began (MAPSA 2022b).

Limited crop diversification. Unlike the situation for mechanization, farmers' cropping patterns have changed little over the past decade (for example, Mather et al. 2020). In the decade before 2020, the share of cereals increased slightly, driven primarily by the expansion of maize in Shan State as a result of rising demand for animal feed domestically and in neighboring countries, and the availability of hybrid seed. Among oilseed crops, shares of cropped area under groundnut and sesame have increased, while the share under sunflower has declined. Groundnut and sesame are widely used in specialty dishes, such as tea leaf salad, and pure groundnut and sesame oils are highly prized in the market. Sunflower shares have lagged due to low yields, which is related to lack of access to hybrid varieties and to competition from imported palm oil. However, to reduce dependency on palm oil, the military government recently began promoting sunflower production.

Among pulses, shares of green gram and chickpea have increased slightly. Chickpea is used widely in Myanmar dishes, and green gram has multiple export destinations. Shares of pigeon pea, in contrast, have declined. This pulse is narrowly targeted to the Indian market and experienced a sharp drop in export prices when India imposed import quotas. Industrial crops such as cotton have lost almost half their share over the past decade because of a lack of competitiveness.

Reasons for limited crop diversification include agroecological constraints, land use regulations, issues with access to finance, and risk. Agroecological constraints (discussed further in Chapter 5) include heavy and increasingly unpredictable rainfall in the Delta and Coastal agroecological zones, which limits the range of crops that can be grown. By contrast, Shan State and other areas of the Hills and Mountains have much higher crop diversification due to more temperate climatic conditions.

In terms of land use regulation, while the new agricultural policy has allowed freedom of seasonal crop choice, the permanent conversion of paddy land to alternative uses, such as orchards, livestock, or aquaculture, still requires approval at multiple levels. Existing MOALI-managed irrigation systems do not allow for water control at the individual plot level, effectively precluding freedom of crop choice by the individual farmer. Only a small proportion of farmers belong to water user groups that could facilitate collective decision-making. Private tubewells using groundwater can avoid this constraint, but groundwater reserves are not adequately mapped. This leads to uncertainty about water depth, hence, the cost of well drilling, and sustainable extraction rates. Loans for private tubewell development from the formal financial sector are nonexistent.

Meanwhile, diversification into perishable crops such as cut flowers, melons, or vegetables can be quite risky, given the volatility in prices. Investment in value-added processing facilities, such as for cold storage, grading and packing, or processing, can expand market options and reduce downside price risk, but investment in such facilities is sorely lacking. Contract farming can also reduce risks but works only when farmers and buyers have strong incentives to respect commitments. In sum, like enterprise diversification more generally, crop diversification requires market access and a set of supportive conditions.

Low crop productivity and profitability. A key potential driver of the agriculture sector is productivity growth from improved varieties (or animal breeds) combined with improved crop (or livestock) management practices. However, as noted, yields have declined for most crops except post-monsoon irrigated rice and hybrid maize. In turn, low yields reflect minimal uptake of improved varieties for all crops, except irrigated paddy,[2] and low levels of input use. Inorganic fertilizer, pesticide, and herbicide use have increased slightly over the past 10 years for all Dry Zone crops and for irrigated paddy in the Delta. Despite this, post-monsoon irrigated paddy is the only crop to show (small) yield gains. Increased input use may not translate into observable yield gains for several reasons. Farmers may not know the correct inputs needed for their conditions or may apply them at the wrong time. Also, the switch from transplanting to broadcast seeding of paddy, which has been commonly

2 A recent study of varietal adoption and demand for quality seed in the Dry Zone found limited adoption of improved varieties by farmers despite such varieties being available for almost all crops (Boughton et al. 2020). The authors advocate for more extensive variety evaluation and seed quality demonstration programs on farmers' fields. Such programs could enable researchers to learn about the performance of new varieties under farm conditions while increasing farmer awareness of their potential benefits.

observed but not systematically measured, reduces labor costs but also yields potential, especially in the monsoon season.

Livestock. In contrast with crop production, livestock has performed strongly in recent years. Poultry and egg production has done well, as has aquaculture. In both cases, private sector investment throughout the value chain has driven growth. Of critical importance has been an expansion in the number of commercial feed companies, some based on investment from the Netherlands and Republic of Korea. This has contributed to an expansion of maize production. There has also been a surge in live cattle exports thanks to strong demand from neighboring countries. However, it takes longer to scale up cattle production than poultry and egg production. There has been no investment in agricultural research and extension to improve the forage crops or pasture needed for ruminants like cattle. The livestock subsector performed strongly before the crisis years, but it also has seen some of the biggest challenges to its operations since that time.

INTERNATIONAL TRADE CHANGES

Agricultural exports can supplement domestic food markets and significantly expand opportunities for agricultural growth, as in the case of Myanmar's pulse exports to India and maize exports to China and Thailand. However, these export markets have proven volatile and risky, with export quantities and prices subject to rapid spikes and abrupt declines (Chapter 14). Pulse exports to India were reduced by quotas before they were relaxed in 2021. Bans on maize imports in China limited exports to its markets. International price volatility has led to wide swings in prices for many commodities, including rubber, pulses, and maize. Compounding these problems is the generally low productivity of Myanmar's farmers and limited value-added processing, hampering competitiveness and confining the country's exporters to low prices in often volatile international markets. At the farm level, such price characteristics do not encourage investment by farmers in either quality or productivity.

Constraints

PROBLEMATIC INPUT AND FACTOR MARKETS

Highly skewed access to agricultural land. Access to land for farming in Myanmar remains highly skewed, with more than half of rural households having no access to farmland despite agriculture being an important source of livelihood (Chapter 6). This reflects a long history of dispossession, whether through bankruptcy brought on by the paddy quota system or land confiscation by the government. Even among landed households, there is a high degree of inequality in landownership: the top 20 percent of households with the largest farm sizes own 55 percent of total land. In comparison, households at or below the 60th percentile of farm size own just 22 percent (Chapter 6). In addition to inequitable land distribution, farmers are not allowed to convert land designated as paddy land to more profitable permanent alternative uses such as aquaculture. The process for obtaining permission to change land use is complex, time-consuming, and fraught with rent-seeking by local officials.

Underperforming agricultural research. Investments in agricultural research are central to improving agricultural performance over time. Compared with other countries in the region, Myanmar's low yields partly reflect minimal investment in research and human capacity. Table 3.9 shows that Myanmar spends less than 0.1 percent of its agricultural GDP on agricultural research. In contrast, Thailand spends 16 times as much, and Viet Nam—the region's second-lowest spender on agricultural research—spends 3 times as much. Other metrics, such as expenditure per capita or per rural resident, are also extremely low. Myanmar has very few aquaculture or fisheries researchers and no livestock researchers other than faculty members at the veterinary university who supervise research by their students. This low investment in agricultural research is compounded by weak extension linkages, which translate into low rates of varietal adoption (Boughton et al. 2020).

Figure 3.6 further shows the limited number of agricultural researchers and the relatively low proportion of MSc and PhD degree holders in Myanmar's agricultural research system. This reflects the situation before the crisis years, but the situation has since worsened significantly.

Stads and colleagues (2020) assess to what extent increased expenditure on agricultural research would benefit the agriculture sector in Southeast Asia overall. They find that all countries in the region are underinvesting in agricultural research and that increased spending would lead to considerable growth in agricultural productivity, especially in Myanmar. Their analysis of a closing-the-gap scenario—under which growth in agricultural research investments is set at rates that will gradually close the investment gap by 2030 and keep it closed until 2050[3]—indicates that Myanmar's annual productivity growth could reach a 7.7 percent scenario.

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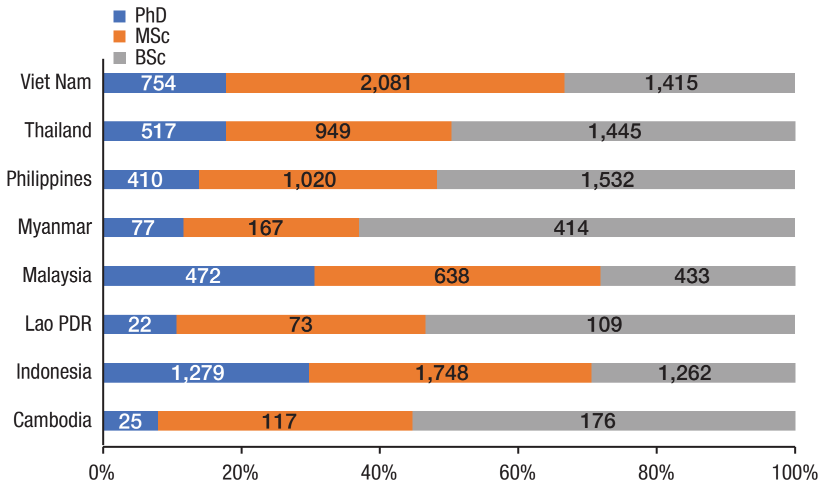
3 This implies a 10-fold increase in R&D investments from about US$47 million annually in 2017 (0.06 percent of agrifood system GDP [AgGDP]) to about US$470 million in 2030 and the years

TABLE 3.9 Investments in agricultural research, Myanmar and neighboring countries, 2017

Country	US$ million[a]	% of agricultural GDP	US$ per capita[a]	US$ per capita of rural population[a]
India	4,172	0.30	3.12	4.69
Thailand	847	0.94	26.79	109.10
Malaysia	629	0.85	11.79	16.91
Bangladesh	288	0.38	4.17	8.21
Viet Nam	178	0.20	1.86	2.87
Myanmar	47	0.06	0.28	0.44

Source: ASTI database, accessed December 2020.
Note: [a] Constant 2011 values.

FIGURE 3.6 Agricultural researchers by degree, Myanmar and neighboring countries, 2017



Source: Stads et al. (2020).
Note: PDR = People's Democratic Republic.

Lack of agricultural extension. Agricultural extension can facilitate the adoption of new agricultural technologies. While MOALI employed more than 60,000 people before the military coup, only about 8,200 were extension

after (0.61 percent of AgGDP, called the "attainable investment level") (Stads et al. 2020). Stads and colleagues (2020) developed "attainable" investment targets for each country based on the size of their agriculture sector and total economy, their income level, and the availability of relevant technology spillovers from other countries.

agents. There are many private extension agents in the country,[4] but their overall number is still small compared with the total number of farmers and area of cultivated agricultural land (Figure 3.7). Myanmar has one extension agent for every 4,135 farmers, compared with one for every 2,600 farmers in Thailand. Even before the military coup, agricultural extension workers did not visit farmers frequently, and have done so even less often since the coup.

Low access to rural finance. Lack of access to finance was a common constraint facing agrifood system actors prior to COVID-19 and one that worsened during the pandemic. Before the February 2021 coup, more than 70 percent of the population lacked access to formal finance. The underdeveloped finance sector was not able to meet the financing needs of private firms (IFC 2020). Domestic credit to the private sector was 25.7 percent of GDP in 2019, one of the lowest rates in East Asia and the Pacific.[5] Moreover, while the agrifood system represents one-third of GDP and employs about half of the working population, only 2.5 percent of all loans are related to agriculture (IFC 2020). The microfinance sector and cooperatives have expanded their services rapidly in recent years, but many farmers remain unserved or underserved (Basu et al. 2020), especially since the recent crises (MAPSA 2021e). Therefore, a substantial share of farmers, traders, and other agribusinesses relies on informal markets that charge high interest rates. At the farm level, the limited access and high cost of finance can restrict the adoption of improved agricultural inputs, high-value crops, and improved quality and safety practices. Downstream actors similarly face reduced incentives to invest in efficient marketing, processing, and storage.

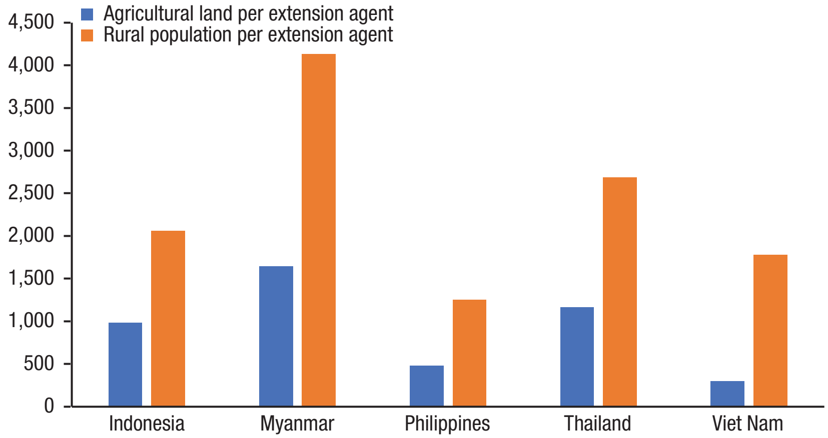
HIGH TRANSACTION COSTS

Myanmar spends significantly less on the transport sector than other countries in the region (World Bank 2017b). More than 60 percent of highways and railways are in poor condition, and 40 percent of the rural population lacks access to all-season roads (World Bank 2024). Of this share of the rural population, 9.2 million people reside in approximately 25,000 villages that are not connected by any road, and another 20,000 villages—home to 11.3 million people—are connected by a road that is not accessible during all

4 In countries with thriving, modern agribusiness sectors, it is often the input vendors who extend varietal and other input information to farmers, or even the agro-processors—who purchase the final product from farmers—who instruct these producers on exactly which seed varieties, agrochemical packages, and cultivation calendars they expect farmers to employ.

5 The overall average for the region was 155.4 percent in 2019 (World Bank 2024).

FIGURE 3.7 Extension agent coverage, Myanmar and neighboring countries



Source: Ekanayake, Ambrosio, and Jaffee (2019).

seasons (World Bank 2017b). Transport connectivity in Myanmar is still a major challenge that hampers agricultural performance. Moreover, some rural areas are also disconnected from markets because of conflict-related security issues. In these villages, costs are higher for inputs and mechanization services to raise productivity and for getting produce to market, resulting in lower farm incomes.

Regulatory obstacles compound the high costs resulting from poor physical infrastructure. The World Bank (2020) has developed an international standardized indicator on the ease of doing business, which measures regulation in 12 areas of business activity in a country. While Myanmar has improved its ranking over time, it still ranked low in 2020, at 165 out of 190 countries. Peer economies rank between 12 and 70. The Logistics Performance Index is a benchmarking tool that identifies "the challenges and opportunities countries face in their performance on trade logistics and what they can do to improve their performance (Arvis et al. 2018)." Using this measure, Myanmar scores significantly below its peer countries, as Table 3.10 shows. While peer countries rank between 26 and 44 on a list of 160 countries, Myanmar is far below at 137.

Difficulties related to international trade have enormous implications for the implicit and explicit costs of importing and exporting. Bouët and Laborde (2019) calculate the costs—implicit and explicit—of international

TABLE 3.10 Ranks of ease of doing business and international trade and trade tariffs, Myanmar and neighboring countries

Category	China	India	Malaysia	Myanmar	Thailand	Viet Nam
Rank on ease of doing business (out of 190 countries)	31	63	12	165	21	70
Rank on Logistics Performance Index (out of 160 countries)	26	44	41	137	32	39
Equivalent ad valorem tariffs exports (%)	41	28	22	59	31	26
Equivalent ad valorem tariffs imports (%)	78	163	111	311	148	100

Source: Bouët and Laborde (2019); World Bank database (2020).

trade in agricultural goods for several countries.[6] For Myanmar, they find that the sum of these costs is equivalent to an ad valorem tariff for imports of 311 percent, significantly higher than for peer countries. On the export side, Myanmar's costs are equivalent to an ad valorem tariff of 59 percent, compared with 22 percent for Malaysia and 26 percent for Viet Nam (Table 3.10). Given complications with trade since the military coup, all these indicators have worsened.

This international comparison indicates that Myanmar ranks low on several indicators of access to infrastructure and service delivery, associated, as expected, with overall lower development and income levels. Myanmar is doing especially poorly on regulations and ease of doing business, ranking much lower than all its peer countries.

Conclusions

Despite important initial steps between 2011 and 2019, tangible progress in Myanmar's agricultural transformation was slower than hoped. The impoverishment of farming communities during decades of socialist military rule, from the 1960s until the turn of the century, led to an outflux of migrants to neighboring countries. As the country opened up to foreign investment through economic reforms initiated in 2011, rural wages surged, and farm mechanization services expanded rapidly. Together with increased remittance flows from migrants, higher rural household incomes drove growth in a wide

6 These costs include (1) duties; (2) nontrade measures such as price and quantity control measures, antidumping measures, safeguards, sanitary and phytosanitary standards, technical barriers to trade, export measures, trade-related investment measures, distribution restrictions, restrictions on post-sale services, subsidies, and measures related to intellectual property rights and rules of origin; and (3) trading costs related to customs infrastructure, domestic transportation, communications infrastructure, credit, and insurance markets.

range of nonfarm service enterprises. Nevertheless, agricultural growth was low, and most crop subsectors stagnated as a result of underlying and unresolved structural constraints, such as poor infrastructure and inequality in land access.

The public sector has made progress in reallocating expenditure and modernizing its service delivery to farmers, but there is still a long way to go. Land access, land use restrictions, and uncertain tenure undermine smallholder growth. Farmers and small-scale agribusinesses have inadequate access to financial services. Decades of underinvestment in research and the diffusion of improved varieties, quality seed, and crop and livestock management techniques have left Myanmar's farmers behind their peers in the region. The trade policies of Myanmar's neighbors have created high price volatility for key crops such as pulses, rice, and maize, causing farmers to be more risk averse.

Myanmar's recent history—including its rural economic transformation and the effects of COVID-19 and the military coup in February 2021—provides important lessons for designing and implementing plans to help the country recover and advance. As in many other Asian countries, border closures and lockdowns instituted in early 2020 to prevent the spread of COVID-19 resulted in widespread losses to employment and income. The Myanmar government proactively sought to mitigate the impacts through expanded credit to farmers and businesses. By the end of 2020, Myanmar was beginning to recover from the economic stresses of COVID-19. However, the February 2021 military coup resulted in a far more severe economic downturn, which the collapse of the financial system, massive resignations by public sector employees, and prolonged movement restrictions compounded. The coup-induced state failure greatly magnified the health and economic consequences of COVID-19, namely the effects on poverty, food insecurity, and stalled economic transformation.

The economic consequences of COVID-19 and the military coup have revealed important weaknesses in Myanmar's agrifood system and its ability to support resilient rural livelihoods and national food and nutrition security. Agriculture's contribution to the economy and the welfare of farmers and consumers remains far below its potential. Despite recent setbacks, supporting the potential of Myanmar's agriculture sector to drive economic transformation, reduce poverty, and achieve food and nutrition security for all is a worthwhile goal, even in this crisis period.

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Chapter 4

DIETARY QUALITY AND NUTRITION: PAST PROGRESS, CURRENT AND FUTURE CHALLENGES

Kristi Mahrt, Derek Headey, Olivier Ecker, Andrew Comstock, and Salauddin Tauseef

Prior to the onset of the COVID-19 pandemic in 2020 and the military coup in 2021, Myanmar was experiencing a period of rapid economic growth and transformation in the wake of economic and political liberalization. Between 2005 and 2017, average annual growth in real GDP per capita was 7.8 percent, making Myanmar the fastest growing economy among the Association of Southeast Asian Nations (ASEAN) countries. Strong growth was accompanied by a halving of the national poverty rate between 2005 and 2017 from 48.2 to 24.8 percent (CSO, UNDP, and World Bank 2019).

COVID-19 and the economic and political shocks affecting the country since 2021 have led to an economic contraction: 2021 saw an 18 percent drop in real GDP per capita; in 2022, real GDP per capita was estimated to be 15 percent lower than in 2019 (World Bank 2022). The impacts on poverty were even more dire. A high-frequency panel phone survey of mothers and young children in urban Yangon and the rural Dry Zone revealed incomes collapsing during the COVID-19 lockdowns and further income losses in the wake of the February 2021 military takeover (Headey et al. 2022). Prices rose dramatically, with the consumer price index rising by 20 percent between July 2021 and July 2022 (MOPF 2022), while food prices rose by 34 percent over the same period and by about 50 percent between December 2021 and December 2022 (MAPSA 2023; WFP 2022; 2023). Nationally, a variety of different poverty indicators suggest that between 40 and 50 percent of the population was living in poverty in 2022 (MAPSA 2021; 2022b; World Bank 2022)—poverty rates similar to those found between 2005 and 2010.

This reversal in economic growth and poverty reduction gains, alongside sharp increases in food prices, has profound implications for dietary quality and, hence, malnutrition. The international literature shows strong connections between economic growth and improvements in key nutrition outcome indicators, such as preschooler stunting (Headey 2013; Smith and Haddad

2002), while at the micro level, increases in household wealth remain one of the strongest predictors of stunting reduction over time (Headey, Hoddinott, and Park 2016). Recent research also suggests that economic growth shocks and food inflation are important risk factors for child wasting (Headey and Ruel 2022a; 2022b).

While COVID-19 and the political crisis have precluded the implementation of anthropometric surveys, a deteriorating nutritional situation is to be expected. Dietary quality is strongly associated with household income or wealth. In good times, as incomes rise, smaller shares of household income are spent on food (Engel's law), and diet composition shifts from baskets heavy in starchy staples toward more diverse diets comprising relatively more expensive foods (Bennett's law). Conversely, when incomes decline, dietary diversity also tends to decline. One key explanation is that foods rich in micronutrients and high-quality protein—such as animal-source foods (ASFs), fruits, and vegetables—are typically expensive sources of calories (Headey and Alderman 2019). Thus, poor households concerned about basic hunger (calorie adequacy) tend to consume fewer nutrient-dense foods as their incomes decline. The lack of consumption of nutrient-dense foods results in low intake of micronutrients and high-quality protein and rising deficiencies in key nutrients.

Numerous reports and studies carried out prior to COVID-19 document the poor state of nutrition in Myanmar, including high rates of stunting among preschoolers, overweight/obesity among adult women, and micronutrient deficiencies across a range of demographic groups (Grover et al. 2019; MoHS 2019; MoHS and IFC 2017; MoHS, WHO, and WDF 2015). During the pre-COVID decade of sustained economic growth and development, stunting among preschoolers fell from 35 percent in 2010 to 27 percent in 2018 (MoHS 2019; Grover et al. 2019; MoH and MNPED 2010;). However, around one-quarter of adult women were overweight or obese in 2015, and there was evidence of rising levels of diet-related noncommunicable diseases prior to COVID-19, such as hypertension and type 2 diabetes, particularly in urban areas (Aung, Nguyen, and Sparrow 2018; Grover et al. 2019; MoHS, WHO, and WDF 2015; Ueno et al. 2021). Huge regional disparities in nutrition outcomes and diet quality were also seen. For example, stunting was found to be especially high in remote areas, such as Rakhine and Chin States, where in 2015/16 roughly one in two preschoolers were stunted.

Addressing malnutrition comprehensively, including both undernutrition and overweight/obesity, requires an inclusive, multisectoral, and nutrition-sensitive development strategy. It must be inclusive because poverty is a root cause of poor diets through a sheer inability to afford a healthy diet. This strategy must be multisectoral because malnutrition is caused by both poor diets and a poor health environment, including poor access to health services; poor water, sanitation, and hygiene conditions; and lack of education and caregiver knowledge. And it must be nutrition-sensitive in the sense that traditional approaches to development require new, nutritionally smarter strategies to transform agricultural and food systems as a whole, as well as to appropriately engage health, sanitation, hygiene, family planning, and other nutritionally relevant sectors. Unfortunately, economic, social, and political crises represent a significant barrier to developing and implementing an improved strategy to address malnutrition, and only a resolution to these crises will allow the country to resume meaningful progress.

This chapter applies economic techniques to a wide range of surveys implemented in Myanmar to assess the food and diet situation in the country prior to these crises, before turning to more recent evidence from surveys conducted during and since COVID-19 and the political crisis, including a new nationally representative household survey conducted in 2022. This chapter makes a valuable contribution in that, while there have been many studies on nutrition outcomes in Myanmar and a few small sample surveys on diet quality, there has been little research on diet quality at the national level, and evidence on diet quality during COVID-19 and the political crisis is minimal.

The chapter first documents variations in household dietary quality using past national economic surveys and explores the socioeconomic factors that explain these variations. The following section then presents household food demand estimates to get a sense of food preferences, particularly to gauge household consumption responses to income and price changes. Next, dietary quality in 2020/21 is examined using evidence from the aforementioned panel survey of mothers of young children in Yangon and the rural Dry Zone, as well as a new nationally representative phone survey of some 12,000 households. The chapter concludes with a discussion of the policy priorities to regain progress against malnutrition in both the immediate and the longer term, assuming that resolution of the political crisis can put Myanmar back on a more progressive development path.

Diet quality prior to the current crisis

We use data from two national household surveys with modules designed to capture household food consumption and expenditure. Most of the analysis is based on the 2015 Myanmar Poverty and Living Conditions Survey (MPLCS) (MOPF and World Bank 2017c). We also use the Integrated Household

Living Conditions Assessment (IHLCA) from 2009/10 to explore dietary changes over time (MNPED, UNDP, and Sida 2011).[1]

In both the IHLCA and the MPLCS surveys, households report quantities of foods consumed during specified recall periods together with quantities and values of purchased food items. Methods for constructing quantities of food consumed, unit values, and household total and food consumption expenditure are presented in a technical report (MNPED, UNDP, and Sida 2011). We also calculate food quantities in edible portions, as well as the nutrient content of foods, with results reported on a per adult equivalent basis.[2]

Evolution of household dietary patterns

We begin by exploring the evolution of food consumption by detailed food groupings. Between 2010 and 2015, the incidence of poverty nationally fell from 42.4 to 32.1 percent (MOPF and World Bank 2017b), and real GDP per capita rose an average of 7 percent per year. Real household consumption expenditure rose an average of 3 percent per year. However, it was uneven, with urban household consumption expenditure increasing by 4.1 percent per year compared with only 2.9 percent in rural areas (MOPF and World Bank 2017a). During this time, food expenditure shares decreased considerably by 2.9 percent on average per year—2.5 percent in urban areas and 3.5 percent in rural areas (authors' calculations). This pattern is consistent with Engel's law.

According to Bennett's law (Bennett 1941; 1954), we would also expect a corresponding shift in consumption from energy-dense staple foods to a relatively more expensive and diverse set of foods. We explore this by examining changing dietary energy shares between 2010 and 2015 (Table 4.1). Total

1 An MPLCS poverty report (MOPF and World Bank 2017a) details important differences between the two surveys that could affect comparability, including differences in sampling and survey design as well as seasonality (IHLCA: December 2009/January 2010 and May 2010; MPLCS: January–April 2015). Key differences in the collection of food data include differences in food lists, recall periods for some foods, and methods of collecting information on food consumed away from home (FAFH).

2 Food wastage factors and the energy and nutrient content of foods are obtained from the United States Department of Agriculture food composition table (USDA 2016), supplemented with information from Bangladesh (Shaheen et al. 2013), the Association of Southeast Asian Nations (Institute of Nutrition 2014), Japan (MEXT 2015), West Africa (Stadlmayr et al. 2012), and World Fish for Myanmar (Scott 2019). Wastage factors allow for the conversion of "as purchased" food quantities to edible portions. All food quantities are reported in edible portions. In calculating the nutrient content of foods, we apply USDA (2007) nutrient retention factors for typical cooking techniques in Myanmar. Some results are reported per adult equivalent, which we calculate using an adult equivalency scale derived from the daily age–sex energy needs of individual household members relative to that of a 30-year-old adult woman—2,195 kilocalories—following the methodology described by Waid and colleagues (2017) and outlined for Myanmar in Mahrt et al. (2019).

TABLE 4.1 Evolution of dietary energy percentage shares by detailed food groupings, 2010 and 2015

Food group	Detailed food grouping	National			Urban			Rural		
		2010	2015	Change	2010	2015	Change	2010	2015	Change
Staples	Rice	65.0	57.4	–7.7	57.7	50.9	–6.8	67.6	59.8	–7.8
	Other cereals	1.6	1.1	–0.5	2.4	1.4	–1.0	1.3	1.1	–0.3
	Roots and tubers	0.7	0.9	0.2	0.7	0.9	0.2	0.6	0.9	0.2
	Total staples	67.3	59.4	–7.9	60.8	53.2	–7.6	69.6	61.8	–7.8
Animal-source foods (ASFs)	Fresh milk	0.1	0.1	0.0	0.2	0.3	0.1	0.0	0.0	0.0
	Eggs	0.8	1.0	0.2	1.1	1.4	0.3	0.7	0.8	0.1
	Small fresh fish	0.2	0.3	0.0	0.2	0.3	0.1	0.3	0.3	0.0
	Other fresh fish/seafood	1.1	1.0	0.0	1.4	1.2	–0.1	0.9	0.9	0.0
	Small dried fish/shrimp	0.3	0.3	0.0	0.4	0.3	0.0	0.3	0.3	0.0
	Medium/large dried fish	0.3	0.3	0.0	0.4	0.4	0.0	0.3	0.3	0.0
	Fish/shrimp products	0.4	0.4	0.0	0.3	0.3	0.0	0.4	0.4	0.0
	Poultry	0.8	1.3	0.6	0.9	1.9	1.0	0.7	1.1	0.4
	Other meat	2.8	2.0	–0.8	2.5	2.3	–0.3	2.9	1.9	–1.0
	Total ASFs	6.8	6.7	0.0	7.5	8.4	1.0	6.5	6.1	–0.5
Pulses	Pulses and products	3.7	3.3	–0.3	4.2	3.5	–0.7	3.5	3.3	–0.2
Vegetables	Dark green leafy veg.	0.6	0.3	–0.3	0.6	0.4	-0.2	0.6	0.3	–0.3
	Other vegetables	1.3	1.9	0.6	1.4	2.1	0.6	1.2	1.9	0.6
	Total vegetables	1.9	2.3	0.4	2.0	2.5	0.5	1.9	2.2	0.3
Fruits	Fruits	1.9	1.4	–0.5	2.1	1.9	–0.2	1.8	1.3	-0.6
Fats	Oils	9.3	12.0	2.7	10.9	12.9	2.0	8.7	11.6	2.9
	Nuts and seeds	1.5	1.1	–0.4	1.1	0.8	–0.2	1.6	1.2	–0.4
	Total fats	10.7	13.1	2.3	12.0	13.7	1.7	10.3	12.8	2.5
Other foods	Sugars and sweets	2.1	2.7	0.6	3.0	3.2	0.2	1.8	2.5	0.7
	Seasonings	1.3	1.6	0.3	1.2	1.4	0.2	1.3	1.6	0.3
	Alcoholic beverages	0.4	0.9	0.5	0.3	0.7	0.4	0.4	1.0	0.6
	FAFH	3.8	8.6	4.8	6.7	11.3	4.6	2.8	7.6	4.8
	Total other foods	7.5	13.7	6.2	11.2	16.7	5.4	6.3	12.6	6.4
Kilocalories per adult woman equivalent		2,449	2,442	NA	2,081	2,080	NA	2,578	2,581	NA

Source: Authors' calculations using 2010 IHLCA and 2015 MPLCS.

Note: ASFs = animal-source foods. FAFH = food consumed away from home. NA = not applicable.

energy intake at the national, urban, and rural levels is quite similar between survey years. However, consistent with Bennett's law, energy shares of staple foods at home declined by 11 percent between 2010 and 2015 at the national level, or 7.9 percentage points. One caveat is that we do not know the energy shares from staple foods in food consumed away from home (FAFH), and indeed, declining staple consumption at home was accompanied by increased FAFH consumption, whose share rose by 4.8 percentage points.[3]

In addition, consumption shares of added oils and fats rose by 2.3 percentage points, while discretionary foods (sugars and sweets, condiments, and alcohol) rose by 1.4 percentage points in aggregate. Since much FAFH may be unhealthy, this suggests a nutrition transition toward relatively unhealthy foods, as observed elsewhere in Asia (Pingali and Abraham 2022). Increased shares of added fats in the diet were further driven by the greater availability of cheaper imported oils, particularly palm oil, due to the relaxation of import restrictions in 2011 (Belton and Win 2019) and a general global decline in palm oil prices.

Nationally, the share of dietary energy from nutrient-dense ASFs remained constant between 2010 and 2015, while energy shares increased in urban areas (13 percent) and declined in rural areas (–7 percent). Within ASFs, consumption shifted from pork and beef to eggs and poultry. Nationally, chicken consumption shares increased by 72 percent and more than doubled in urban areas. Increased consumption of chicken and eggs is consistent with the growth of commercial chicken farming during the same period (Belton et al. 2020). Though reported vegetable consumption increased and fruit and pulse consumption declined, seasonality is an important factor in the consumption of some of these foods. Consequently, the different timings of the 2010 and 2015 surveys mean it is imprudent to draw firm conclusions on consumption patterns for seasonal foods.

Household dietary patterns by subnational household groups in 2015

Table 4.2 examines consumption patterns by household consumption expenditure quintiles; Table 4.3 presents the same results by agroecological zone (AEZ) and Yangon. The last column in Table 4.2 shows differences between the richest quintile (Q5) and the poorest quintile (Q1). As expected, energy

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3 The IHLCA and MPLCS surveys take quite different approaches to collecting data on food prepared and consumed outside the home. This difference affects the comparability of their results. However, whether either approach has a relatively greater upward or downward bias is unclear.

TABLE 4.2 Dietary energy percentage shares by detailed food groupings and consumption expenditure quintile, 2015

Food group	Detailed food grouping	Q1 (poorest)	Q2	Q3	Q4	Q5 (richest)	Q5–Q1 (gap)
Staples	Rice	67.2	63.1	57.7	52.7	45.9	–21.3
	Other cereals	0.8	0.8	0.9	1.4	1.8	1.0
	Roots and tubers	0.8	0.9	0.9	0.9	1.0	0.2
	Total staples	68.8	64.8	59.6	55.0	48.8	–20.0
Animal-source foods (ASFs)	Fresh milk	0.1	0.0	0.0	0.1	0.3	0.2
	Eggs	0.6	0.9	0.9	1.1	1.3	0.7
	Small fresh fish	0.4	0.3	0.3	0.2	0.2	–0.2
	Other fresh fish/seafood	0.6	0.8	1.0	1.2	1.5	0.9
	Small dried fish/shrimp	0.4	0.3	0.3	0.3	0.4	0.1
	Medium/large dried fish	0.2	0.2	0.4	0.4	0.5	0.3
	Fish/shrimp products	0.3	0.4	0.4	0.4	0.4	0.0
	Poultry	0.6	1.0	1.2	1.7	2.2	1.6
	Other meat	0.9	1.5	2.1	2.2	3.2	2.3
	Total ASFs	4.1	5.4	6.4	7.6	10.0	5.9
Pulses	Pulses and products	3.0	3.2	3.2	3.7	3.5	0.5
Vegetables	Dark green leafy vegetables	0.3	0.3	0.3	0.4	0.4	0.1
	Other vegetables	1.8	1.8	1.9	2.0	2.2	0.3
	Total vegetables	2.1	2.1	2.3	2.4	2.6	0.4
Fruits	Fruits	0.9	1.0	1.3	1.7	2.3	1.4
Fats	Oils	11.3	11.5	12.2	11.9	12.9	1.6
	Nuts and seeds	0.8	1.1	1.1	1.3	1.2	0.5
	Total fats	12.1	12.6	13.4	13.2	14.1	2.0
Other foods	Sugars and sweets	1.4	1.8	2.7	3.6	3.8	2.4
	Seasonings	1.7	1.6	1.5	1.5	1.5	–0.2
	Alcoholic beverages	1.0	0.9	0.8	1.1	0.7	–0.3
	FAFH	4.9	6.6	8.8	10.2	12.6	7.8
	Total other foods	8.9	10.9	13.8	16.4	18.6	9.7
Kilocalories per adult woman equivalent		1,904	2,296	2,483	2,719	2,811	907

Source: Authors' calculations using 2015 MPLCS.

Note: Q1 to Q5 refer to consumption expenditure quintiles estimated using spatially deflated total household consumption expenditure per adult equivalent. FAFH = food consumed away from home.

shares of staple foods decline incrementally as consumption expenditure increases. Households in Q1 derive 67 percent of their total energy from rice, compared with 46 percent in Q5. Richer households make up for this smaller share of starchy staples with higher consumption of nutrient-dense foods—and also unhealthy foods. The poorest quintile derives 4 percent of total energy from ASFs, compared with 10 percent in the richest quintile; 1 percent from fruit, compared with 2 percent; 1 percent from sugary foods, compared with 4 percent; and 5 percent from FAFH, compared with 13 percent. Mahrt and colleagues (2023) find a strong relationship between FAFH and total consumption expenditure—FAFH is estimated to increase by 5 kyat with each 100 kyat increase in daily income (per adult equivalent).

Consumption of most other nonstaple foods and food groupings also increases by quintile, but to a lesser degree. Within ASFs, energy shares from small fresh fish decline with increasing quintiles, whereas small dried fish and fish and shrimp products hold steady. In contrast, all other ASFs increase by two to five times between the poorest and the richest quintiles.

Regionally, staple shares are highest in the Hills and Mountains, Delta, and Coastal AEZs (Table 4.3), consistent with their higher poverty rates (Mahrt et al. 2022; MOPF and World Bank 2017b). Grains other than rice have more importance in the Hills and Mountains, as do roots and tubers (also more important in the Dry Zone). Energy shares from ASFs are lowest in the Hills and Mountains and the Dry Zone (where pulse consumption is relatively high), while fish and seafood are more important in the Delta and Coastal AEZs and Yangon. Energy shares for oils are around 10 percent, which is likely an underestimate given the expected high oil content in FAFH, which is not observable. The widespread use of palm oil likely means oil consumption is a major risk for overweight/obesity and noncommunicable diseases. In contrast, total fruit and vegetable shares across areas are fairly similar but relatively low (3.5–4.1 percent).

Diet composition relative to healthy diet guidelines

Food-based dietary guidelines outline culturally appropriate healthy dietary recommendations with the intent of serving as educational tools and informing national policy. The guidelines are designed to meet an individual's nutrient requirements. The guidelines also consider non-nutrient health properties of foods, such as recommending foods known to reduce risks of noncommunicable diseases. We assess dietary quality by evaluating how closely observed household food consumption adheres to healthy diet recommendations.
The government has developed preliminary food-based dietary guidelines

TABLE 4.3 Dietary energy percentage shares by detailed food groupings and agroecological zone and Yangon, 2015

Food group	Detailed food grouping	Hills and Mountains	Dry Zone	Delta	Coastal Zone	Yangon
Staples	Rice	61.7	53.2	59.7	64.1	51.8
	Other cereals	1.8	1.0	1.0	0.6	1.2
	Roots and tubers	1.2	1.2	0.6	0.8	0.6
	Total staples	64.7	55.4	61.4	65.5	53.6
Animal-source foods (ASFs)	Fresh milk	0.1	0.1	0.1	0.1	0.3
	Eggs	1.0	0.8	0.9	0.7	1.5
	Small fresh fish	0.2	0.2	0.3	0.8	0.3
	Other fresh fish/seafood	0.6	0.5	1.5	1.2	1.6
	Small dried fish/shrimp	0.2	0.3	0.3	0.9	0.3
	Medium/large dried fish	0.2	0.2	0.4	0.4	0.4
	Fish/shrimp products	0.2	0.3	0.5	0.3	0.4
	Poultry	1.2	0.9	1.4	1.0	2.3
	Other meat	2.2	2.0	1.9	1.5	2.3
	Total ASFs	5.9	5.2	7.3	6.9	9.3
Pulses	Pulses and products	3.5	4.7	2.8	1.0	2.8
Vegetables	Dark green leafy veg.	0.3	0.4	0.3	0.3	0.4
	Other vegetables	2.1	2.1	1.7	2.2	1.8
	Total vegetables	2.3	2.5	2.0	2.5	2.2
Fruits	Fruits	1.4	1.4	1.4	1.2	1.9
Fats	Oils	9.6	15.1	11.1	8.2	12.3
	Nuts and seeds	1.0	1.6	1.0	1.2	0.5
	Total fats	10.6	16.7	12.1	9.4	12.8
Other foods	Sugars and sweets	2.5	2.2	3.1	2.6	3.2
	Seasonings	1.3	1.4	1.9	1.7	1.6
	Alcoholic beverages	1.1	0.9	0.8	1.1	0.8
	FAFH	6.6	9.7	7.2	8.2	11.9
	Total other foods	11.5	14.0	13.0	13.5	17.4
Kilocalories per adult woman equivalent		2,235	2,500	2,672	2,465	2,123

Source: Authors' calculations using 2015 MPLCS.

Note: FAFH = food consumed away from home.

for the general population that include six healthy food groups—starchy staples; vegetables; fruits; dairy; meat, fish, eggs, and legumes; and nuts and oils—plus some allowance for sugary foods (MoHS 2016).[4] However, because Myanmar's guidelines do not specify a healthy diet in grams per food group, we adapt the healthy diet guidelines from neighboring Bangladesh, where diets are broadly similar (Nahar et al. 2013) (Table 4.4). One additional adaptation pertains to dairy, which is not often consumed in Myanmar, whereas consumption of calcium-rich small freshwater or marine fish is common throughout the country.[5] Therefore, we combine ASFs into a single food group rather than having a separate dairy group, which is consistent with the approach taken by Myanmar's guidelines for pregnant and lactating women (Zaw, Thar, and Lee 2022b).

Recommended average quantities applied to a typical Myanmar diet align closely with the energy needs of a reference 30-year adult woman (2,195 kilocalories). Thus, for each food group, we compare daily per adult woman equivalent food group consumption measured in food group equivalent grams[6] with healthy diet average food group quantities. The household is considered deprived in a food group when consumption is less than the healthy diet quantity. However, since the extent of deprivation matters, food group gaps measure the percentage shortfall between consumption and the healthy diet quantity, where the shortfall equals zero in households that consume sufficient quantities.

We begin by comparing the consumption expenditure and energy composition of average household consumption of healthy diet food groups with

4 The Food and Agriculture Organization of the United Nations (FAO) recently released guidelines for pregnant and lactating women that specify six food groups: staples, pulses/ASFs, fruits, vegetables (with an emphasis on colorful fruits and vegetables), nuts/seeds, and fats (Zaw, Thar, and Lee 2022b). UNICEF has also released guidelines for children ages two to five years (Zaw, Thar, and Lee 2022a); these guidelines disaggregate milk products from the pulses/ASFs group.

5 In a report of a calcium taskforce assembled to assess global calcium deficiencies, Bourassa et al. 2022 present the merits of food-based interventions in populations with low calcium intake, including promoting the consumption of small fish with bones. Hansen et al. (1998) demonstrate that fish consumed with bones provide calcium absorption at levels comparable with calcium in milk. Furthermore, fish species from tropical areas contain higher concentrations of calcium, iron, and zinc relative to cooler areas (Hicks et al. 2019).

6 Serving sizes apply to typical foods within each food group (for example, dried rice, dried pulses, or fresh fish) but are not specified for atypical foods (for example, potatoes, bean curd, or dried fish). We convert atypical food quantities to food group equivalent quantities using the ratio of a reference macronutrient contained in each item to the average macronutrient content among typical foods in the food group (Herforth et al. 2020; Mahrt et al. 2022). This process allows within-food group quantity comparisons and aggregations.

TABLE 4.4 Bangladesh healthy diet guidelines adapted for Myanmar, daily amounts per person

Food group	Subfood group	Recommended number of servings			Serving size (grams)	Recommended average quantity (grams)	Reference macro-nutrient
		Min.	Max.	Avg.			
Starchy staples		9	15	12	30	360	Carbohydrate
Pulses		1	2	1.5	30	45	Protein
Animal-source foods (ASFs)	Meat/fish/eggs	1	4	2.5	40	100	Protein
	Dairy	1	2	1.5	150	225	NA
Vegetables	Dark green leafy veg.	1	2	1.5	100	150	NA
	Other vegetables	2	4	3	100	300	NA
Fruits		1	3	2	100	200	NA
Fats		3	6	4.5	7	30	Fat

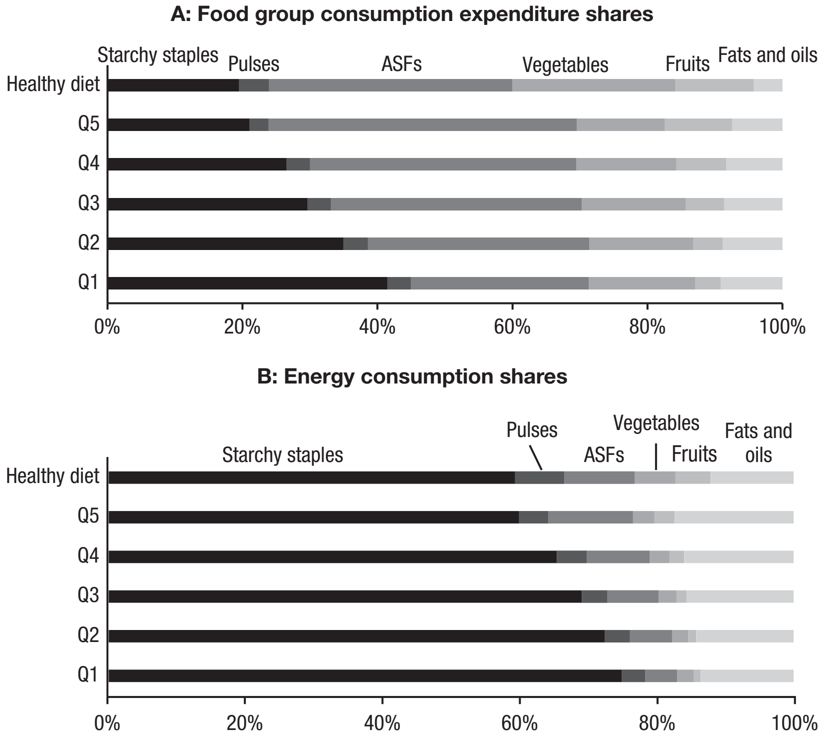
Source: Nahar et al. (2013).

Note: Healthy diet serving sizes and quantities are specified in the key messages and the food pyramid of the guidelines. A food exchange list provides further clarity on serving sizes for pulses and ASFs. Avg. = average. Max. = maximum. Min. = minimum. NA = not applicable.

the composition of the healthy diet guidelines (Figure 4.1),[7] focusing on the expected differences between richer and poorer households. The poorest quintile (Q1) spends 40 percent of its healthy food budget on starchy staples, amounting to 75 percent of its calorie consumption; in contrast, Q5 spends around 20 percent on staples, or 60 percent of its healthy diet calorie consumption. The richest quintile is, therefore, close to the 60 percent starchy staple share recommended in the healthy diet guidelines. However, these better-off households overconsume calories from fats and oils, a notable pattern observed across Asia (Pingali and Abraham 2022). The richest quintile roughly achieves the recommended intake of ASFs but under-consumes fruits, vegetables, and pulses. The gaps for these nutrient-dense foods get progressively larger for poorer household groups, and the poorest quintiles also under-consume ASFs. From the differences in the share sizes between panel A (consumption expenditure) and panel B (calories) in Figure 4.1, one can also infer which foods are calorically expensive—ASFs, fruits, and vegetables

7 We estimate the consumption expenditure and energy composition of the healthy diet guidelines by assigning Myanmar-specific foods to each food group following Mahrt and colleagues (2022). Using the MPLCS food consumption data, Mahrt and colleagues generated healthy diet food baskets aligned with recommended healthy diet food group quantities. Within each food group, foods consumed by poor and near-poor households were weighted according to observed quantities consumed relative to the total food group quantity consumed, measured in food group equivalent grams.

FIGURE 4.1 Food consumption expenditure and energy shares by food group: Actual consumption compared with the healthy diet share, by consumption expenditure quintile



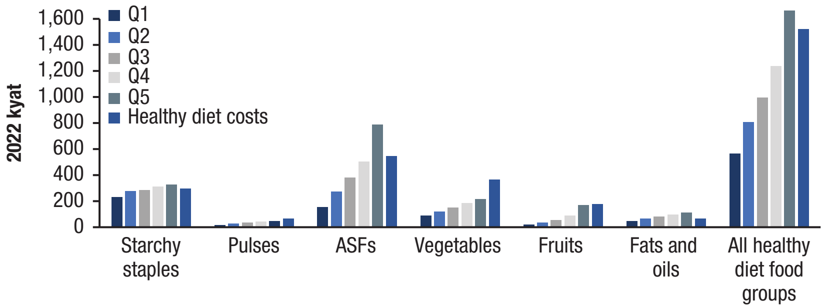
Source: Authors' estimations using 2015 MPLCS and Bangladesh food-based dietary guidelines (Nahar et al. 2013).

Note: Q1 (poorest) to Q5 (wealthiest) refer to consumption expenditure quintiles estimated using spatially deflated total household consumption expenditure per adult equivalent. The figures exclude consumption of food consumed away from home and foods not classified into healthy diet food groups. ASFs = animal-source foods.

are expensive sources of calories. In contrast, oils, fats, and starchy staples are cheap sources of calories but sparser in key nutrients.

Figure 4.2 explores household healthy food group consumption expenditure levels compared with the estimated cost of a recommended healthy diet. Overall, total household expenditure on all healthy food groups is about two-thirds the total cost of acquiring a healthy diet, but only one-third in the poorest households. Households spend about half the healthy diet costs of pulses, vegetables, and fruits, and three-quarters the cost of ASFs. In each food group, expenditure increases by consumption expenditure quintile. The poorest households spend less than one-third of what the richest households allocate

FIGURE 4.2 **Healthy diet costs compared with reported expenditure (August 2022 kyat), by food group and consumption expenditure quintile**



Source: Authors' estimations using 2015 MPLCS and Bangladesh food-based dietary guidelines (Nahar et al. 2013).

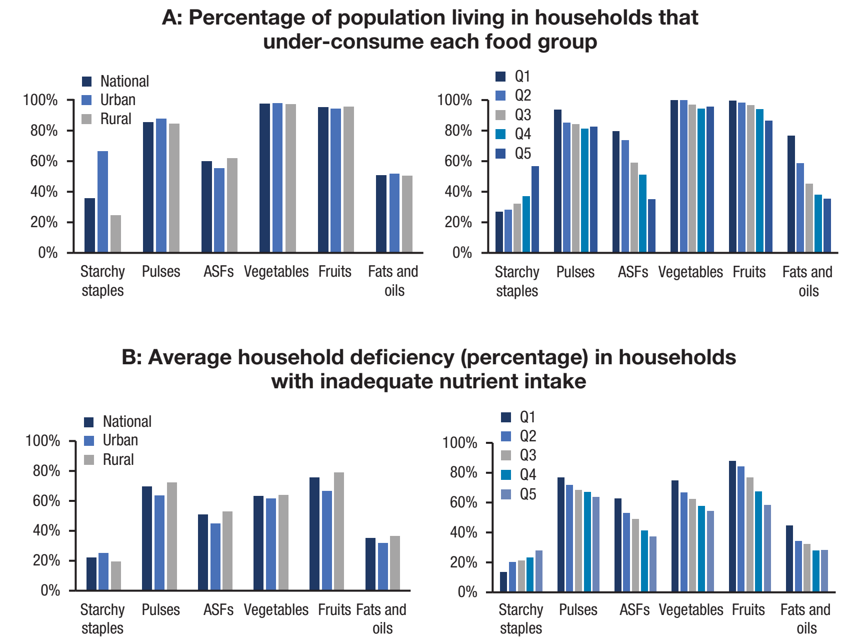
Note: Q1 (poorest) to Q5 (wealthiest) refer to consumption expenditure quintiles estimated using spatially deflated total household consumption expenditure per adult equivalent. The figure excludes expenditure on FAFH and foods not classified into healthy diet food groups. The category "All healthy diet food groups" is the sum of starchy staples, pulses, ASFs, vegetables, fruits, and fats and oils. 2015 kyat are adjusted for inflation based on the official food price index for January 2015 to April 2021 (CSO 2021) and price data collected by IFPRI between May 2021 and August 2022 (MAPSA 2023). ASFs = animal-source foods. FAFH = food consumed away from home.

to healthy food groups in total, with the poorest spending less than one-fifth of what the richest households spend on ASFs and fruits. Even upper quintile households underspend on pulses and vegetables.

Diet shortfalls

Figure 4.3 shows the percentage of the population living in households that consume less than the recommended healthy diet quantity of each food group (panel A) and, for those with insufficient consumption levels, the percentage shortfalls (Panel B). The results are disaggregated by quintile and location. Each panel's final set of columns measures mean shortfalls across nutrient-dense food groups: ASFs, fruits, vegetables, and pulses. Nationally, nearly everyone lives in households that under-consume vegetables and fruits (95 and 97 percent, respectively) by large margins (65 and 75 percent less than recommended). The majority of the population also reports consuming too few pulses (85 percent), ASFs (60 percent), and added fats (51 percent), with shortfalls of 70, 51, and 35 percent, respectively. However, added fat consumption is likely underreported, as the survey design does not include many processed foods or the composition of FAFH, which is often high in fat. Percentage shortfalls in nonstaple food groups are 5 to 10 points smaller in urban areas

FIGURE 4.3 Food group consumption shortfalls, by urban and rural areas and consumption expenditure quintile



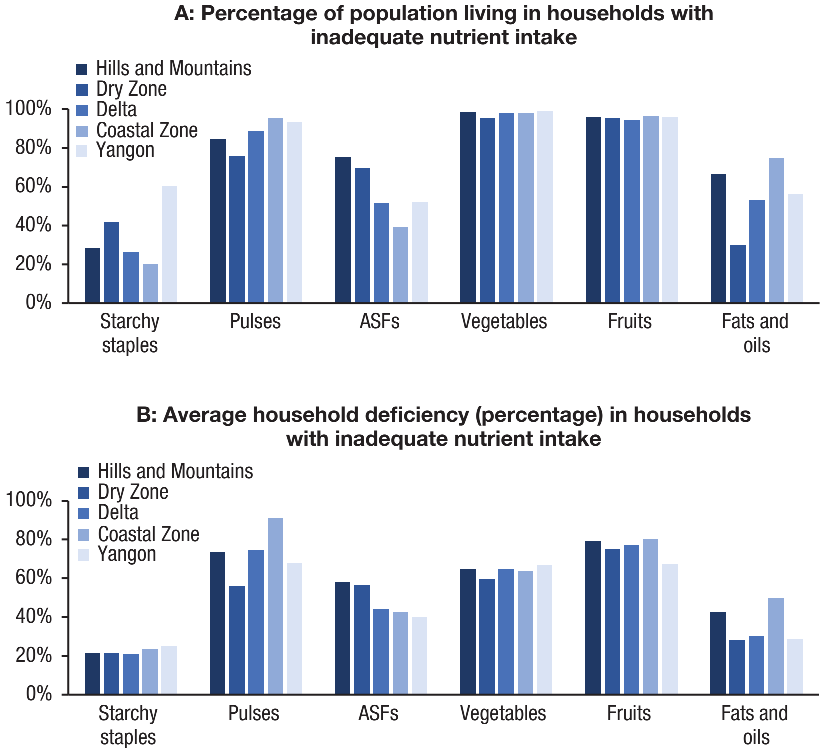
Source: Authors' estimations using 2015 MPLCS and Bangladesh food-based dietary guidelines (Nahar et al. 2013).

Note: Based on household consumption in daily food group equivalent grams per adult woman equivalent relative to total daily grams per food group in the healthy diet guidelines (see Table 4.4). Q1 (poorest) to Q5 (wealthiest) refer to consumption expenditure quintiles estimated using spatially deflated total household consumption expenditure per adult equivalent. ASFs = animal-source foods.

compared with rural areas, which are poorer on average. Both deprivation rates and percentage shortfalls decline incrementally by quintile in most cases.

Consumption of staple foods follows a different pattern—urban areas and better-off quintiles appear to have greater deprivations in both the share of the population with shortfalls and the percentage shortfall. However, the lower reported staple consumption in urban and higher-quintile households is likely related in part to the survey not adequately capturing processed foods and the composition of FAFH. Although there is no way to verify this with the data, urban and better-off individuals tend to be more time-constrained, that is, higher opportunity cost of time, and less income-constrained, making processed foods and FAFH more attractive. More research on these issues is needed in Myanmar.

FIGURE 4.4 Food group consumption shortfalls, by agroecological zone and Yangon



Source: Authors' estimations using 2015 MPLCS and Bangladesh food-based dietary guidelines (Nahar et al. 2013).

Note: Based on household consumption in daily food group equivalent grams per adult woman equivalent relative to total daily grams per food group in the healthy diet guidelines (see Table 4.4). ASFs = animal-source foods.

Figure 4.4 reports shortfalls by AEZ and Yangon separately. The share of the population living in households that under-consume ASFs is considerably higher in the Hills and Mountains and the Dry Zone. The percentage shortfall is also higher in the Hills and Mountains and the Dry Zone than the other AEZs. However, households in the Dry Zone face lower deprivations in pulse consumption.

Nutrient shortfalls

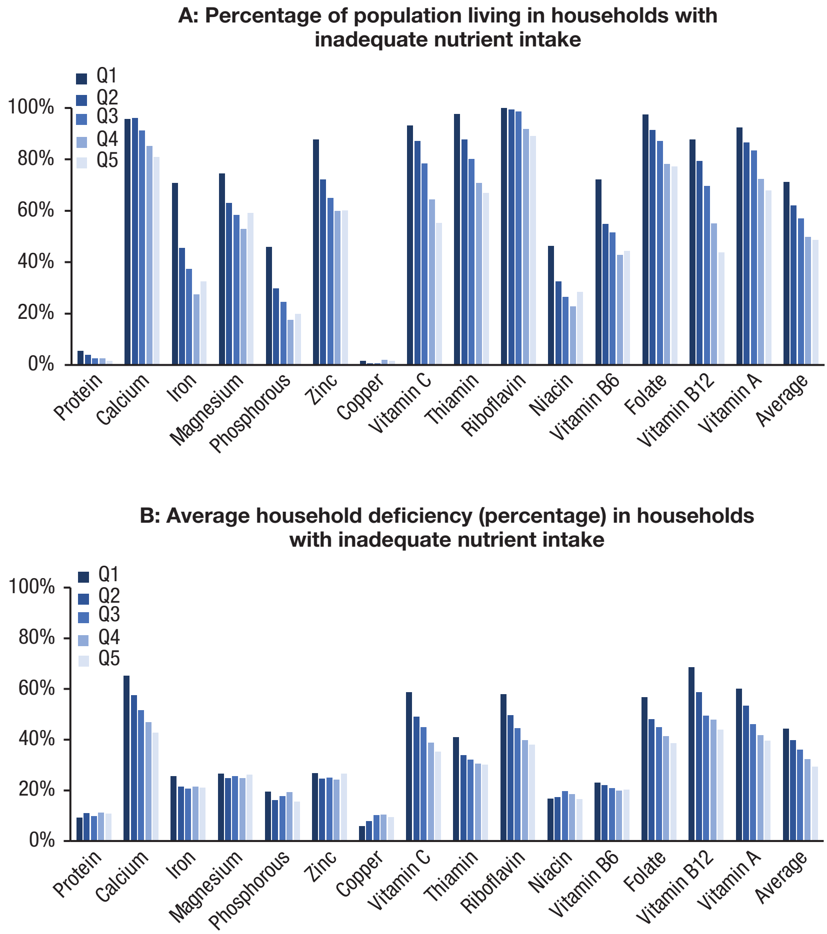
As noted, recommended healthy diets are intended to specify diets consistent with good health in both nutrient intake and other food properties. In addition to assessing food group-level consumption relative to healthy diet guidelines, we directly evaluate intake of 14 nutrients relative to estimated average requirements (EARs) specified in Allen, Carriquiry, and Murphy (2020).[8] For each nutrient, we compare the nutrient content of daily total household consumption, adjusted for typical food preparation methods (USDA 2007), to the sum of the age- and sex-specific EARs across household members. The household is considered deprived in the nutrient if the total adjusted household quantity is less than the household-specific total EAR, and the nutrient gap is measured as the percentage shortfall, where the shortfall equals zero in households that consume sufficient quantities. We again emphasize the important caveat that this analysis excludes FAFH. Another limitation is that we do not observe individual-level consumption or factor in intrahousehold inequalities in consumption, another key area for future research.

Figure 4.5 presents the percentage of the population living in households that consume less than the household-specific EAR of each nutrient (panel A) and, for those with insufficient consumption levels, the percentage shortfalls (panel B). We also present the mean nutrient shortfall facing households with any shortfall. Nationally, 3 percent of the population live in households that consume inadequate levels of protein, and 1 percent consume too little copper. In contrast, more than three-quarters of the population live in households that consume too little riboflavin, calcium, folate, vitamin A, thiamin, and vitamin C. On average, nutrient intake levels are 36 percent less than the household-specific EAR. For most nutrients, shortfalls decline incrementally as consumption expenditure quintiles increase. However, it is striking that there are still sizable shortfalls for households in the richest quintile.

Figure 4.6 presents results by AEZ and Yangon (see Mahrt et al. 2023 for urban and rural results). Regional differences are nuanced and vary by nutrient. One unusual feature in Myanmar is that micronutrient deficiencies are often quite high in Yangon. This is also consistent with poor dietary diversity in Yangon observed in different surveys and different demographic groups, including young children (Headey et al. 2022).

8 EARs are estimates of the nutrient intake that satisfies the nutrient needs of half the healthy individuals in a specified age and sex group (Otten, Hellwig, and Meyers 2006). The reference population (30-year-old adult women) is the same used in global analyses (FAO et al. 2020; Herforth et al. 2020). The nutrient composition of foods relies on the following assumptions: (1) the protein EAR is calculated based on 0.66 g/kg/day and a median weight for attained height of 49.4 kg, (2) iron takes the assumption of a moderate-absorption diet, (3) zinc takes the assumption of a semi-undefined diet; and (4) foods are prepared using typical cooking methods.

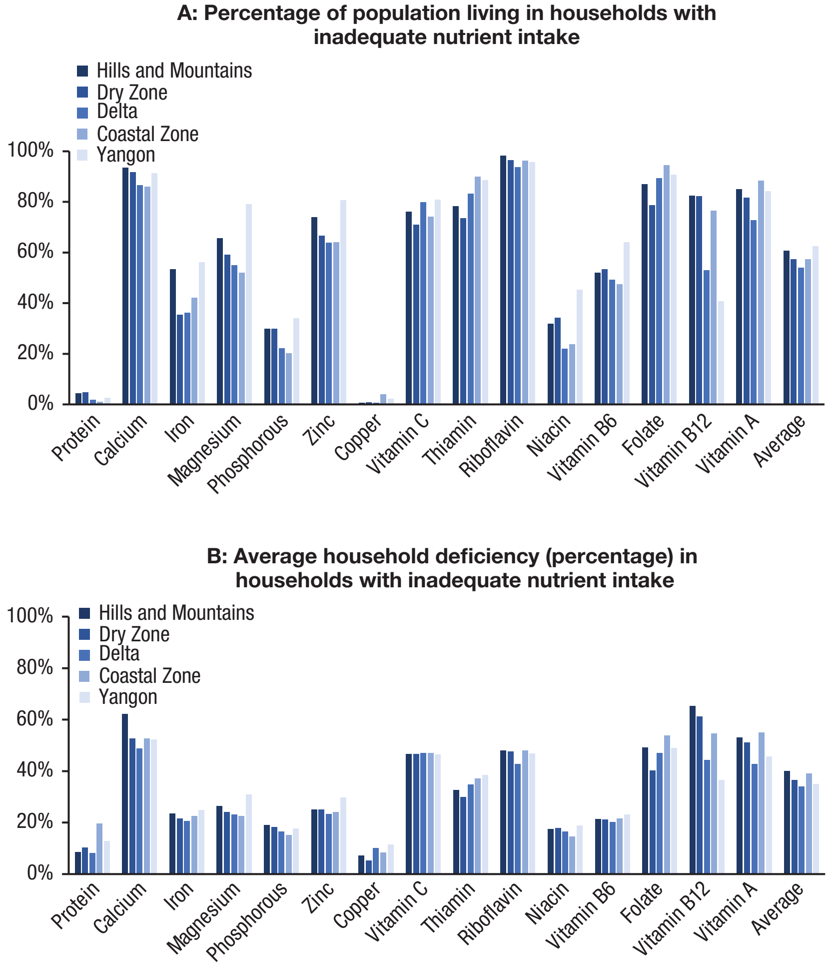
FIGURE 4.5 Nutrient intake shortfalls, by consumption expenditure quintile



Source: Authors' estimations using 2015 MPLCS, estimated average requirements (EARs) from Allen, Carriquiry, and Murphy (2020); various food composition tables (Institute of Nutrition 2014; MEXT 2015; Shaheen et al. 2013; Stadlmayr et al. 2012; Scott 2019; USDA 2016); and food retention factors (USDA 2007).

Note: Q1 (poorest) to Q5 (wealthiest) refer to consumption expenditure quintiles estimated using spatially deflated total household consumption expenditure per adult equivalent.

FIGURE 4.6 Nutrient intake shortfalls, by agroecological zone and Yangon



Source: Authors' estimations using 2015 MPLCS, estimated average requirements (EARs) from Allen, Carriquiry, and Murphy (2020); various food composition tables (Institute of Nutrition 2014; MEXT 2015; Scott 2019; Shaheen et al. 2013; Stadlmayr et al. 2012; USDA 2016); and food retention factors (USDA 2007).

Note: Q1 to Q5 refer to consumption expenditure quintiles estimated using spatially deflated total household consumption expenditure per adult equivalent.

Healthy diet deprivation index

While examining the incidence and extent of diet deprivation by food group and nutrient is useful, it may be difficult to get a clear picture of how overall diet quality compares across subnational regions or household groups. Existing dietary diversity measures—such as maternal, child, and household dietary scores—have the major limitation that they do not measure the extent of deprivation of any specific food group, being based on simple yes/no consumption measures.

To facilitate more holistic comparisons of diet quality that capture the quantitative extent of deprivation, we generate a multidimensional diet deprivation index that aggregates the healthy food group deprivations described above. The healthy diet deprivation index is an application of the Reference Diet Deprivation index developed by Pauw and colleagues (2023), which follows the Alkire and Foster (2011) methodology used to define the multidimensional poverty index. Pauw and colleagues developed the index in the context of food group deprivations relative to a reference diet.

The index captures three aspects of multidimensional diet deprivation: incidence, intensity, and depth. Incidence of multidimensional healthy diet deprivation (H) measures the share of the population living in households that consume insufficient quantities in at least *k* food groups relative to the recommended healthy diet quantities.[9] We consider a deprivation in any food group as unacceptable and set *k* equal to one dimension. In other words, panel A in Figure 4.3 and Figure 4.4 measures the incidence of deprivations in each food group. In contrast, H measures whether a household has a deprivation in any food group. However, H does not increase as the number of deprivations increases (intensity) or as the extent of deprivations increases (depth). Therefore, H provides a limited perspective on diet deprivations. Thus, the second aspect of multidimensional diet deprivation, intensity of deprivation (A), measures the share of food groups with deprivations in deprived households. Finally, depth of deprivation (G) captures average consumption shortfalls across deprived food groups, where the shortfall is measured as the percentage difference between food group consumption and the recommended healthy diet quantity.

The multidimensional deprivation index is the product of H, A, and G, so it jointly reflects the incidence (H), intensity (A), and depth (G) of diet deprivations. Table 4.5 presents the healthy diet deprivation index.[10] Households are considered healthy diet deprived if they do not consume adequate

9 The Alkire Foster multidimensional index and the Reference Diet Deprivation index allow each dimension to be assigned weights that sum to one across dimensions. Following Pauw et al. (2023), we calculate the healthy diet deprivation index by assigning the same weight to each dimension.

10 For ease of interpretation, we present the index, which falls in the range of 0 to 1, as a percentage of the highest possible deprivation score (1), which is the value in a population that consumes none of the healthy diet food groups.

TABLE 4.5 **Healthy diet deprivation index by household group**

	Healthy diet deprivation (%)			
Household group	Incidence	Intensity	Depth	Index
National	100	71	59	42
Urban	100	76	52	40
Rural	100	69	62	42
Hills and Mountains	100	75	62	47
Dry Zone	100	68	56	38
Delta	100	69	60	41
Coastal Zone	100	71	67	47
Yangon	100	76	54	41
Q1 (poorest)	100	79	68	54
Q2	100	74	62	46
Q3	100	69	59	40
Q4	100	66	54	35
Q5 (wealthiest)	99	66	50	32

Source: Authors' estimations using 2015 MPLCS and Bangladesh food-based dietary guidelines (Nahar et al. 2013).
Note: Q1 to Q5 refer to consumption expenditure quintiles that are estimated using spatially deflated total household consumption expenditure per adult equivalent. Incidence measures the share of the population living in households with a deprivation in any food group; intensity measures the share of food groups with deprivations, in deprived households; and depth measures average consumption shortfalls across deprived food groups.

quantities of any of the six food groups. This is a strict standard, so nearly all households, even in the highest quintiles, are deemed deprived.

The intensity of healthy diet deprivation measures the share of inadequately consumed food groups in healthy-diet-deprived households, which is, on average, 4.25 of the 6 food groups (71 percent). Intensity of deprivation is 7 percentage points higher in urban areas than in rural areas. The average depth of healthy diet deprivation is 59 percent; in other words, household consumption in food groups with shortfalls is 59 percent lower than the healthy diet food group quantity. In contrast with intensity, depth of deprivation is 9 percentage points lower in urban areas than in rural areas. That is, households in urban areas are deprived in a larger number of food groups, but on average, these deprivations are smaller than those facing rural households.

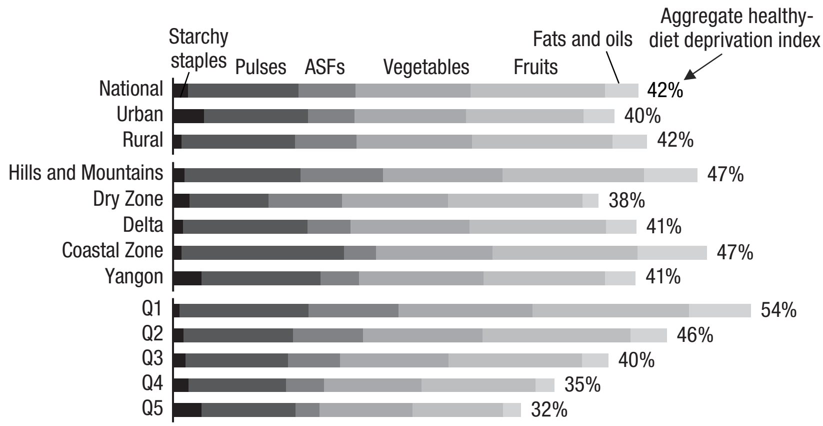
The healthy diet deprivation index, which jointly accounts for the incidence, intensity, and depth of deprivation, is 42 percent nationally. The large differences in intensity and depth between urban and rural areas nearly balance out, with an index of 40 percent in urban and 42 percent in rural areas. This highlights that the deprivation index is useful for ranking diet quality by subnational household group, but the real story lies in the structure of deprivation.

AEZs also experience different structures of deprivation, as seen in various combinations of intensity and depth of healthy diet deprivation—specifically, Coastal Zone: moderate intensity, high depth; Hills and Mountains: high intensity and depth; Yangon: high intensity, low depth; Delta: moderate intensity and depth; and Dry Zone: low intensity and depth. Intensity, depth, and the healthy diet deprivation index are highest in households in the poorest quintile and decline as consumption expenditures increase.

Intensity and depth of deprivation are important in understanding the deprivation index in subnational household groups, as seen in urban and rural areas and AEZs. The contribution of each food group to the healthy diet deprivation index is also useful in understanding differences in subnational deprivations (Figure 4.7). Pulses, vegetables, and fruits account for about three-quarters of the deprivation index nationally (78 percent). Food group contributions are quite similar between urban and rural areas, except for fruit, which contributes more to the deprivation index in rural areas. Notably, hardly any healthy diet deprivation can be attributed to starchy staples.

Across AEZs and Yangon, the contribution of ASFs to the deprivation index is largest in the Hills and Mountains and the Dry Zone, while the

FIGURE 4.7 Absolute food group contributions to the aggregate healthy diet deprivation index



Source: Authors' estimations using 2015 MPLCS and Bangladesh food-based dietary guidelines (Nahar et al. 2013).

Note: Staples contribute .01 to .03 points to the indexes; values are not displayed. Q1 (poorest) to Q5 (wealthiest) refer to consumption expenditure quintiles estimated using spatially deflated total household consumption expenditure per adult equivalent. ASFs = animal-source foods.

contribution of pulses is lowest in the Dry Zone and highest in the Coastal Zone. Except for staples, the contribution of each food group to the deprivation index declines as consumption expenditure quintiles increase.

Regression analysis on the predictors of dietary deprivation

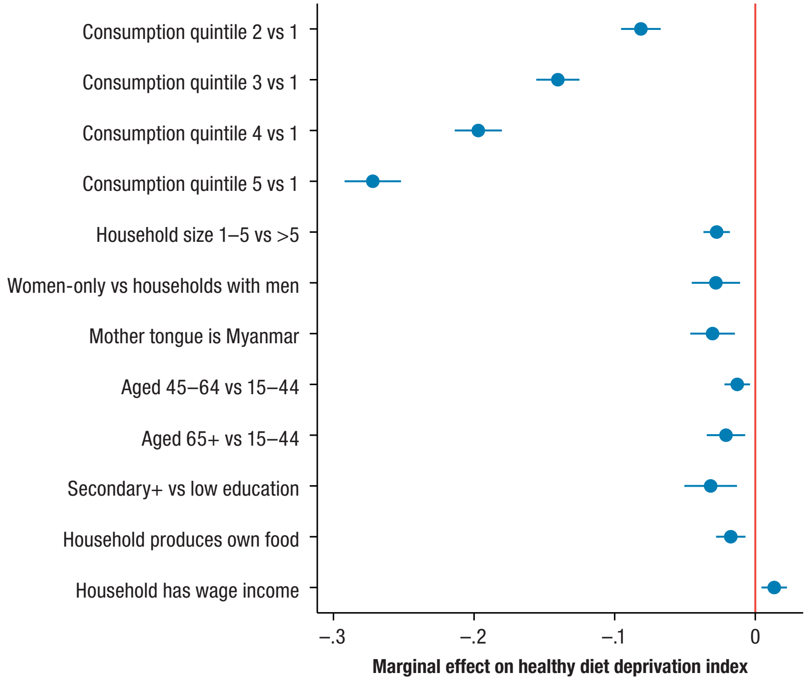
Finally, we use regression analysis to identify household characteristics that explain variation in the healthy diet deprivation index and shortfalls in each food group. As each measure of dietary quality can take values ranging from 0 to 1, we perform fractional logit regressions of dietary quality, interpreting the coefficients in percentage points for ease of understanding.[11] In each regression, we model dietary quality as a function of standard household economic and demographic characteristics known to predict diet quality (in some sense, extensions of Bennett's law): consumption expenditure, asset ownership, sources of income, household composition, household head age, education, and mother tongue. However, since farm households can source food from their own farm as well as markets, the rural regressions additionally control for farm size, use of irrigation, and community distance from a market.

Figure 4.8 displays the marginal effects of key statistically significant explanatory variables (95 percent confidence intervals) on the healthy diet deprivation index. Consumption expenditure—an income proxy—has the most significant association, with the extent of deprivation among the richest households being around 27 percentage points lower than among the poorest households. Having fewer household members, adult women-only households, a head who has completed secondary school, an older head, a head whose first language is Myanmar, and own-produced food consumption each lowers the index by 2 to 3 percentage points, which are small effects relative to consumption expenditure. The index is slightly higher when the household has a wage income (about 1.5 percentage points). Nonfarm business and remittance income were included in the model but had no significant association when other economic controls were included. An exception to this pattern is seen in the urban subsample, for which remittances reduce the risk of dietary deprivation by around 2.3 percentage points (for details, see Mahrt et al. 2023).

Finally, to understand the relationship between household characteristics and the subcomponents of the healthy diet deprivation index, we also ran the model on shortfalls in the pulses, ASFs, vegetables, and fruits food groups

11 Regressions are performed in STATA using the command fracreg logit. To check for robustness, we also implement the same analyses using ordinary least squares and tobit models for food group shortfalls, which are censored at zero. Irrespective of the model, the results are very similar.

FIGURE 4.8 Marginal effects of key explanatory variables with 95% confidence intervals in regression models exploring associations between the healthy diet deprivation index and household characteristics



Source: Authors' estimations using 2015 MPLCS and Bangladesh food-based dietary guidelines (Nahar et al. 2013).
Note: Results of fractional logistic models with region fixed effects and standard errors are clustered at the enumeration area level. N = 3,024. Consumption expenditure quintiles are estimated using spatially deflated total household consumption expenditure per adult equivalent.

(for details, see Mahrt et al. 2023). A few interesting differences across food groups are seen.

First, smaller fruit and vegetable shortfalls are associated with owning a vehicle or communication device, smaller and women-only households, education, and own-food production. Lower levels of ASF deprivation are also linked to owning a communication device and education, as well as remittance income and refrigerator ownership, which may indicate some benefits to cold storage (particularly important for milk but also eggs and fresh meat and fish). Households with wage income have higher ASF and vegetable shortfalls.

Second, examination by subcomponents of a healthy diet shows a much stronger deprivation consumption expenditure gradient (negative) for some components than others. For example, the richest households have a 42 and

44 percentage point smaller fruit and ASF shortfall, respectively, than the poorest. In contrast, the Q5–Q1 gaps for pulses and vegetables are 20 and 33 percentage points, respectively. These patterns indicate stronger household preferences for ASFs and fruit compared with other healthy food groups, as we will discuss further in the next section.

Elasticities of food demand

While availability, accessibility, desirability, and convenience all drive food choices, the analyses presented above have highlighted the critical role of affordability in determining dietary quality, which is unsurprising given the country's relatively low levels of development. In this section, we use a standard economic approach to understanding food demand, estimating elasticities of food consumption with respect to real consumption expenditure (an income proxy) and relative food prices. These income and price elasticities can be useful for designing effective policies and programs to improve diets, such as social protection, behavioral change interventions to shift preferences, food taxes and subsidies, and agricultural supply interventions. Income and price elasticities of food demand also indicate how consumers' food choices may respond to real income and food price changes, including longer-term economic growth or contractions and also economic shocks.

We estimated income and price elasticities of food demand using the 2015 MPLCS and methods described in Ecker and Comstock (2021a; 2021b; 2021c).[12] Table 4.6 presents estimated income and own price elasticities of food demand for urban and rural areas in 2015, which measure how much food consumption is expected to change with a 1.0 percent increase in income or prices, respectively. The income elasticity of total food demand suggests that a 10 percent increase in real household income predicts a 5.6 percent increase in total food consumption in urban areas and a 6.3 percent increase in rural areas. The price elasticity estimates of total food demand suggest that a 10 percent increase in food prices decreases total food consumption by, on

12 A two-stage estimation approach is used to estimate household-specific, unconditional income and Marshallian (or uncompensated) price elasticities for 15 food groups as part of a complete food demand system modeling framework. In the first stage, a Working-Leser model (Leser 1963; Working 1943) produces elasticities for total food demand relative to aggregate demand for nonfood consumption. The second stage implements a censored complete food demand system model to estimate income and price elasticities for the 15 food groups. Specifically, the within-food budget allocation is modeled separately using a quadratic almost ideal demand system while allowing for full substitutability between all food groups conditional on the available food budget (Banks, Blundell, and Lewbel 1997; Shonkwiler and Yen 1999). Refer to Ecker and Comstock (2021b) for more methodological details.

TABLE 4.6 Income and own price elasticities of total food demand and major food groups

	Income elasticities				Own price elasticities			
Food group	**Urban**		**Rural**		**Urban**		**Rural**	
Total food	0.56	***	0.63	***	–0.55	***	–0.60	***
Rice	0.26	***	0.50	***	–0.37	***	–0.67	***
Pulses and nuts	0.62		0.17		–0.54	***	–0.70	***
Starchy roots and tubers	0.55	***	0.75	***	–0.52	***	–0.91	***
Poultry	0.60	***	0.95	***	–1.11	***	–0.88	***
Dairy and eggs	0.55	***	0.83	***	–1.32	***	–1.07	***
Red meat	0.68	***	1.32	***	–0.73	***	–1.48	***
Fresh fish	0.71	***	0.50	***	–0.78	***	–0.83	***
Preserved fish	0.63	***	0.73	**	–0.83	***	–0.85	***
Dark green leafy vegetables	0.54	***	0.71	***	–0.42	***	–0.61	***
Other vegetables	0.62	***	0.76	***	–0.49	***	–0.75	***
Fruits	0.88	***	1.80		–0.65	***	–0.15	
Oils and fats	0.33	***	0.55	***	–0.21	***	–0.44	***

Source: Ecker and Comstock (2021c).

Note: Elasticities are presented for healthy food groups. Total food includes nonhealthy foods, such as sugars, condiments, snacks, and beverages. The need to combine a small number of disparate foods means the results for these other food groups are unreliable and, therefore, not presented. * $p < .10$; ** $p < .05$; *** $p < .01$.

average, 5.5 percent in urban areas and 6.0 percent in rural areas. Thus, rural households' food consumption is more sensitive to income and price changes than that of urban households, which is unsurprising given Engel's law and the lower income levels of rural households.

The results suggest that, as income changes, households make relatively small adjustments to their consumption of rice and oils and fats and large adjustments to their consumption of fruits and ASFs. In rural areas, in addition to rice and oils and fats, adjustments to fresh fish consumption are also expected to be small. In contrast, red meat has an elasticity greater than one in rural areas, meaning that changes in income result in even higher percentage changes in consumption. In addition, poultry has a relatively high elasticity close to one. In urban areas, the elasticities of red meat and fruit are not close to one, but, together with fresh fish, they still have elasticities higher than for other food groups. Dark green leafy vegetables are less income-elastic than fruit and other vegetables, which is unfortunate given their high nutrient density and health benefits

In urban and rural areas, food group-specific price changes result in relatively large changes in consumption of ASFs and, in rural areas, roots and tubers, but small changes in oil and fat consumption. This is relevant given the recent inflation in edible oil prices, suggesting that consumers are likely to cut back relatively little on oils and fats and instead cut back on nutrient-dense foods, such as ASFs. Additionally, the elasticities suggest urban households would not change rice consumption substantially. As with the income elasticity, dark green leafy vegetables are less price-elastic than fruits and other vegetables.

The relatively large (negative) price elasticity of rice in rural areas, which is greater than the overall price elasticity of food in total, could be the result of combining all rice varieties into a single food grouping. If rice were disaggregated, there would likely be varieties that respond little to price changes and others that respond strongly. Another explanation may be that many rural households source rice from their own production, making these estimates somewhat unreliable for the rural sample.

Mahrt and colleagues (2023) present results for each consumption expenditure quintile. In general, income elasticities for different foods tend to decline gradually as households get richer, as one would expect given Engel's law.

Based on patterns of demand observed in 2015, we would expect that, with large reductions in real income coupled with high food inflation, as occurred in 2021 and 2022 with the political instability, the composition of household diets would shift toward greater shares of rice and fat consumption. Rural households and lower income quintiles would likely experience greater pressure on overall diet quality. Consumption of ASFs is particularly vulnerable, though fresh fish consumption in rural areas may be more resilient. Pulses and vegetables, particularly dark green leafy vegetables, have moderate to low income and price elasticities. Consequently, these may prove important sources of micronutrients in times of stress, though in some cases the bioavailability of nutrients from these foods is relatively low.

Table 4.7 presents selected results from a study that uses the same dataset to simulate the dietary impacts of the severe economic shocks of 2021 (Ecker et al. 2023). The table first reports energy and micronutrient consumption gaps for households in the bottom two quintiles at baseline in 2015 (column 1). These are roughly 50 percent for calcium, iron, vitamin A, and folate. With the economic shock of 2021—amounting to a close to 20 percent contraction in GDP at the aggregate level—these gaps increase by 6 to 10 percentage points (column 2). The study then reports the expected impacts of the provision of social protection transfers, all valued at $13/month per household, through three alternative modalities: cash (column 3), plain rice (column 4), and fortified rice (column 5). Strikingly, this cash transfer—which

TABLE 4.7 Nutrient consumption gaps (percentage) among the bottom 40 percent of the expenditure consumption distribution in Myanmar under economic shock simulation scenarios

	(1)	(2)	(3)	(4)	(5)
		Economic shocks with no social protection	Shocks + $13/month worth of social protection		
Characteristic	Baseline (2015)		$13 of cash transfers	$13 of plain rice	$13 of fortified rice
Calories	–4.7	–11.6	–9.3	–7.3	–7.7
Calcium	–52.1	–60.0	–57.6	–57.2	–57.9
Iron	–48.4	–58.7	–55.4	–55.0	–19.5
Vitamin A	–50.8	–61.9	–58.5	–57.9	–13.4
Folate	–55.0	–64.1	–61.4	–60.9	–0.8

Source: Ecker et al. (2023).

Note: The simulation results depict a hypothetical situation for the third quarter of 2021 (July–September), when Myanmar was experiencing the COVID-19 Delta wave and intensifying political instability. Iron consumption gaps assume a moderate absorption diet.

approximates the transfers implemented in 2020 under the democratic regime—has little impact on micronutrient gaps. This is because the gaps are so large at baseline, the transfers are relatively small, and the cash is spent on both nonfood and food items. Transferring plain rice also has little impact—only a modest “real income” effect similar to cash. In contrast, transferring fortified rice has a major impact on closing the gaps for all micronutrients except calcium (rice is not fortified with calcium). The study makes the strong assumption that all fortified rice is consumed—that is, there are no quality, wastage, or consumer preference constraints. Nonetheless, these results suggest much promise for rice fortification in times of crisis.

The impacts of recent economic shocks on diet quality

Results from the previous section are all drawn from household surveys conducted before the severe economic and political crises between 2020 and 2023. As it was not possible in this context to implement in-person surveys—with detailed consumption expenditure modules—we instead analyze data from various phone surveys conducted by IFPRI in recent years. We first report trends in the cost of healthy diets from a food vendor survey conducted regularly in several hundred communities between 2020 and 2023 (MAPSA 2023). Second, we report maternal and child dietary diversity results from the rural Dry Zone subsample of the Rural-Urban Food Security

Survey (RUFSS), a 10-round panel of mothers of young children (Headey et al. 2022).[13] Third, we report trends in dietary diversity for men, women, and young children for the first three quarters of 2022 using the nationally representative Myanmar Household Welfare Survey (MHWS) (MAPSA 2022a).

Trends in the cost of healthy diets over 2020–2023

While the COVID-19 pandemic and the military takeover both resulted in rising poverty rates, there was initially relatively little change in food prices because of the resilience of the agriculture sector and because supply restrictions were offset by lower food demand. However, in late 2021, international food, fuel, and fertilizer prices began increasing, including prices of palm oil, which is an important imported food. To track food inflation through a nutritional lens, we follow Mahrt and colleagues (2022) and MAPSA (2023) in measuring the cost of a healthy diet food basket aligned with food-based dietary guidelines adapted for Myanmar, using a food vendor survey implemented 14 times between June/July 2020 and February 2023 (MAPSA 2023).[14] Figure 4.9 shows that the costs of a healthy diet rose by just 6 percent between June/July 2020 and February 2022 but skyrocketed by 63 percent between February 2022 and 2023. A decomposition of the inflation of the healthy diet food basket between February 2022 and 2023 shows that inflation in ASFs had the largest impact on healthy diet costs (37 percent of the total), followed by that in vegetables (26 percent) and starchy staples (23 percent), with pulses, fruits, and oils seeing small price increases.

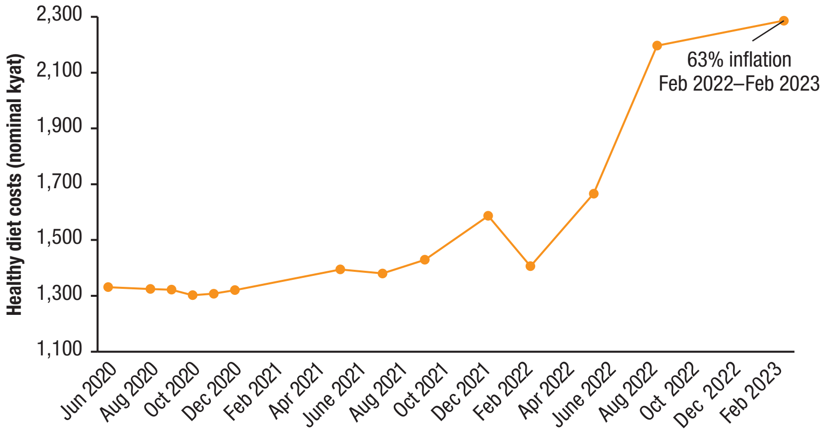
Dietary diversity trends of mothers and young children in the rural Dry Zone in 2020 and 2021

Figure 4.10 examines trends in inadequate maternal dietary diversity—fewer than 5 of 10 food groups were consumed in the previous 24 hours—for the rural Dry Zone from the RUFSS subsample. The figure indicates seasonality

13 We do not report results for the urban subsample of RUFSS because that sample was derived from mothers who were pregnant in early 2020. We found that mothers who had just given birth abstained from eating a number of foods, making an analysis of trends in their diets complicated from the standpoint of inferring impacts from the COVID-19 economic shock. Likewise, children in the urban sample of RUFSS were very young, so they were reported in several RUFSS rounds to have been given only breast milk.

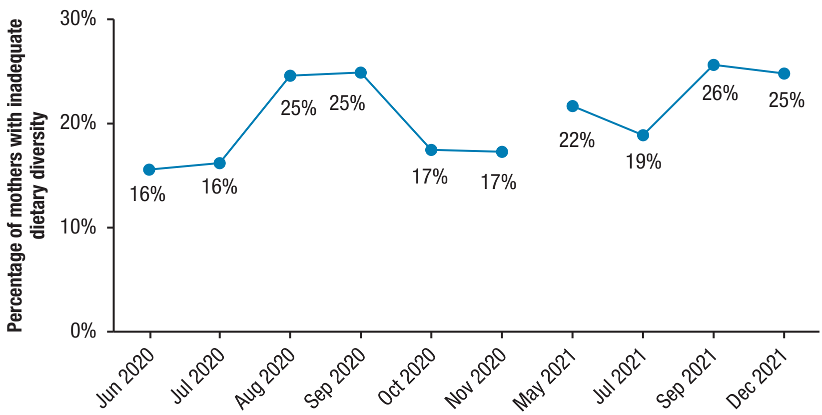
14 The surveys collect data on the cheapest commonly consumed varieties of rice, potatoes, pulses, bananas, dark green leafy vegetables, onions, chicken, fresh and dried fish, and oil. The cost of each item equals its price times the recommended food group quantity in Table 4.4, and each food group cost equals the average item cost, weighted according to within-food group consumption shares obtained from the 2015 MPLCS.

FIGURE 4.9 Changing costs of a healthy diet, June 2020–February 2023, nominal kyat



Source: Authors' calculations using food vendor surveys (MAPSA 2023).

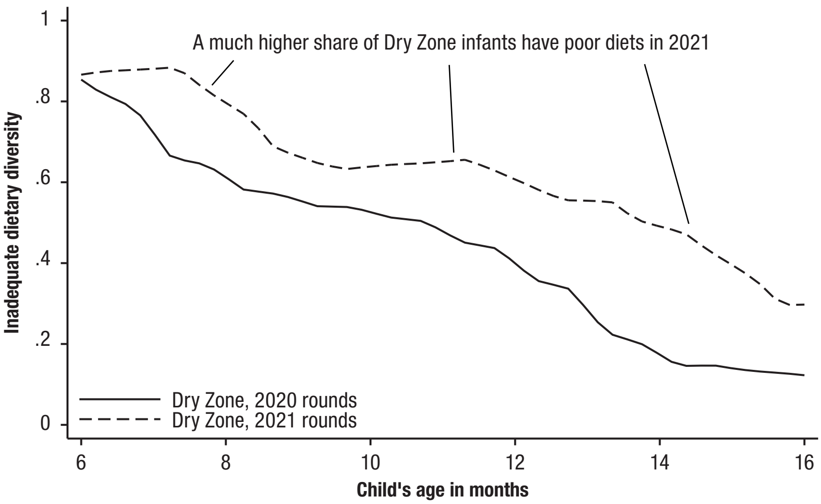
FIGURE 4.10 Trends in inadequate dietary diversity among mothers, rural Dry Zone, 2020–2021



Source: Authors' calculations using RUFSS (various rounds).

in dietary diversity among mothers—August and September are typically lean season months—but there is also evidence of a more secular deterioration in dietary diversity between 2021 and 2022. By December 2021—10 months after the military takeover—25 percent of mothers in the rural Dry Zone had poor dietary diversity compared with 17 percent at the end of 2020.

FIGURE 4.11 Comparisons of inadequate dietary diversity among children ages 6–16 months in the rural Dry Zone sample in 2020 and 2021, by child age



Source: Authors' calculations using RUFSS (various rounds).

Figure 4.11 points to a deterioration in the dietary diversity of infants ages 6 to 16 months, as measured by the share consuming fewer than four of seven food groups in the past 24 hours. Poor dietary diversity is very high among the youngest children just being introduced to complementary foods, but improvements are seen as children get older. However, in 2021, there was a higher share of children with poor quality diets throughout the 6- to 16-month age range. This is deeply worrying, as good nutrition in utero and the first few years of life is critically important for both physical and cognitive development. The adverse impacts of the nutritional insults these young children experienced on their development are unlikely to be fully reversible.

National-level results from the 2022 Myanmar Household Welfare Survey

For 2022, the MHWS provides evidence using nationally representative data on the prevalence of poor dietary diversity among men and women 18 years and older and among children ages 6 to 23 months.

During 2020 and 2021, households were hit predominantly by income losses as the economy contracted due to COVID-19 and the military takeover. However, in late 2021, food prices started to increase rapidly (especially

TABLE 4.8 Percentage share of adults with inadequate diet diversity (fewer than 5 out of 10 food groups)

Adults		Round 1 (December–February 2022)	Round 2 (April–June 2022)	Round 3 (July–August 2022)	Difference: Round 3–Round 1
National	Overall	20.6	27.1	27.6	7.0***
	Male	21.0	25.3	26.7	5.7***
	Female	20.2	28.6	28.4	8.2***
Rural	Overall	21.2	28.3	28.8	7.5***
	Male	21.3	25.9	27.9	6.6***
	Female	21.2	30.3	29.6	8.4***
Urban	Overall	18.9	24.1	24.6	5.7***
	Male	20.2	23.8	23.6	3.4*
	Female	17.7	24.4	25.5	7.8***
National	Asset poor (0–3 assets)	30.5	39.7	37.2	6.7***
	Asset low (4–6 assets)	18.4	24.3	25.3	6.9***
	Asset rich (7–10 assets)	12.6	16.9	19.4	6.8***
National	Income poor	23.7	32.5	31.1	7.4***
	Income not poor	16.6	19.9	22.3	5.6***
Observations		12,100	12,142	12,128	NA

Source: Authors' calculations using MHWS Rounds 1–3.

Note: NA = not applicable. Statistical significance in difference in means across Round 3 and Round 1: * $p < .10$; ** $p < .05$; *** $p < .01$.

for palm oil, which is imported), and this continued into 2022 as food, fuel, and fertilizer prices increased. Table 4.8 presents the proportion of adults not achieving minimum diet diversity for each of the first three rounds of the MHWS, a period of deteriorating household budgets and rising costs of healthy diets (see Figure 4.9). There was a large and statistically significant increase in the prevalence of inadequate diet diversity among adults from 20.6 percent in Round 1 to 27.6 percent in Round 3—most of the increase occurred between Round 1 and Round 2 when food prices started increasing rapidly. Regarding spatial patterns, adults in rural areas had a somewhat higher prevalence of inadequate diet diversity than urban adults and a larger rate of increase between Round 1 and Round 3.[15] Women were somewhat more likely to have poor dietary diversity than men, which is worrying because poor diet quality can put mothers at risk as well as adversely affect the health

15 Mahrt and colleagues (2023) report further results by state/region.

TABLE 4.9 Percentage share of children (ages 6–23 months) with inadequate diet diversity (fewer than 4 out of 7 food groups)

Children	Round 1 (December–February 2022)	Round 2 (April–June 2022)	Round 3 (July–August 2022)	Difference: Round 3 – Round 1
Overall	40.7	40.0	37.2	–3.5
Boys	39.9	37.4	37.2	–2.7
Girls	41.5	42.6	37.1	–4.4
Observations	684	601	739	NA

Source: Authors' calculations using MHWS Rounds 1 to 3.
Note: NA = not applicable.

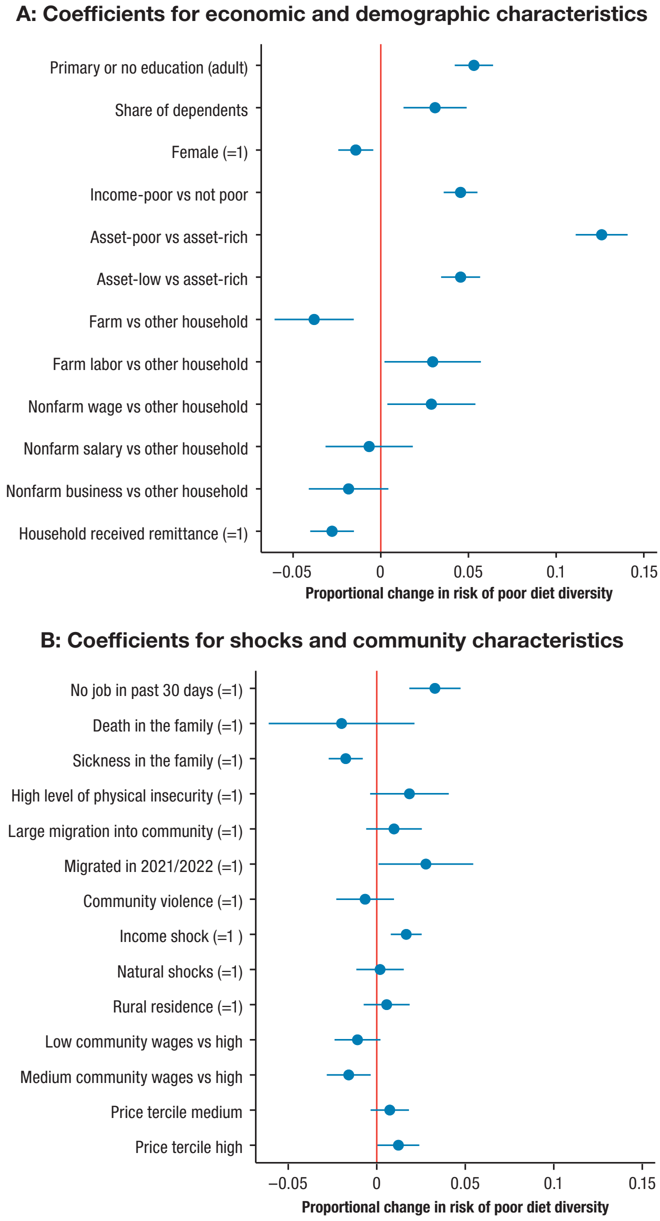
and long-term cognitive ability of their children. We also find that asset-poor households (who own 0–3 of 10 possible assets) were much more likely to have poor dietary diversity than asset-low (4–6 assets) or asset-rich (7–10 assets) households. However, diet quality deteriorated for all three economic groups, as it did for both income poor and nonpoor households.

What about children ages 6 to 23 months? We find that more than one-third of all children in this age group had poor diet quality by the third round of the MHWS (July–August). However, unlike for adults, there is no evidence of increasing rates of poor dietary diversity (Table 4.9). It may be that parents insulated their children from further deterioration in diet quality by sacrificing their own diet quality to some extent.

Finally, Figure 4.12 presents results on some of the most important predictors of inadequately diverse diets among adults. Low income and limited assets are a significant risk for inadequate diet diversity. Farm households are less likely to have inadequate diet diversity, while wage worker households are more at risk of inadequately diverse diets. Adults in low-wage communities are more likely to be less at risk of inadequate diets, but adults in high-price communities are at greater risk. Remittance-receiving households have a lower likelihood of having adults with inadequately diverse diets. Remittances seem to offer substantial resilience to receiving households in this sense. However, recent migrants are more at risk of poor dietary diversity. Self-reported income shocks increase the likelihood of having inadequate diet diversity. Similarly, not having a job in the 30 days prior to the survey has a negative effect on the diversity of adult diets.

In summary, chronic poverty characteristics—low assets, low education, high shares of dependents—and more recent economic and conflict-related shocks are strong predictors of poor dietary diversity among Myanmar's adult populations.

FIGURE 4.12 Linear probability model regressions of household- and community-level predictors of the proportional change in the risk of inadequate diet diversity among adults



Source: Authors' calculations using MHWS.

Note: Additional controls not presented in the figures are age, survey months, and state fixed effects.

Discussion

Myanmar made significant economic progress in the decade prior to 2020. Then COVID-19 first paralyzed the economy, and the military takeover in early 2021 resulted in an unprecedented 18 percent contraction in real GDP per capita (World Bank 2022b). In 2022, economic stagnation continued, and high food and nonfood inflation rates further threatened household food and nutrition security.

This chapter has explored the characteristics of Myanmar's food consumption patterns through a nutrition lens, focusing on food consumption and nutrient deprivation, income and own-price elasticities for food groups, and an analysis of phone survey evidence on patterns and trends in dietary diversity indexes between 2020 and 2022. The main findings are as follows:

First, most of the population has a poor diet relative to the country's (adapted) national dietary guidelines, with very low consumption of pulses, fruits, vegetables, and ASFs and large consumption gaps for several micronutrients and protein. Food group and nutrient gaps diminish as household income (consumption expenditure) increases, though gaps diminish faster for ASFs and fruits than for vegetables and pulses. Income elasticities also indicate strong demand for ASFs, moderately strong demand for fruits, and somewhat weaker preferences for vegetables and pulses. We further find evidence that edible oil consumption is excessively high among better-off households, which may indicate a risk of obesity and noncommunicable diseases. In addition to income being a strong predictor of dietary quality, other social, economic, and demographic characteristics have some explanatory power, though economic drivers seem predominant. However, simulation evidence on the impact of social protection transfers on nutrient consumption gaps, in the context of the economic shocks that Myanmar has faced, points clearly to a critical role for fortification of rice. In contrast, cash or unfortified rice transfers have little impact on nutrient intake or on closing the gap between actual and recommended diets (Ecker et al. 2023).

Second, dietary quality among adults and children in the rural Dry Zone deteriorated in 2020 and 2021. National phone survey evidence shows further deterioration in 2022 during a period of high food inflation and rising costs of a healthy diet. Regression evidence points to chronic predictors of poor diet quality, such as wealth levels, education, and demographic conditions in the household, but also the influence of a variety of shocks pertaining to income and job losses, price increases, conflict, and migration at the household and community level. The negative association between migration and diet quality likely emerges from many households being forced to migrate, the high costs of migration, and the paucity of employment opportunities. In contrast, households receiving remittances have individuals with somewhat better diet quality, suggesting remittances are a source of nutritional resilience.

Several policy and programmatic implications can be drawn from these findings. First, improving diets will require Myanmar to return to a path of sustained and inclusive economic growth, which will require conflict resolution. At the same time, while consumption of some food groups (particularly ASFs) increased quite rapidly with income growth between 2010 and 2015, vegetable and pulse consumption increased only modestly. Nutrition education campaigns may effectively improve consumer awareness of the nutritional benefits of these foods. Nutrition education campaigns and maternal education programs have been shown to be associated with improved short- and long-term child nutrition outcomes in Indonesia (Block 2007; Webb and Block 2004). Other Asian countries, such as Viet Nam, have experimented with incorporating nutrition education in schools (Nguyen et al. 2021). This may be a promising avenue to improve nutritional knowledge at scale in Myanmar.

Another intervention with some potential for improving diets may be the enhanced homestead food production programs pioneered by Helen Keller International in neighboring countries (Haselow, Stormer, and Pries 2016). Phone survey research consistently finds that farm-owning households in Myanmar have better food security and dietary diversity than other rural households. Many parts of Myanmar have relatively good access to water for homestead gardens or irrigated fruit and vegetable production, while homestead poultry production could potentially be scaled up. More commercially oriented diversification of the food system is also warranted and could yield high payoffs for rural income generation and improving diets (Chapter 1), but such an approach would require renewed stability, a more favorable policy environment, investments in agricultural research and development, and critical infrastructure.

Second, while multiple forms of social protection would be highly desirable in the context of multiple economic shocks, for nutritional reasons there are strong justifications for (1) scaling up the fortification of rice and improving access to fortified rice for the poorest segments of the population and (2) directing scarce financial resources toward mothers and young children, perhaps through maternal and child cash transfers. Such transfers have been shown to be highly effective in combatting malnutrition in Myanmar when coupled with nutrition education interventions (Field and Maffioli 2021; Maffioli et al. 2023).

Myanmar's progress against malnutrition has certainly been halted and likely reversed during the current period of crisis. Deteriorating dietary quality is likely a sign of rising micronutrient deficiencies and increased risks of stunting and wasting. These risks are compounded by disruption to other nutritionally important services, such as health, water, sanitation, and education. Reversing this deterioration in nutrition will require the "macro" solutions of conflict resolution, democratization, and economic reform. Yet, in the short run, judicious and innovative "micro" interventions can also play a role in protecting nutritionally vulnerable groups from the worst impacts of Myanmar's multiple crises.

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Chapter 5

VULNERABILITY AND WELFARE DURING MULTIPLE CRISES

Joanna van Asselt, Isabel Lambrecht, and Zin Wai Aung

The triple transition that took place between 2011 and 2019 in Myanmar—from a planned to an open market economy, from military to civilian rule, from conflict to peace—was not without its limitations. As discussed in Chapter 1, poverty reduction was modest relative to economic growth, a fully democratic system was not established, and ethnic conflict continued in many areas. In this mixed context of social welfare improvements and unfulfilled reforms, COVID-19 hit—the first in a series of crises. The pandemic had an immediate adverse impact on Myanmar's economy and pushed many households into poverty. Then, while the country remained under threat from the pandemic, in February 2021, the military took over in a coup, and Myanmar fell into a political crisis. Declines in welfare accelerated for many. One year later, the Myanmar economy faced sharp rises in prices for food, fuel, and fertilizer as a result of a global economic crisis triggered by the start of the conflict in Ukraine. This triple crisis—pandemic, political, economic—has had enormous impacts on welfare and livelihoods in Myanmar. (Chapter 1 summarizes how the triple crisis unfolded; refer to that chapter for details on the causes, levels, and apparent consequences of the sequence of shocks.)

This chapter assesses the economic vulnerability and welfare of Myanmar households in 2022 and the extent to which the shocks associated with the triple crisis reversed the improvements achieved during the earlier triple transition. It compares households' experience of shocks, how households have coped with these shocks, and how they affected household welfare in 2015 during the triple transition and in 2022 during the triple crisis. We first examine the conflict, climate, health, and economic shocks households in Myanmar have faced before exploring how household incomes changed in 2022. We then investigate the coping strategies households used to meet their daily needs in the period of crisis. Last, we discuss the household and local characteristics associated with the income changes and coping strategies reported by households.

Data and methodology

The analysis in this chapter relies on data from the 2015 Myanmar Poverty and Living Conditions Survey (MPLCS) (CSO 2019) and the 2022 Myanmar Household Welfare Survey (MHWS) (MAPSA 2022b). Both datasets are representative at national and urban/rural levels, while MHWS is also representative at the state/region level. MPLCS is a cross-sectional household survey that was conducted in person. It comprised 3,658 households interviewed between January and April 2015.[1] Our analysis of MHWS draws on the entire dataset, pooling data from all three rounds or making comparisons across rounds (Figure 5.1), using the data from households that were interviewed in all three rounds. This reduces the size of our sample relative to that of all households interviewed in at least one of the rounds. There was considerable attrition in the survey sample between rounds—not unexpected given the insecure setting. The MHWS three-round panel sample consisted of 5,978 households interviewed repeatedly between December 2021 and July 2022. The panel was weighted to be representative at the national and urban/rural levels.

The quantitative analysis is mainly descriptive and includes indicators on shocks, livelihoods, asset poverty, income poverty, and coping. The shock indicators include self-reported shocks and a township-level indicator based on secondary information from the Armed Conflict Location & Event Data Project dataset (ACLED 2022). The township-level shock indicator is computed as the sum of all battles, explosions, and violence reported in the ACLED dataset in the three months prior to the interview date.

The poverty line is the minimum welfare level for an individual not to be considered severely deprived (CSO, UNDP, and World Bank 2019). In MPLCS, as in similar surveys, poverty lines are estimated based on a consumption aggregate calculated from detailed expenditure information from each individual's household. However, collecting such detailed expenditure information in a phone survey, like MHWS, is not feasible. Therefore, we constructed an income-based poverty measure. We calculated total monthly household income as the sum of income from 15 different economic activities plus net remittances received in the past month. We then averaged this total income to a daily income measure and adjusted for household size using standard adult equivalency scales (Deaton and Zaidi 2002). To determine

1 We use MPLCS data instead of data from the more recent 2017 Myanmar Living Conditions Survey (MLCS) because of challenges in accessing the latter dataset.

FIGURE 5.1 Myanmar Household Welfare Survey of 2022, timeline of rounds compared with monsoon and maize and rice cropping calendars

	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
R1				R1	R1	R1						
R2								R2	R2	R2		
R3											R3	R3
Monsoon												
Rice												
Maize												

Source: Compilation by authors.

Note: Lighter yellow includes the recall period for each round, while darker yellow is the data collection period. Green refers to growing and harvesting. The darker the green, the larger the share of farmers growing/harvesting at that time. Blue refers to rainfall amounts, with darker shades indicating more rainfall during the month. R1 = Round 1. R2 = Round 2. R3 = Round 3.

whether a household was income poor, we compared the daily per adult equivalent income for the households to the national poverty line. We developed the national food-based poverty line by updating the line from the first quarter of 2017. For the period to mid-2020, this was done with the official food consumer price index. After that, we used a food price index developed by the Myanmar Agriculture Policy Support Activity (MAPSA) using data from a national survey of food vendors to update the line (MAPSA 2022c). Finally, we used a spatial price deflator to adjust food prices for rural and urban areas within each state or region based on price information from the national food vendor survey.

We employed exploratory regression analysis to understand better which households are more likely to experience income loss and income poverty. First, we used a random effects logit regression to estimate the impact of shocks on the likelihood of a household being economically affected and being income poor. Second, we employed fixed effects logit models to estimate the impact of shocks on coping strategies. In these models, we considered three main shocks: security, climate, and health. For security shocks, we included in the analyses three quantiles of the number of violent acts toward civilians in the township in the three months prior to the interview. This measure is based on ACLED township-level data (2022). Climate shock is a self-reported measure of any climate shock the household experiences. We defined health shock as a household having reported a member who has passed away as a result of disease. In our analysis, we controlled for the main household income source, other sources of income, and other household and respondent characteristics. The models also included state/region dummies.

To explore income loss and poverty, we ran the first two regressions as random effects models. Using panel data enables us to control for unobserved heterogeneity, while establishing a random slope allows us to identify a full set of characteristics associated with income loss and poverty. For our exploration of coping, we chose instead to measure overall effects and include household-specific fixed effects to account for unobserved heterogeneity and to control for time-invariant characteristics that might affect coping, such as household preferences.

Shocks

In our analyses of the economic vulnerability and welfare of Myanmar households during this crisis period, we first explore the extent of the negative impacts on households of different shocks and how this changed between 2015 and 2022. Table 5.1 presents a detailed comparison of shocks using the MPLCS data and the MHWS panel. MPLCS asked households to name all shocks they had faced in the 12 months preceding the survey. MHWS asked respondents about different shocks their household or community experienced in the past three months. Because we have only three rounds from MHWS, these shocks are for a 9-month period instead of 12 months. This methodological dissimilarity may result in our analysis understating differences between 2015 and 2022.

Climate shocks were and continue to be an important threat to households' livelihoods and well-being in Myanmar. They are reported to have been more frequent in 2022 compared with 2015 but still within a reasonably similar order of magnitude. In 2015, 20.2 percent of households were negatively affected by a climate shock; in 2022, 25.6 percent were. In 2015, drought was a more commonly cited climate shock; in 2022, flooding was more common.

COVID-19 introduced a new set of health shocks to Myanmar's households. In 2015, 14.2 percent of households reported that their household was negatively affected by a serious illness, accident, or death of a member in the past 12 months. In 2022, over a 9-month period, 72.9 percent of households reported that their household had been negatively impacted by sickness or death (Table 5.1). This is a fivefold increase from 2015 and is most likely due to the pandemic. At least one household member in 39.2 percent of households was reported to have had COVID-19 symptoms in 2021. Moreover, 43 percent of households reported that a member had had symptoms during the first half of 2022—January through August.

Similar to the case for health shocks, insecurity shocks increased significantly between 2015 and 2022—see Figure 1.5 in Chapter 1. Evidence from the phone survey confirms a major increase in the number of households

TABLE 5.1 **Households experiencing negative impacts from shocks, by survey year**

	Share of households experiencing shock (%)	
Shock	**2015 (12 months)**	**2022 (9 months)**
Climate shock	20.2	25.6
Drought	9.8	5.0
Irregular rain	7.8	5.7
Flood	5.9	13.2
Climate shock other	1.5	0.9
Theft from household	1.4	8.1
Physical assault against household member	0.2	1.5
Confiscation of land	0.8	0.9
MAF/EAO violence against household	0.3	3.9
Breakup of household	0.5	1.7
Sickness or death in household	16.4	72.9
Reduced earnings compared with previous year	14.2	81.7
End of aid/remittances compared with previous year	1.4	2.9
High food prices	8.1	72.8
Crop disease affecting household plots	20.0	11.8
Livestock disease among household livestock	1.8	2.4
Low prices for agricultural outputs for household	7.3	29.0
High cost of agricultural inputs for household	4.3	37.9
Observations	3,648	5,978

Source: Authors' calculations using MPLCS and MHWS data.

Note: The 2015 survey uses a recall period of 12 months. The MHWS three-round panel relies on recall data that covers 9 months. EAO = ethnic armed organization. MAF = Myanmar Armed Forces.

witnessing violence in their community. Table 5.2 shows the increase in insecurity, low social trust, violence, and crime across Myanmar from September 2021 to August 2022. The number of households that reported feeling insecure in their community increased from 18.6 percent in Round 1, which spans September to January 2021, to 19.6 percent in Round 2, which covers February to April 2022, to 22.0 percent in Round 3, which includes April to August 2022. A larger percentage of urban than rural households felt that their community was insecure. When asked in Round 3 to describe the social relationships in their community, 22.1 percent of households reported low trust, an increase from 19.7 percent in Round 1. The share of households experiencing crime and violence in their community also increased across the

TABLE 5.2 Households reporting security shocks by MHWS round, 2022, percentage share

Security shock	Round 1	Round 2	Round 3	Pooled average	Rural average	Urban average
Feel insecure in community	18.6	19.6*	22.0***	20.1	18.9***	23.0
Low social trust	19.7	20.0	22.1***	20.6	18.7***	25.7
Crime in community	7.7	8.7**	9.6**	8.7	6.4***	14.4
Violence in community	6.3	7.0*	7.6	7.0	5.8***	10.0

Source: Authors' calculations using MHWS data.

Note: Asterisks indicate statistically significant difference from the previous MHWS round, as well as the difference between rural and urban locations: * $p < .10$; ** $p < .05$; *** $p < .01$.

2022 period. Both crime and violence were more commonly reported in urban than in rural areas.

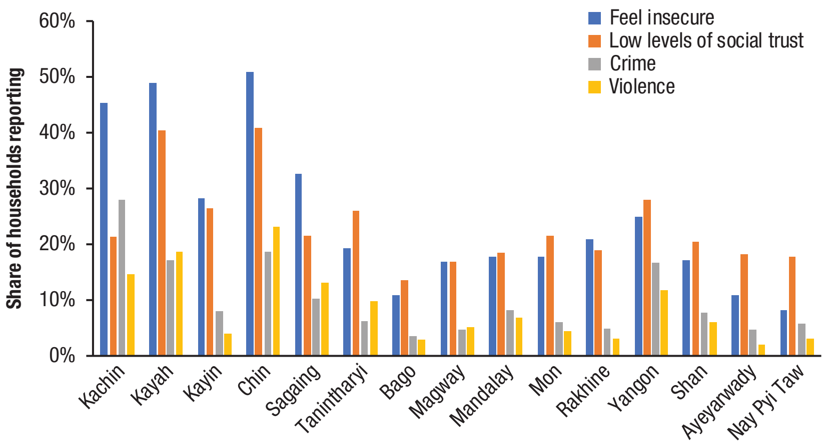
The number of households that felt insecure in their community varied significantly between regions/states (Figure 5.2). Those where households felt the most insecure from September 2021 through August 2022 were Chin, Kayah, and Kachin. Households in Chin and Kayah also had the lowest levels of trust in their community. Over the same period, households in Kachin and Yangon faced the most crime in their community, whereas households in Chin and Kayah reported the most violence. Overall, the insecurity situation in Kayah, Chin, and Kachin is alarming and negatively impacted household well-being.

There has also been an increase in the share of households directly affected by violence. In 2015, 0.3 percent of households experienced violence perpetuated by ethnic armed organizations (EAO) or the Myanmar Armed Forces (MAF), compared with 3.9 percent of households in 2022 (Table 5.1).[2] Physical assault or violence against a household member also increased over the period. Theft increased sixfold between 2015 and 2022, to 8.1 percent. In both surveys, these are likely underestimates of insecurity because sampling households affected by conflict is difficult. At the same time, the downward bias may be larger in the in-person MPLCS because sampling conflict areas is more difficult in person than over the phone.

Finally, the rise in global food, fuel, and fertilizer prices in 2022 had further negative impacts. In 2015, 8.1 percent of households reported facing unusually high food prices. While we do not have a direct comparison for

2 In the MHWS, we define MAF/EAO violence against households as the destruction or appropriation of assets or property, forced payment, or detention of a household member. In the MHWS, the definition is military/rebel violence.

FIGURE 5.2 Conflict shocks by region, September 2021–August 2022



Source: Authors' calculations using the average of pooled Round 1, Round 2, and Round 3 MHWS data.

this shock indicator for 2022, we consider several other indicators to understand the changing situation. Between January 2014 and April 2015, which spans the entire recall period for MPLCS, the food price index increased by 10 percent (CSO, UNDP, and World Bank 2020). This was driven by an increase in the price of rice (7.9 percent between July 2014 and 2015), maize (20.3 percent between July 2014 and 2015), and groundnut oil (75.9 percent between July 2014 and 2015) (FAO 2015). Between January and August 2022, the average price for a basket of food increased by 20 percent, with the price of rice increasing by 13 percent, chicken by 19 percent, fresh fish by 17 percent, and edible oils by 60 percent.

Farming households face their own set of shocks, including from crop disease, extreme weather, low crop prices, and high input prices. Therefore, we also compare issues farmers faced in the two periods. In 2015, households were asked to list all the challenges they faced. Among farm households, 7.3 percent mentioned low prices for their agricultural outputs, and 4.3 percent mentioned high prices for agricultural inputs. Meanwhile, in each of the three survey rounds of MHWS, respondent farmers were asked to select their main challenge for agricultural production and for agricultural marketing. Despite the survey not covering a full year, a much larger share of farm households in 2022—29.0 percent—mentioned low output prices for their crops as a main challenge, and 37.9 percent cited high prices for agricultural inputs as a main challenge (Table 5.1).

Income

Livelihoods

To understand how households cope with shocks, it is crucial to understand the sectors from which they earn their income. Table 5.3 presents different income sources by share of households. In 2022, households' own nonfarm enterprise was one of the most important sources of income: 43 percent of households—59.0 percent of urban households and 37.2 percent of rural households—earned some income from this source. Further, 27.7 percent of households earned their main income from this source. Own crop farming was also an important source of income: 37.6 percent of households earned some income from their own farming, and it was the main source of income for 23.0 percent of households.

In 2022, 21.3 percent of households reported earning income from nonagricultural salaried work (Table 5.3). This was predominately an urban source of employment. Salaried work in agriculture was much less common, reported by only 1.3 percent of households. Nonagricultural casual wage work engaged 26 percent of households, although this fluctuated by survey round. Agricultural casual wage work was as important as nonagricultural casual wage work, with 24.1 percent of households earning such income. This source of income was almost entirely rural. The principal harvest period for rice, maize, pulses, and oilseeds spans October to January. The second harvest of maize and rice, as well as the harvest of pulses in the Delta, is from February to May. As a result, agricultural casual wage work is also seasonal, with few households earning agricultural casual wage income in April, May, and June.

Income reduction

The combination of increased conflict across the country, disease preventing household members from working, COVID-19 mitigation measures, and disruption to trade from border closures has reduced earnings in Myanmar. In 2015, 14.2 percent of households reported a reduction in earnings compared with the previous year. In 2022, the figure was 81.7 percent (Table 5.1). Further, relative to May through August 2021, total nominal own-farm agricultural income for May through August 2022 decreased by 48 percent, total nominal own-farm livestock income decreased by 35 percent, and total nominal own-farm fishing/aquaculture income decreased by 36 percent.

MHWS asked households how their total household income in the previous three months compared with their total household income in the same period a year earlier. In Round 3, 46 percent of households reported a

TABLE 5.3 Income sources by share of households, 2022

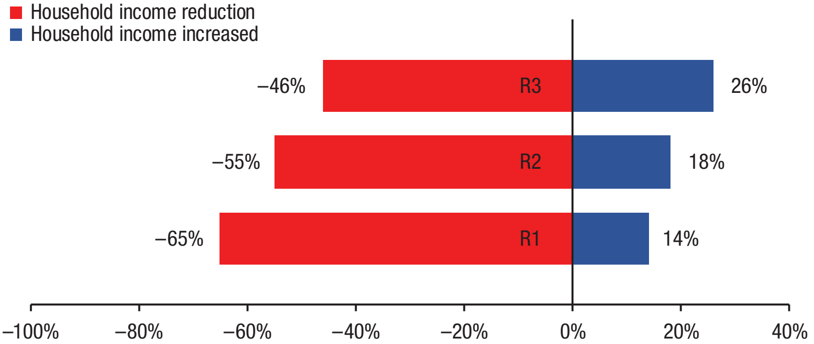
Source	National	Rural	Urban
Income sources (number)	1.9	2.0**	1.8
Own or operate household nonfarm enterprise (%)	43.3	37.2**	59.0
Own or operate household crop farm (%)	37.6	49.6**	7.1
Own or operate household livestock business (%)	13.7	17.7**	3.6
Own or operate household fishing or aquaculture business (%)	2.8	3.7**	0.6
Salaried work—nonagricultural (%)	21.3	13.9**	40.3
Salaried work—crop farming (%)	0.7	0.7	0.8
Salaried work—fishing or aquaculture (%)	0.3	0.4*	0.2
Salaried work—livestock (%)	0.2	0.2	0.2
Wage work—nonagricultural (%)	25.8	23.5**	31.8
Wage work—crop farming (%)	22.9	30.5**	3.5
Wage work—fishing or aquaculture (%)	0.8	1.0**	0.2
Wage work—livestock (%)	0.4	0.4**	0.2
Receive remittances (%)	15.9	15.9	15.7
Receive gifts, donations, pensions, or other assistance (%)	9.0	7.5**	12.9
Rent out land or properties (%)	3.1	2.5**	4.6
No employment and no income sources (%)	0.6	0.5	0.7

Source: Authors' calculations using the average of pooled Round 1, Round 2, and Round 3 MHWS data.
Note: Asterisks indicate statistically significant differences between rural and urban areas: * $p < .05$; ** $p < .01$.

reduction in income—27.6 percent reported a large reduction (greater than 20 percent), while 18.0 percent reported a small reduction (1–20 percent). However, compared with the two previous survey rounds, fewer households reported decreased income in Round 3 (Figure 5.3). Twenty-three percent of panel households reported income losses in all three periods. Another 30.6 percent of panel households reported income reductions in two periods. Of those, 65 percent reported income reductions between Rounds 1 and 2 compared with only 35 percent between Rounds 2 and 3.

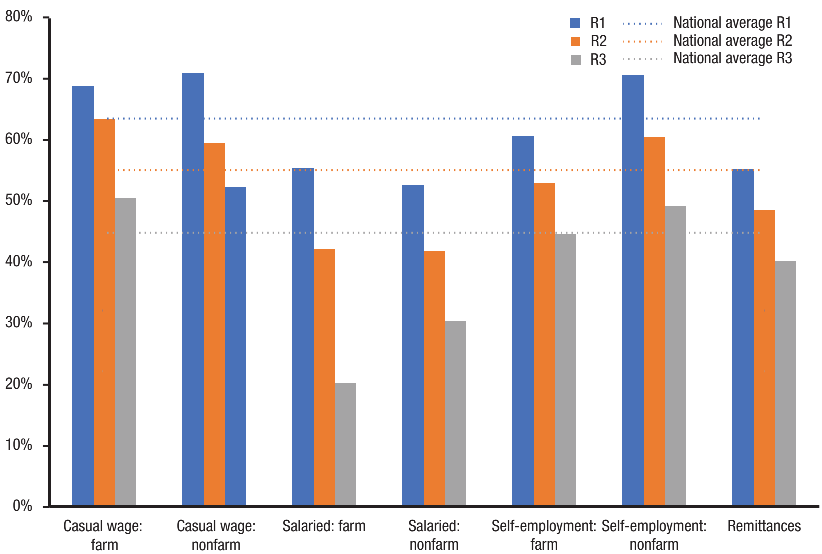
Compared with households earning income from other sources, more casual nonfarm and farm wage-earning households experienced income loss compared with the previous year. Lower income in Round 3 compared with the previous year was reported by 50.6 percent of farm wage-earning households and 52.0 percent of casual nonfarm wage-earning households (Figure 5.4). While this is significantly lower than the shares reporting income reductions in Round 2, when 59.6 and 63.5 percent of households earning income from nonfarm wage work and farm wage work, respectively,

FIGURE 5.3 Households whose income in previous three months was lower (or higher) than in same period one year earlier, by MHWS round



Source: Authors' calculations using MHWS data.
Note: R1 = Round 1. R2 = Round 2. R3 = Round 3.

FIGURE 5.4 Households reporting earning less money compared with previous year, by main source of household income



Source: Authors' calculations using MHWS data.
Note: R1 = Round 1. R2 = Round 2. R3 = Round 3.

reported lower incomes, these households still experienced greater income loss than those whose main income came from other sources.

Households employed in salaried work, both farm and nonfarm, were the least likely to see an income reduction compared with the previous year. Further, there was a significant improvement for these salaried workers compared with earlier in 2022. In Round 3, 30.5 percent of nonfarm salaried workers and 20.2 percent of farm salaried workers reported a reduction in their income, while in Round 2, 41.9 percent and 43.3 percent, respectively, saw the same.

In Round 1, 18.9 percent of salaried and casual wage workers pointed to their own poor health or the poor health of a family member as their most significant challenge to earning income. However, this was an issue for only 3.1 percent of households in Round 2 and 4.4 percent in Round 3. Further, and likely related, in Round 1, 43.4 percent of households reported reduced working hours as their main challenge. This improved to 21.8 and 20.7 percent of households in Round 2 and Round 3, respectively, but was still the largest issue facing salaried and casual wage workers. Finally, in some areas, it continued to be unsafe for workers to reach their work location. While this improved after Round 1, if insecurity worsens, it may be an issue moving forward.

Many self-employed farmers and nonfarm households also earned less income than in the same period in the previous year. In Round 3, this included 44.8 percent of self-employed crop, livestock, or aquaculture farming households and 49.3 percent of self-employed nonfarm households. While farmers, like salaried and casual wage workers, fared better in Round 3 compared with Round 1, they continued to face many challenges in crop production, including the increasing price of fuel, high input prices, and pest and disease infestations. Most of the positive change between survey rounds seems to have been from fewer weather-related issues, which are seasonal. While self-employed nonfarm households fared better, their businesses still faced issues with high raw material and fuel prices.

Although fewer households reported lower income in Round 3 compared with Round 2 and Round 1, it is important to highlight that 23 percent of panel households reported lower income in all three periods, making these households especially vulnerable. Further, this is a comparison with the previous year (2021), when COVID-19 was widespread in the country and households already had lower income compared with the previous year. Although we do not have estimates of income loss at the national level for 2021, we can get a feel for how dire the situation was from a sample of households in urban Yangon and the rural Dry Zone. Among these households, 77.4 percent reported lower income in June 2020 compared with June 2019 (MAPSA 2022a). Finally, the comparison with the previous year also masks the chronic vulnerability of some households and regions.

Income poverty

From 2010 to 2017, the proportion of the population living below the poverty line declined from 37.5 percent to 24.8 percent (CSO, UNDP, and World Bank 2019). COVID-19 slowed down or reversed this progress. Drawing on data from the 2017 Myanmar Living Conditions Survey (MLCS) (CSO 2019) and a 2020 Household Vulnerability Survey, the United Nations Development Programme (UNDP) estimates that, from January 2019 to December 2020, poverty could have risen by as much as 6 to 11 percentage points. Further, it projects that the ongoing political crisis could increase poverty by as much as 50 percent, with the share of the population living in poverty reaching 48.2 percent in its worst-case scenario (UNDP 2021).

The MHWS income data support this projection of rising poverty (Table 5.4). Regarding households' per capita daily incomes, in Round 1, half of Myanmar's population (51 percent) lived on an income below the national poverty line. This share rose rapidly to 57 percent in Round 2 and 62 percent in Round 3. Most of the increase occurred in rural areas: rural poverty increased by 14 percentage points over the period, while urban poverty rose by 4 percentage points.

Income poverty increased at different rates in the different states and regions (Figure 5.5). Particularly alarming is the high share of households with low incomes in Chin and Kayah States in Round 3 (90 and 87 percent of the population, respectively). In mid-2022, income poverty in Kachin, Kayin, Tanintharyi, Magway, Rakhine, Shan, Sagaing, and Ayeyarwady was above the national level. This is a stark difference from six months earlier, when the share of the population with low incomes in Kayah, Sagaing, Magway, and Ayeyarwady was below the national level.

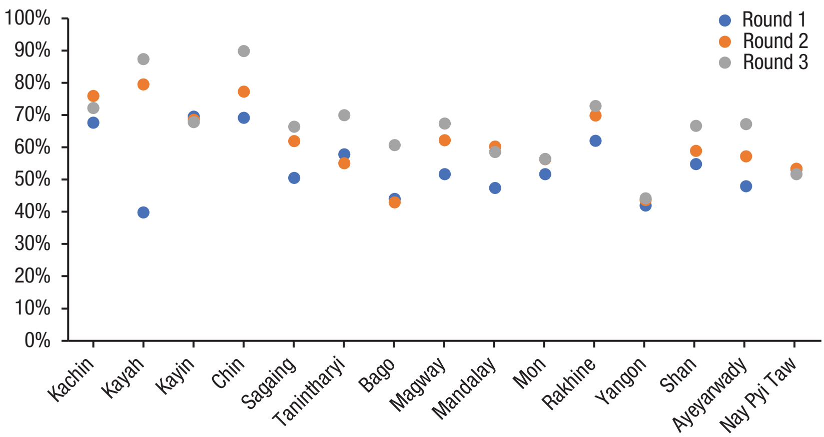
Figure 5.6 shows the percentage of households with per capita daily income below the poverty line by principal source of household income. Households whose main income comes from a farm casual wage or a farm salary are the most vulnerable: 81 percent of these households had a very low income in mid-2022. Further, the position of households earning their primary income from their own farm deteriorated between Round 1 and Round 3, with 37 percent of these households having a critically low income in Round 1 but 62 percent

TABLE 5.4 Income-poor households by MHWS round, September 2021–August 2022

	Share of population (%)		
Household location	Round 1	Round 2	Round 3
National	46.3	52.6*	58.2*
Rural	48.4	56.4*	62.7*
Urban	40.9	42.6*	46.6*

Source: Authors' calculations using MHWS data for Round 1, Round 2, and Round 3.
Note: Asterisks indicate statistically significant differences from previous round: * $p < .01$.

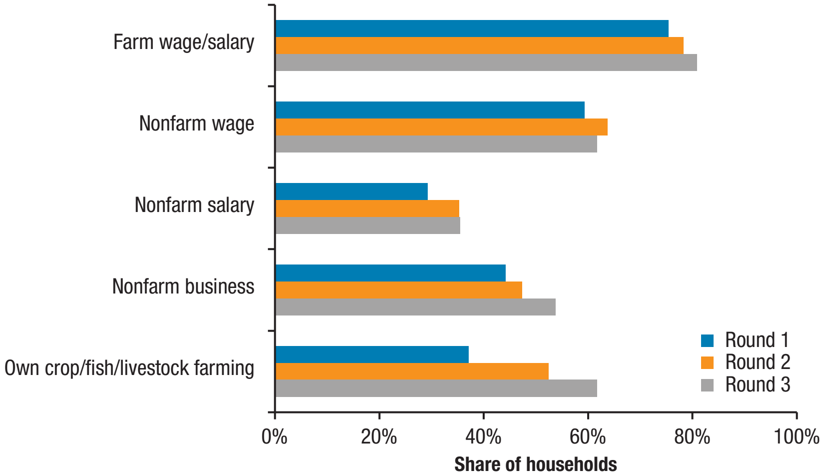
FIGURE 5.5 Share of population with daily per capita income below poverty line, across three survey rounds, by states/regions, 2022



Source: Authors' calculations using MHWS data.

by mid-2022. Some of the increase may be seasonal, as the Round 3 recall period was during the lean season. Nonfarm casual wage workers are less vulnerable than farm casual wage workers but poorer than own-farm households, with 62 percent having a critically low income. Households with a nonfarm business as their main source of income are faring better than farm and casual wage households. However, they are still highly vulnerable, with 54 percent having a critically low income. Finally, even among households with a nonfarm salaried worker, typically considered better-off households, 35 percent have consumption levels below the poverty line.

FIGURE 5.6 Households with per capita daily income below poverty line, by main income source and by rural/urban location



Source: Authors' calculations using MHWS data.

Coping

Shocks can be particularly damaging to household well-being when either the household cannot deploy a coping mechanism to maintain the same living standard or uses a coping mechanism that results in permanent loss of assets, income, or safety. Table 5.5 compares coping strategies used in 2015 with those used in 2022. First, we must note important differences between the MPLCS and MHWS questionnaires. For each shock with a negative impact, MPLCS households were asked what they had done to regain their former level of well-being. On the other hand, MHWS households were asked if, in the past 30 days, anyone in the household had taken any actions from a list of coping strategies provided to cope with a lack of food or money. Therefore, there are two major differences between the surveys: the MPLCS does not ask about coping strategies for the full sample of households, and the MHWS asks about coping strategies only with a one-month recall three times over a nine-month period. Since 97.9 percent of panel households in the MHWS experienced a shock over the period, we do not expect polling all households to lead to an overestimate. Further, while the MHWS will not capture coping strategies used during non-enumerated months, coping is likely captured in greater detail in each round because of the shorter recall period. Therefore,

TABLE 5.5 Comparison of household coping strategies in 2015 and 2022, nationwide, rural, and urban

	Share of households (%)					
	2015 During the past 12 months			2022 At least once in the past 30 days (across three survey periods)		
Coping strategy	National	Rural	Urban	National	Rural	Urban
Borrowed money	21.6	25.2**	12.1	57.7	62.2**	46.2
Spent savings	6.6	7.1*	5.3	73.8	73.4	74.8
Reduced food expenditure	6.4	6.4	6.2	70.5	72.2**	66.1
Reduced expense on health and education[a]	0.3	0.2	0.4	56.7	58.9**	1.0
Sold nonagricultural productive assets/transport	1.5	1.2*	2.3	6.8	6.6	7.6
Sold agricultural productive assets (agricultural households only)	1.0	1.0	1.1	9.7	10.0**	4.0
Sold/consumed seed stocks (agricultural households only)	2.1	2.2*	0.5	28.8	29.3	21.5
Observations	3,648	2,364	1,284	5,978	4,145	1,833

Source: Authors' calculations using MPLCS and MHWS data.

Note: [a] The MPLCS captures both health and education expenditures, whereas the MHWS covers only health expenditures, owing to extensive school closures in the months preceding the interviews. Asterisks indicate statistically significant differences between rural and urban areas: * $p < .05$; ** $p < .01$.

it is unclear by how much the MHWS values are underestimated. Regardless, we present the numbers together in Table 5.5 to demonstrate the contrast between the years.

Twice as many households reported having experienced any shock in the 9-month recall period of the MHWS (97.9 percent) compared with during the 12-month recall period of the MPLCS (46.5 percent). We expect that a much larger share of households would report using coping mechanisms in 2022 and find a much more than twofold increase in the use of coping mechanisms. Different patterns of coping mechanism use are also observed. This suggests, on the one hand, that households and communities were in a different socio-economic position in 2022 compared with 2015 and, on the other hand, that the shocks were more severe and widespread in 2022.

Borrowing money was by far the most commonly reported coping mechanism in 2015, with 21.6 percent of households (Table 5.5). In 2022, a much larger share, 57.7 percent, borrowed money to cope with shocks. However, borrowing was not the most prevalent coping mechanism in 2022. Instead, spending savings was most commonly reported, followed by reducing food expenditure. In 2015, only 6.6 percent of households reported having spent some of their savings to regain their former level of well-being; in 2022, 73.8 percent of households reported doing so. Similarly, in 2015, only 6.4 percent of households reduced food expenditures, while in 2022, 70.5 percent of households did so. Further, in 2015, less than 0.05 percent of households reduced their expenses on health and education. In 2022, 56.7 percent of households reduced spending on health alone. Finally, among farm households, in 2015, 1.0 percent sold agricultural productive assets, and 0.8 percent sold or consumed seed stocks. In 2022, 9.7 percent of farm households sold agricultural productive assets, and 28.8 percent sold or consumed seed stocks. It may be that households' socioeconomic status in early 2020, prior to the crises, was better than in 2015, and therefore, households had a wider range of coping mechanisms available to them. However, the severity and the range of shocks were also much greater in 2022, likely requiring households to resort to more and different coping strategies than in 2015.

Table 5.6 provides detailed shock information by MHWS round. Overall, 85.1 percent of households had used at least one coping mechanism in the past 30 days across survey rounds (pooled estimate). More rural than urban households used coping mechanisms, at 85.1 and 75.1 percent, respectively. Ninety-six percent of panel households reported using at least one coping mechanism in the three rounds. The average was 9.3 different coping mechanisms employed during the nine months.

The share of households using coping mechanisms—in general, but also for specific coping strategies—declines over time. In Round 1, 89.8 percent of households used a coping mechanism; in Round 2, 83.3 percent; and in Round 3, 82.3 percent (Table 5.6). However, this decline may relate to a decline in the ability to use coping mechanisms rather than a reduced need to use them.

Overall, the most common coping strategies were spending savings (69.9 percent on average across the three rounds), reducing nonfood expenditures (57.9 percent), and reducing food expenditures (57.9 percent). The share of households spending savings was higher in rural than in urban areas. Reducing food expenditure was also more common in rural areas, whereas rural and urban households reduced nonfood expenditure at the same rate. Fewer households relied on these coping methods in Round 3 compared with Round 1. However, in all three periods, 24.5 percent spent some of their savings, 21.8 percent reduced nonfood expenditure, and 15.7 percent reduced food expenditure. Finally, households that reduced their food expenditure did so mainly by decreasing their spending on meat (84.9 percent); fish

TABLE 5.6 Households that used coping strategies in month prior to interview, 2022, by MHWS round

Use of coping mechanisms	Round 1	Round 2	Round 3
Coping mechanisms used (number)	3.7	3.0***	3.0
Used at least one coping mechanism (%)	89.8	83.3***	82.3*
Spent savings (%)	76.1	67.8***	66.0**
Reduced nonfood expenditures (%)	65.7	55.7***	52.5***
Reduced food expenditures (%)	67.0	54.5***	52.4***
Reduced expenditures on health (%)	41.0	34.6***	31.0***
Borrowed money (%)	45.2	36.9***	35.0**
Purchased food on credit or borrowed (%)	42.1	32.7***	34.1**
Mortgaged household assets (%)	23.9	19.7***	18.7
Sold household assets (%)	20.1	15.1	13.5***
Mortgaged nonagricultural productive assets or transport vehicle (%)	1.0	0.8***	0.9
Sold nonagricultural productive assets or transport vehicle (%)	4.7	3.3	2.9
Mortgaged or sold house (%)	1.7	1.9	1.3***
Mortgaged or sold land (%)	0.5	0.4	0.5
Mortgaged or sold other assets (%)	1.6	1.8***	1.8
Engaged in high-risk activities (%)	4.5	3.6*	5.0***
Children (under age 15 years) need to work (%)	6.4	7.3	5.8***
Migrated entire household (%)	1.3	1.4	1.4
Reduced agricultural input expense (% agricultural households only)	60.3	53.2***	50.2*
Sold or consumed seed stocks (% agricultural households only)	25.3	22.7*	21.0
Mortgaged or sold agricultural productive assets (% agricultural households only)	1.9	1.4***	1.3
Observations	12,100	12,142	12,128
Farming households	5,465	5,605	5,678

Source: Authors' calculations using MHWS data.
Note: Asterisks indicate statistically significant differences from the previous round: * $p < .10$; ** $p < .05$; *** $p < .01$.

(75.6 percent); oils, fats, and butter (76.6 percent); and restaurant or takeaway meals (51.1 percent).

The number of households that borrowed money also decreased over time, from 45.2 percent in Round 2 to 35.0 percent in Round 3. Fifty-seven percent of panel households borrowed money in at least one of the three periods. The share of households that borrowed food or purchased it on credit (36.3 percent) decreased between Rounds 1 and 2 but increased slightly between Rounds 2 and 3. Given the protracted crisis, we expect that households found it increasingly difficult to obtain a loan—either in cash or in kind. In rural areas, borrowing money and purchasing food on credit was more common than in urban centers. This is likely related to better social networks among rural communities that facilitate borrowing. Although borrowing is decreasing, indebtedness is a growing issue in Myanmar, especially in rural areas. In Round 1, 61.5 percent of households owed money to loan or credit providers, including banks, microfinance institutions, moneylenders, shops, traders, suppliers, relatives, or friends (Table 5.7). After Round 3, 55.0 percent of households owed money. Significantly more rural than urban households owed money. Among panel households, only 25 percent did not owe money over the entire survey period. Further, 37 percent reported owing money in Round 1 and continued to report owing money in Round 3.

To cope with a lack of food or money, some households mortgaged household assets (20.7 percent), including gold, jewelry, furniture, electronics, and appliances, or sold those assets (16.1 percent). Mortgaging assets was more common in rural areas, whereas selling assets was more common in urban areas. Combining assets sold or mortgaged, 29.5 percent of households sold or mortgaged gold or jewelry, 3.2 percent means of transport, 2.7 percent livestock, and 2.3 percent residential parcels. Focusing on panel households only, 7.0 percent sold or mortgaged an asset in all three rounds, and 13.0 percent did so in two rounds.

At risk of jeopardizing their future income-generating capacity, 3 percent of households sold nonagricultural productive assets, and less than 1 percent mortgaged them. Nonagricultural productive assets include sewing machines, wheelbarrows, bicycles, cars, and other means of transportation. Finally, some households also mortgaged or sold critical assets such as their dwelling (1.6 percent) or agricultural land (0.5 percent). Households in rural areas were more likely to use these strategies. Further, among panel households, 6.8 percent and 1.3 percent sold or mortgaged nonagricultural productive assets during the 9-month panel survey period, respectively. Given the recall period of 30 days, the share of households that mortgaged or sold household assets is concerning.

Households also pursued risky activities to meet their daily needs—4.4 percent of households engaged in income-generating activities that they themselves considered risky, while children were reported to work in 6.5 percent of households to supplement the household income. Both of these coping strategies were more commonly employed in rural areas. Most households that engaged in a risky activity did so only in one round. Finally, 1.4 percent of families migrated with their entire household to deal with their dire economic situation.

TABLE 5.7 Households that owed money to a lender, 2022, by MHWS round

Household location	Round 1	Round 2	Round 3
National (%)	61.5	56.2**	55.0*
Rural (%)	66.6	60.7**	59.5
Urban (%)	48.4	44.5**	43.5

Source: Authors' calculations using MHWS data.

Note: Asterisks indicate statistically significant differences from the previous round: * $p < .10$; ** $p < .01$.

Farm households were asked about a specific set of farm-related coping mechanisms. Nationally, 54.9 percent of farm households reduced their agricultural input expenses. Farm households also consumed or sold their seed stocks (23.0 percent) and sold other agricultural assets (1.6 percent). The most common agricultural asset sold was livestock. Seventy percent of farm panel households reduced agricultural input expenses at least once during the three rounds, while 28.8 percent sold their seed stocks at least once. Reducing agricultural input expenses, selling or consuming seed stocks, and selling agricultural assets will likely lower yields, with the potential to create food shortages across the country.

Monetary transfers into the household may help households cope with shocks. Households in Myanmar receive little support from local and international relief organizations or the government. Most transfers into the household come from friends and family. Table 5.8 shows that, in 2022, remittances were the largest monetary transfers households received. Sixteen percent of households received money from remittances over the year. However, this marks a decrease from before COVID-19 and the coup. In 2017, 19.5 percent of households received some income from remittances (CSO, UNDP, and World Bank 2020). Because of the pandemic, many migrants who had been sending remittances returned home. Although migration picked up rapidly after the 2021 coup, by mid-2022, earnings from remittances had yet to return to pre-COVID levels.

After remittances, the most common form of support was friends or family. Across the period, 8.0 percent of households received money from this source. Pensions were the third-largest transfer into the household. Around 4 percent of households received pensions—3.2 percent of rural and 7.9 percent of urban households. Receiving support from relief organizations was less common. Local relief organizations provided support to around 1.2 percent of households at the beginning of 2022. International relief organizations provided

TABLE 5.8 Households receiving support, 2022, by MHWS round

Form of support	Share of households (%)		
	Round 1	Round 2	Round 3
Remittances	15.9	16.7*	14.5***
Family, friend, or other individual	8.1	8.9**	7.0***
Pension	4.6	4.6	4.2
International relief organization	1.7	1.9	1.9
Local relief organization/local NGO	1.4	1.1*	1.0
State administration council/local governing entities	0.7	0.8	0.5**
Monastery, church, or other religious group	0.6	0.5	0.5***
Community-based savings/credit group	0.3	0.3	0.1***
Unemployment benefits	0.3	0.1***	0.1

Source: Authors' calculations using MHWS data.

Note: NGO = nongovernmental organization. Asterisks indicate statistically significant differences from the previous round: * $p < .10$; ** $p < .05$; *** $p < .01$.

support to about 1.9 percent of households during the same period, primarily in urban areas. Given the limited number of households that receive relief from the government or local and international organizations, it is unlikely that households can rely on transfers from these sources to cope with a lack of food or money.

Vulnerability analysis

This section uses regression analysis to explore how shocks and household characteristics are associated with vulnerability. More specifically, we explore the extent to which household characteristics and different shocks are associated with household outcomes in terms of being economically affected, having a critically low income, and coping strategies employed. Households are defined as economically affected if they have experienced a reduction in income or had no income at all in the previous three months. Households are considered to have critically low income if their per capita daily income is below the poverty line.

Table 5.9 presents the marginal effects from the random effects logit regressions. The results show that households facing security, climate, and health shocks are more likely to experience a reduction in income and, so, be economically affected (column 1 in Table 5.9). Households that face violence, either medium or high levels, are 1.6 and 4.9 percentage points more likely to be economically affected than those facing low levels of violence.

Household livelihood sources matter. Compared with households whose main source of income is from their own farm, farm wage households are the most likely to be economically affected. Households whose main source of income is a farm wage have an 8.5 percentage point probability of being economically affected compared with farm households. Similarly, nonfarm casual wage and nonfarm business households are more likely to be economically affected than farm households, at a slightly lesser magnitude than farm wage households, at 7.3 and 6.9 percentage points, respectively. On the other hand, households earning money from a salaried job are less likely to be economically affected than farm households.

Households in which the head has completed only primary education are more likely to be economically affected, as are households with a greater than the median ratio of nonworking to working household members. Further, households in rural areas are less likely to be economically affected than those in urban areas. At the same time, though, households that are in the third quartile of remoteness are more likely to be economically affected. Finally, compared with households in Mandalay, those in Kachin, Kayah, Kayin, Chin, Sagaing, Bago, and Yangon are more likely to be economically affected.

Turning to income poverty (column 2 in Table 5.9), shocks significantly increase the probability that a household is income poor. There is a significant, though small, association of income poverty with experiencing a health shock and with experiencing high levels of violence, compared with a low level of violence. However, there is no clear association with climate shocks.

Compared with households with a farm income, households that rely on income from a nonfarm business, nonfarm casual wage work, and farm casual wage work are more likely to be income poor. Farm casual wage workers have a 25.4 percentage point higher probability than farm households of being income poor. Remittances, on the other hand, help avert income poverty. Households that receive remittances are 16.7 percentage points less likely to be income poor. Households that have migrated in the last two years are also less likely to be income poor.

On the other hand, households with a greater than the median ratio of nonworking to working household members, households with large families, and households in which the head has completed only primary education are more likely to be income poor. Households living in communities with low or medium compared with high median household wages are more likely to be income poor. More remote households, as well as rural households, are also more likely to be income poor. Finally, households in Kachin, Kayah, Kayin,

TABLE 5.9 Marginal effects from exploratory regression analysis of characteristics associated with income loss and income poverty

Characteristic	(1) Economically affected		(2) Income poor	
	Coefficient	SE	Coefficient	SE
Climate shock	0.074***	0.008	0.012	0.008
Violence: medium vs. low	0.016**	0.006	−0.008	0.006
Violence: high vs. low	0.049***	0.008	0.012*	0.007
Health shock	0.068***	0.017	0.033**	0.016
Farm wage vs. farm household	0.085***	0.010	0.254***	0.010
Nonfarm wage vs. farm household	0.073***	0.009	0.097***	0.009
Salary vs. farm household	−0.112***	0.009	−0.100***	0.009
Nonfarm business vs. farm household	0.069***	0.007	−0.005	0.007
Remittances	−0.034***	0.008	−0.167***	0.007
Assistance from family or friends	−0.012	0.009	−0.098***	0.009
Migrated <2 years ago	−0.008	0.015	−0.055***	0.015
High dependency ratio	0.041***	0.006	0.169***	0.005
More than five household members	0.009	0.007	0.136***	0.007
Primary education only	0.019**	0.008	0.069***	0.007
Women-only household	−0.012	0.013	−0.014	0.012
Respondent is female	0.016**	0.006	0.108***	0.006
Community wages: low vs. high	−0.014	0.013	0.053***	0.012
Community wages: medium vs. high	0.007	0.007	0.037***	0.007
Remoteness: medium vs. low	0.010	0.008	0.016**	0.007
Remoteness: high vs. low	0.023***	0.009	0.017**	0.009
Rural	−0.026***	0.008	0.030***	0.007
Kachin vs. Mandalay	0.055***	0.019	0.087***	0.019
Kayah vs. Mandalay	0.186***	0.032	0.113***	0.031
Kayin vs. Mandalay	0.037**	0.019	0.107***	0.018
Chin vs. Mandalay	0.156***	0.028	0.220***	0.028
Sagaing vs. Mandalay	0.029**	0.013	0.016	0.012
Tanintharyi vs. Mandalay	0.011	0.019	0.036*	0.019
Bago vs. Mandalay	0.031**	0.013	−0.039***	0.012
Magway vs. Mandalay	0.021	0.014	0.017	0.013
Yangon vs. Mandalay	0.081***	0.012	−0.051***	0.011
Mon vs. Mandalay	0.029*	0.017	−0.013	0.016
Rakhine vs. Mandalay	0.025	0.017	0.063***	0.017

(continued)

TABLE 5.9 (continued)

Characteristic	(1) Economically affected		(2) Income poor	
	Coefficient	SE	Coefficient	SE
Shan vs. Mandalay	0.016	0.013	0.002	0.012
Ayeyarwady vs. Mandalay	0.025**	0.012	0.012	0.012
Nay Pyi Taw vs. Mandalay	–0.015	0.021	–0.031	0.020
Round 2 vs. Round 1	–0.084***	0.006	0.086***	0.006
Round 3 vs. Round 1	–0.186***	0.006	0.116***	0.006
Observations	35,754		34,872	

Source: Authors' calculations using MHWS data.

Note: Households are defined as economically affected (column 1) if they experienced a large or a small reduction in income or if they have had no income at all in the past three months. In column 2, the dependent variable is income poverty. Violence quartiles are based on number of violent events against civilians from ACLED (2022). Community wages are quartiles of median township wages spatially adjusted. Remoteness is quartiles of travel time to the nearest market in hours. SE = standard error. * $p < .10$; ** $p < .05$; *** $p < .01$.

Chin, and Rakhine are more likely to be income poor than those in Mandalay, while households in Bago and Yangon are less likely to be so.

We also use regression analysis to examine the relationships between shocks and five coping strategies commonly observed as being employed following economic and violent shocks. Table 5.10 presents the results from logit fixed effects models between experiencing a security or climate shock and using each of the following coping strategies: reducing nonfood expenditure (column 1), reducing food expenditure (column 2), borrowing money (column 3), selling household assets (column 4), and selling productive assets (column 5). Households that experienced significantly more violence than in a previous period (the third quantile of the number of violent events against civilians) are significantly more likely to reduce their nonfood expenditure, their food expenditure, borrow money, sell household assets, and sell productive assets. While climate shocks have a similar impact in terms of magnitude on reducing nonfood expenses, food expenses, and borrowing money, they are associated with a larger probability of selling household assets. On the other hand, they are associated with a smaller probability of selling productive assets. A death in the household makes households more likely to employ each coping strategy.

Households that added income from farm wages are more likely to reduce their nonfood and food expenditures, borrow money, sell household assets, and sell productive assets. Households that moved beyond the median ratio of nonworking to working household members are more likely to reduce their

TABLE 5.10 Estimates from logit fixed effects models of shocks on coping mechanisms

	(1) Reduced nonfood expense		(2) Reduced food expense	
Characteristic	Coef.	SE	Coef.	SE
Climate shock	0.347***	0.068	0.357***	0.070
Violence: medium vs. low	0.037	0.057	–0.066	0.059
Violence: high vs. low	0.372***	0.075	0.366***	0.078
Health shock	0.470***	0.143	0.900***	0.158
Farm wage	0.248***	0.073	0.235***	0.074
Nonfarm wage	0.132**	0.067	0.114*	0.069
Salary	–0.117	0.079	0.046	0.084
Nonfarm business	–0.036	0.064	0.085	0.067
Farming	0.030	0.084	–0.183**	0.087
Remittances	–0.001	0.070	0.014	0.073
Assistance from family or friends	0.021	0.078	–0.040	0.083
Migrated <2 years ago	0.692*	0.369	0.322	0.344
High dependency ratio	0.153***	0.059	0.119*	0.061
More than 5 household members	0.342***	0.117	0.237*	0.124
Primary education only	0.085	0.140	0.238*	0.144
Women only household	0.198	0.230	–0.152	0.231
Respondent is female	0.323	0.203	0.425**	0.211
Reduced consumption depleted	–18.485	373.47	NA	NA
Reduced consumption depleted	NA	NA	–19.858	876.80
Borrowed money depleted	NA	NA	NA	NA
Sold nonproductive assets depleted	NA	NA	NA	NA
Sold productive assets depleted	NA	NA	NA	NA
Observations	12,561		11,270	
Households	4,821		4,312	

Source: Authors' calculations using MHWS data.

Note: Rural and state/regional dummies are omitted from the regressions because they change for less than 1 percent of the sample. Violence quartiles are number of violent events against civilians from ACLED (2022). Coef. = Coefficient. SE = standard error. NA = not applicable. * $p < .10$; ** $p < .05$; *** $p < .01$.

nonfood and food expenditure, borrow money, and sell household assets. Finally, households that had already borrowed money in the past 12 months or sold household or productive assets were less likely to again employ these coping mechanisms.

(3) Borrowed money		(4) Sold household assets		(5) Sold productive assets	
Coef.	SE	Coef.	SE	Coef.	SE
0.311***	0.07	0.555***	0.095	0.174**	0.080
0.156**	0.061	0.057	0.086	0.210***	0.078
0.362***	0.080	0.371***	0.110	0.508***	0.102
0.702***	0.166	0.483**	0.196	0.924***	0.190
0.211***	0.073	0.190*	0.106	0.201**	0.087
–0.056	0.071	–0.006	0.092	–0.040	0.094
–0.124	0.086	–0.105	0.115	–0.041	0.119
–0.066	0.068	–0.083	0.094	–0.255***	0.087
–0.051	0.086	–0.167	0.117	0.420***	0.115
–0.037	0.076	–0.151	0.108	–0.071	0.099
0.087	0.083	0.166	0.115	0.038	0.114
1.296***	0.461	–0.187	0.472	0.548	0.632
0.188***	0.062	0.222***	0.085	0.128	0.079
0.186	0.122	0.327**	0.163	0.571***	0.160
0.146	0.143	0.014	0.203	–0.244	0.191
–0.139	0.246	–0.541	0.360	–0.028	0.362
–0.095	0.218	–0.080	0.303	0.104	0.259
NA	NA	NA	NA	NA	NA
NA	NA	NA	NA	NA	NA
–0.756***	0.059	NA	NA	NA	NA
NA	NA	–0.998***	0.061	NA	NA
NA	NA	NA	NA	–1.019***	0.073
10,158		5,568		6,122	
3,892		2,137		2,343	

Conclusions

Almost no households in Myanmar were spared from shocks in 2022: climate, health, and conflict shocks were widespread and severe. Within 9 months, at least one of these shocks negatively affected 97.9 percent of households, more than twice the share negatively affected by any shock over 12 months in 2015.

Whereas the experience of climate shocks was relatively similar in 2015 and 2022, experiences of health and conflict shocks were much higher in 2022. Nearly three-quarters of all households (72.9 percent) had a sick household member in 2022, compared with 14.2 percent in 2015. Moreover, there was a major increase in conflict across the country in 2022, and the incidence of households witnessing crime, violence, and insecurity continued to increase over the three MHWS rounds, showing a worrying trend for the future.

In response to these major setbacks, households relied on coping strategies to deal with a lack of food or money. Nearly all households (96.2 percent) employed at least one coping strategy to meet their daily needs during the month prior to one of the three survey rounds. The three most common coping strategies were spending savings, reducing nonfood expenditures, and reducing food expenditures. Households also borrowed money, leaving 55.0 percent of the population in debt by mid-2022. Sixteen percent of households sold household assets, eroding their quality of life. Finally, 7.6 percent of households sold or mortgaged productive assets, jeopardizing future income streams.

Our data further confirm concerns that large shares of the population have fallen back into poverty, and others have experienced a deepening of poverty. Even though 2021 was the first year of the pandemic in Myanmar, 55.0 percent of households reported lower income in the first half of 2022 compared with the same period in the previous year. Further, when comparing households' average daily per capita income with the national poverty line, at least 56.5 percent of the population lived in households with a critically low income between September 2021 and August 2022. Household vulnerability is worrisome, especially if food prices continue to rise. Moreover, the difficulty in interviewing internally displaced and heavily conflict-affected households further raises concerns that the situation is even worse than what this chapter shows.

Further analyses exploring the association of different factors with economic vulnerability, low incomes, and the use of coping mechanisms clearly show that shocks—particularly violent shocks—are detrimental to household welfare and significantly increase vulnerability. However, factors historically associated with poverty, such as level of education, household size, and having young children, continue to be significant predictors of household vulnerability. Further, farm and nonfarm wage-earning households are particularly vulnerable: they are more likely to have reduced incomes, be income poor, and use coping strategies. Of course, these findings should be interpreted with caution. While random effects models can address issues of unobserved heterogeneity, there could still be endogeneity and time-varying confounders that lead to biased and inconsistent estimates. Nonetheless, these results show that, in addition to offering support to households directly affected by violence, resources and support should be directed to those that rely for their livelihoods mainly on farm and nonfarm casual wage work, to those with members with low educational attainment, and to larger households with young children.

Finally, receiving remittances significantly lowers a household's probability of having a reduced income, being income poor, and using coping strategies. Hence, remittances offer an important safety net to 15.1 percent of Myanmar's households. Therefore, supporting safe migration and facilitating remittance flows will continue to be imperative to the well-being of many households in Myanmar, even in this new setting.

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Chapter 6

AGRICULTURAL LAND: INEQUALITY AND INSECURITY

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Land is indispensable to agricultural production and, thus, a critical resource in sustaining agriculture-based livelihoods. Moreover, land as property may facilitate access to credit when used as collateral, further facilitating productive activities. Land ownership also constitutes a buffer against shocks, as it can often be rented out, mortgaged, or sold when cash needs are high.

In Myanmar, more than half of the working population is employed in agriculture or allied activities as a primary job; in rural areas, this share is as high as two-thirds (67.1 percent) (CSO, UNDP, and World Bank 2020). However, a substantial share of rural households does not own any agricultural land, and even among landowners, the distribution of land is highly unequal (Belton and Filipski 2019).

Understanding Myanmar's current state of land tenure and titling and its historical trajectory in this regard is critical to carrying out a well-grounded assessment of the country's crop production patterns and potential. Beyond this, patterns in differential access to agricultural land are important to explaining the country's rural and urban economies and employment in them, both on and off the farm. Access to agricultural land is also a determinant of household economic vulnerability and resilience.

This chapter takes a close look at agricultural land. It starts with a background on land tenure before describing the data and methodology of the quantitative analysis of land tenure patterns for farm households. Next, it discusses land ownership and landholding distribution, comparing smallholder farmers with larger-scale farmers. It then examines the interrelation of land tenure and cropping patterns. The final section offers some reflections on the impact of the recent crises on land tenure and presents conclusions.

Background on agricultural land

In the past half-century, the total area under agriculture in Myanmar has increased substantially—from an estimated 10.6 million ha in the 1960s to 12.7 million ha in the 2010s (Table 6.1). The combination of cropland expansion, increasing demand for timber products, and rapid socioeconomic development, including the construction of large-scale infrastructure, has put substantial pressure on valuable natural resources. Between 1988 and 2017, forest cover decreased by about 11.1 million ha—an annual deforestation rate of 0.87 percent (Yang et al. 2019). Myanmar has been identified as having the most acute mangrove loss among all Asian-Pacific countries—its mangrove area declined 35 percent between 1975 and 2005 and 28 percent between 2000 and 2014 (Gandhi and Jones 2019).

Despite the substantial expansion of farmland area since the 1960s, population growth has meant that agricultural land per capita nearly halved over the same period, falling from an average of 0.43 ha to 0.24 ha (FAO 2023). However, the growth of the population working in agriculture has been substantially lower than the overall population growth. Structural changes in Myanmar likely are driving lower population growth in rural areas than in urban centers. As a consequence, average agricultural land per person active in agriculture rose from 0.76 ha in the 1990s to 1.02 ha in the 2010s. The granting of large-scale land concessions for agriculture also drove this increase (Byerlee et al. 2014; Thein et al. 2018). Even though concession land is distributed highly unequally, the large areas involved result in an upward bias in the apparent agricultural land area per person active in agriculture. Detailed household data on land acquisition and cultivation suggest that, in most parts of the country, the landholdings of most farm households are shrinking. The only exception is Mon State, which has experienced high levels of out-migration, so it may be seeing some emergent consolidation of paddy land (Belton et al. 2021).

Land tenure and markets

Land policy, laws, and administration in Myanmar have been shaped by colonial and postcolonial rule, an inwardly focused socialist period, a more outwardly oriented market-based period, followed by a (neo)liberal democratic transition that ended in early 2021 (Hayward, Hirsch, and Scurrah 2021). Across these periods, several layers of revoked and active laws have accumulated, often conflicting with and contradicting one another. Therefore, the country's land laws and administration are difficult for both farmers

TABLE 6.1 Population growth and evolution of average agricultural land area

Characteristic	1961–1970	1971–1980	1981–1990	1991–2000	2001–2010	2011–2018
Annual population growth (%)	2.3	2.3	1.9	1.2	0.8	0.7
Annual rural population growth (%)	1.8	2.2	1.7	1.0	0.5	0.4
Annual agricultural population growth (%)	—	—	—	0.1	−1.1	−0.9
Agricultural land total (million hectares)	10.65	10.45	10.42	10.51	11.60	12.70
Agricultural land per capita (hectares per capita)	0.43	0.34	0.27	0.24	0.24	0.24
Agricultural land/population in agriculture (hectares per person in agriculture)	—	—	—	0.76	0.89	1.02

Source: FAO (2023); World Bank (2024).
Note: — = data not available.

and investors to navigate (Boutry et al. 2017; Mark 2016; Shivakumar and Hlaing 2015).

Under Myanmar's constitution, all land and natural resources are considered state property (Hayward, Hirsch, and Scurrah 2021). Before 2012, individuals were not legally permitted to buy or sell land, even though purchases and sales did occur in practice (Boutry et al. 2017; Mark 2016). The 2012 Farmland Law made purchases, sales, or other forms of transfers of agricultural land parcels possible, provided the owner had a land use certificate—Form 7—for the parcel. The form includes a drawing indicating the plot's boundaries and size, the holder's name, and the type of land use allowed. Before the 2012 law was passed, farmers documented their rights to a land parcel using Form 105. This document conferred land use rights, but these were not legally transferrable except through inheritance (Boutry et al. 2017). Form 105, where present, is now attached to Form 7.

Following the introduction in 2012 of the Farmland Law, a significant but hasty effort was made to register agricultural parcels. However, many of the land parcels that were granted a Form 7 through this effort already had a Form 105, whereas most land parcels without a Form 105 did not subsequently obtain a Form 7 (Boutry et al. 2017; Mark 2016). Moreover, the pressure to provide title to many parcels within a short period led to numerous errors—often to the benefit of the elite and well-connected. Farmers with legal land tenure documents were often still at risk of land confiscation. Rather than safeguarding tenure security, the process of registration and certification associated with the 2012 Farmland Law itself stirred land disputes (Boutry et al. 2017; Oberndorf 2012; Thein et al. 2018). Despite continuing efforts, many parcels of agricultural land are yet to be registered, particularly in the upland and border states. For example, data from southern Shan show that only 20 percent of all agricultural parcels in 2018 had either Form 105 or Form 7 (Belton et al. 2021).

Accompanying the 2012 Farmland Law was the Vacant, Fallow, and Virgin (VFV) Land Management Law (2012, amended in 2018) (Mark 2016). This law enables individuals, firms, and governments to lease land designated VFV for various types of development (Vicol, Pritchard, and Htay 2018). Although sometimes portrayed otherwise, the 2012 VFV Law is a continuation of a long line of laws, including the 1991 Wastelands Law, but stretching as far back as the 1894 Land Acquisition Act, that deem all land without legal title to be "wasteland" and provide the government the legal right to reallocate it to other users (Meehan 2021; Thein et al. 2018). Provisions under such laws had provided the basis for land confiscations long before 2012—these were particularly widespread under the State Law and Order Restoration Council regime during the 1990s. However, the 2018 amendment to the VFV Law exceeded the stringency of the earlier laws by adding the provision that farmers who did not register their use of land classified as VFV would have no use rights to it and could be fined or imprisoned if they continued to farm on it (Boutry and Thant 2020).

The land certification program, in combination with the accompanying VFV Law, thus provides the legal foundation for potential land expropriations from a vast number of farmers, many of them in upland ethnic areas or areas abandoned as a result of conflict (Boutry and Thant 2020; Suhardiman, Bright, and Palmano 2021). Whereas the reforms starting in 2011 offered prospects of land restitution or compensation for rural households affected by land confiscation, this has been a complex promise to deliver on (Mark and Belton 2020). Meanwhile, even post-2011, land confiscations continued to affect rural households (Mark 2023; Thein et al. 2018).

Agricultural land in non-Bamar ethnic communities in upland areas is often managed under customary tenure systems (Hayward, Hirsch, and Scurrah 2021; Mark 2023). In the past, Myanmar policymakers mainly viewed such systems and the shifting cultivation practices often used within them as a hindrance to economic progress in rural areas (Vicol, Pritchard, and Htay 2018). Despite a greater openness during the democratic transition period, legal reforms to protect the rights of customary land and shifting cultivators remain incomplete and insufficient. Farmers who obtained their land under customary tenure systems are therefore at risk of their land not being recognized as being under legitimate land use, particularly if it is farmed under shifting cultivation or is in a fallow period (Oberndorf 2012; Vicol, Pritchard, and Htay 2018).

Rice and land tenure

Throughout Myanmar's history, policymakers and the country's leaders have established rice-centered policies and regulations aimed at boosting national rice production. Many of these have affected land tenure practices and patterns. Between 1964 and 2003, the government applied compulsory procurement of crops, with individual household quotas based on sown area and anticipated yield. The aim was to foster rice productivity and ensure national self-sufficiency in rice. This policy was enforced most strongly in areas most conducive to rice production. However, farmers' incentives to increase productivity were low because they had to not only give a large share of their crop to the state to fulfill their quota obligation but also sell the remainder to the state at artificially low prices. This combination of marketing controls made it hard for rice producers to turn a profit (Boutry et al. 2017; Kurosaki 2008).

Farmers faced the threat of losing their land rights if they deviated from crop plans formulated by the government or failed to deliver their prescribed quota, especially for paddy cultivation (Boutry et al. 2017; Shivakumar and Hlaing 2015). Historically, farmers in the Delta agroecological zone were under the most pressure to produce paddy. This contributed to high levels of land confiscation and landlessness there (Boutry et al. 2017). The situation remained problematic when the government excluded rice from marketing liberalization in 1988. Only in 2005 was government paddy procurement abandoned and were private traders allowed to export rice (Boutry et al. 2017; Thein et al. 2018). Nevertheless, farmers in designated paddy areas were still required to grow paddy rice for at least one season of the year.

In 2016, policies were changed to allow farmers "freedom of crop choice," yet farmers are still not fully able to choose the crops they cultivate (Thein et al. 2018). The policy announced by the Ministry of Agriculture, Livestock, and Irrigation allowed freedom of seasonal crop choice. However, the Farmland Law still requires farmers to follow the use prescribed for the specific land category of their parcel. Hence, for instance, farmers operating on land categorized as "lowland" were granted the option to switch from cultivating rice to cultivating other seasonal crops, such as pulses or oilseeds, but could not lawfully convert that land to cultivate tree crops, raise livestock, or invest in fishponds. Official permission is required to change the use designated for a land parcel, such as, for example, planting perennial crops on a parcel designated lowland or paddy land or establishing fishponds on “agricultural” land (Boutry et al. 2017; Filipski and Belton 2018; Warr 2016). Moreover, villagers and local authorities are not always aware of changes in legislation related to crop choice (Boutry et al. 2017).

Upland parts of the country less well suited to rice cultivation have maintained somewhat more diverse cropping patterns, as authorities did not exert excessive control over farmers’ crop choice (Rammohan and Pritchard 2014). Nevertheless, these areas still have restrictions on certain cultivation practices, such as fallowing and shifting cultivation (Thein et al. 2018). In farming areas where rights to land are organized through customary tenure systems, farmers are plagued by inadequate recognition of their land use in the existing national land use policy (Boutry et al. 2017; Warr 2016). Moreover, many upland farmers cultivate land on a settled basis and not under shifting cultivation. In doing so, they consider the land as de facto private property but often do not possess formal land use certificates. Such farmers, too, are highly vulnerable to expropriation of their land under current agricultural land laws.

In line with the focus on encouraging rice production, government loans from the Myanmar Agricultural Development Bank (MADB), the main formal provider of credit to farmers, have favored paddy production (Okamoto, Lwin, and Fujita 2021). MADB loan sizes are substantially higher for the production of paddy than for non-paddy crops. The Ministry of Agriculture, Livestock, and Irrigation justifies this on the higher financing needs of paddy compared with many other commonly grown crops (Boutry et al. 2017; World Bank 2014). In 2012/13, about 90 percent of total lending disbursed by MADB was for paddy. Generally, formal documentation of land use rights was a prerequisite for accessing MADB loans before 2018 (Boutry et al. 2017; Okamoto, Lwin, and Fujita 2021). However, since May 2018, farmers must explicitly prove their eligibility for MADB loans by showing Form 7, with Form 105 attached, for the parcel for which they require financing to farm, in addition to a recommendation letter from a loan screening committee.

Data, methods, and definitions

We perform descriptive analyses of land tenure patterns for agricultural households using the Myanmar Living Conditions Survey 2017 (MLCS) dataset (CSO 2019). Furthermore, we apply regression models to explore the relationship between possession of land documents and parcel characteristics (land size, access to irrigation, type of crop grown, tenure status) and farm household characteristics (age and gender of household head, rural or urban residence, total land owned or operated) while also controlling for agroecological zone (AEZ).[1] The regressions are done to analyze the interplay of different plot and farm household characteristics with whether a household has formalized their rights to the land they farm. Given the strong endogeneity between the possession of land documents and several control variables, such as type of crop grown, tenure status, land size, and others, the findings should not be interpreted as causal linkages.

We define "agricultural households" as those that had operated any agricultural land in the previous 12 months, including rented, sharecropped, or borrowed parcels. We use the term "landed households" to describe households that reported owning agricultural land and "landless households" to refer to those that did not.[2]

For each parcel owned, the MLCS questionnaire asks whether the household has a document. However, enumerators do not verify the document itself, and the questionnaire does not ask the respondent to specify the type of land document. Whereas Form 7 is the main ownership document formally recognized for agricultural parcels, respondents may have considered other types of documents, such as Form 105 (the title document that predates Form 7), tax receipts, a rental agreement, or any other document that the respondent assumes qualifies as documenting their rights to use the parcel.

A caveat in this analysis relates to a potential underrepresentation of large-scale farms and plantations, given that a population-based dataset such as MLCS likely does not capture farms that are not family-owned—which, for the most part, are large (Lowder, Skoet, and Raney 2016). Large landholdings are often planted with perennial crops, such as oil palm, rubber, or sugarcane. There may, therefore, be an underestimation in MLCS of the share of farmland under permanent crops. Moreover, fallow land may be underreported, given the troubled history of recognizing fallowed land and that fallowed land under customary tenure systems may not be considered as being owned by its former cultivators.

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1 We follow the AEZ classification suggested by CSO, UNDP, and World Bank (2020): Dry (Mandalay, Magway, Naypyidaw, and Sagaing), Delta (Ayeyarwady, Bago, Mon, and Yangon), Hills and Mountains (Chin, Kachin, Kayah, Kayin, and Shan), and Coastal (Rakhine and Tanintharyi).

2 Ownership is self-reported based on the reported tenure status of the parcel. Households that access agricultural land via temporary arrangements, such as renting, sharecropping, borrowing, or other, but do not report owning land are considered landless households.

Land ownership, landholding distribution, and landlessness

Nationwide, 37 percent of households own agricultural land: 49 percent of rural and 8 percent of urban households (Table 6.2). Most landed households own one or two parcels totaling about 2.6 ha on average. A slightly greater share of households nationally cultivates land (39 percent) than owns land (37 percent). Urban agricultural households cultivate fewer parcels on average than rural households (1.3 compared with 1.7 parcels) but utilize a similar land area.

There are significant differences in land ownership patterns across different AEZs, even when focusing on the subsample of rural households (Table 6.2). In the rural Delta and the Coastal Zone, there are fewer landowning households (38 and 45 percent, respectively), but land sizes are larger at 2.9 ha and 2.6 ha, respectively. A much higher share of rural households in the Hills and Mountains owns land (64 percent), but the average area owned is the smallest (2.1 ha) across the AEZs. Within the urban sample, we find a low share of landed households in the Delta (3 percent) and the Dry Zone (8 percent), likely driven by the large cities of Yangon and Mandalay in these zones.

A majority of agricultural households (89 percent) have landholdings of 5 ha or less (Table 6.3), also called small farms (Jayne et al. 2016). Small farms cover 63 percent of all agricultural land. More than half of all agricultural households (53 percent) cultivate landholdings of 2 ha or less (Table 6.3) and, thus, are considered smallholder farmers (Lowder, Skoet, and Raney 2016). Smallholders cultivate 20 percent of Myanmar's agricultural land area. Only 3 percent of agricultural households operate agricultural land larger than 10 ha. Nevertheless, these large landholders manage 15 percent of the total land area cultivated (Table 6.3).

The Delta zone is the most unequal in land access, with the highest share of landless households and the broadest spread in land sizes among the landed. This inequality is driven in part by the Delta's unique history going back to the 1930s of recurrent high debt levels among rice cultivators, leading to land repossession. Later in the paddy quota era, land was confiscated from farmers who could not meet their quota. There was a period of unchecked land-grabbing in the 1990s and 2000s and considerable displacement of farming households in the Delta following Cyclone Nargis in 2008. Land distribution is more even in the Hills and Mountains, arguably because, in most areas there, the land border has closed only recently or is not yet closed.

Figure 6.1 shows the cumulative distribution of land area owned and operated by households in Myanmar. The bottom 60 percent of landed households

TABLE 6.2 Land ownership and cultivation, by agroecological zone and urban or rural location

Characteristic	National	Delta	Coastal Zone	Dry Zone	Hills and Mountains
Both rural and urban households					
Landed households (owning land) (%)	37	25	40	43	54
Agricultural households (cultivating land) (%)	39	27	39	44	59
Among landed households (owning land):					
Parcels owned (number)	1.62	1.49	1.37	1.81	1.58
Owned area (hectares)	2.59	2.95	2.75	2.62	2.07
Among agricultural households (cultivating land):					
Parcels operated (number)	1.64	1.51	1.39	1.84	1.59
Operated area (hectares)	2.54	2.85	2.77	2.60	2.04
Rural households					
Landed households (owning land) (%)	49	38	45	54	64
Agricultural households (cultivating land) (%)	52	42	44	55	69
Among landed households (owning land):					
Parcels owned (number)	1.65	1.50	1.38	1.83	1.63
Owned area (hectares)	2.60	2.93	2.66	2.65	2.08
Among agricultural households (cultivating land):					
Parcels operated (number)	1.66	1.52	1.40	1.86	1.63
Operated area (hectares)	2.54	2.82	2.68	2.62	2.04
Urban households					
Landed households (owning land) (%)	8*	3*	13*	8*	26*
Agricultural households (cultivating land) (%)	8*	3*	10*	7*	27*
Among landed households (owning land):					
Parcels owned (number)	1.28*	1.30	1.19	1.30*	1.27*
Owned area (hectares)	2.52	3.43	4.39*	2.02	2.06
Among agricultural households (cultivating land):					
Parcels operated (number)	1.33*	1.35	1.29	1.33*	1.33*
Operated area (hectares)	2.51	3.46	4.69*	2.15	2.01

Source: Constructed using MLCS 2017 (CSO 2019).
Note: Asterisks indicate statistically significant differences between urban and rural households: * $p < .01$.

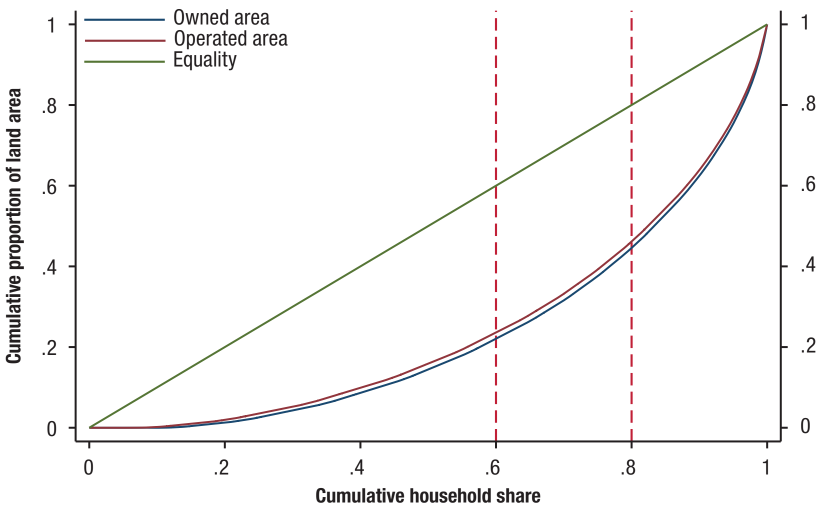
own only about 22 percent of total land, whereas the top 20 percent of landed households own about 55 percent. The Gini coefficient based on the national land distribution of cultivated farmland among households that cultivate land is 0.477. It is highest in the Delta (0.513), indicating higher inequality, and lowest in the Dry Zone. The pattern is similar when considering agricultural

TABLE 6.3 Farm size distribution, share of agricultural households and agricultural land

Farm size (hectares)	Share of agricultural households (%)	Share of total cultivated agricultural land (%)
≤1	26.8	5.6
1+ to 2	25.6	14.0
2+ to 5	36.5	43.3
5+ to 10	8.2	21.6
10+ to 15	2.3	10.8
15+ to 20	0.4	2.4
20+	0.2	2.2
Observations	5,036	5,036

Source: Constructed using MLCS 2017 (CSO 2019).

FIGURE 6.1 Cumulative distribution (Lorenz curve) of land area owned and operated



Source: Constructed using MLCS 2017 (CSO 2019).

households and the area they cultivate (Figure 6.1). Eleven percent of households that cultivate land do not own any land but rely on other tenure arrangements, such as renting or borrowing. Note that the Gini coefficients would be even larger, indicating more inequality, if the agricultural land operated by corporate entities was taken into account.

Land tenure and cropping patterns

Land tenure

Agricultural land sales and rental markets are thin in Myanmar. Most agricultural parcels are owner-operated (88 percent) and were acquired on average 21 years ago, suggesting few changes in ownership during farmers' lifetimes (Table 6.4). Only 4.7 percent of cultivated parcels are accessed through rental and 2.5 percent through sharecropping. While concerns over tenure security could discourage landholders from renting out their land, there are at least three other possible explanations. First, most land is used for low-value grain crops with low margins, thus providing little incentive to farmers to rent in land. Second, most owner-operators do not have any excess land they are willing to rent or sharecrop out. Third, there is no class of large absentee landowners who could rent or sharecrop out their land. Other arrangements to access agricultural land include borrowing or free-leasing (3.7 percent of parcels), some of which may consist of young farmers cultivating their parents' land at no cost (that is, borrowing) in anticipation of future inheritance of the land (Boutry et al. 2017). Almost no land is reported as operated under communal tenure arrangements (0.7 percent).

Owner-operated parcels are predominant in all AEZs, but there are some differences in the occurrence of alternative tenure arrangements. The Delta has the lowest share of owner-operated parcels and a moderate share of rented, sharecropped, and borrowed parcels, but barely any land obtained from communal tenure arrangements. The Dry Zone has the highest share of owner-operated parcels with few alternative arrangements. Land rentals are most common in the Coastal Zone, but sharecropping there is rare. In the Hills and Mountains, we find the largest share of borrowed or free-leased land and a significantly higher share of parcels under communal arrangements. It is more common in this zone than in the others for parcels to be allocated from communal land under customary tenure arrangements.

More than three-quarters (78 percent) of all agricultural parcels have land documents. This share is similar to that calculated by Lambrecht et al. (2023) using the nationally representative Myanmar Poverty and Living Conditions Survey 2015 dataset (World Bank 2021). Their analysis showed that 74 percent of all rural landowners' parcels had a land document. Parcels with seasonal crops are more likely to be documented (80 percent) than parcels planted with permanent crops (56 percent). This likely reflects the separate classification and certification schemes for land with seasonal and perennial

TABLE 6.4 Tenure status of agricultural parcels, by agroecological zone

Characteristic	National	Delta	Coastal Zone	Dry Zone	Hills and Mountains
Tenure status (% of parcels)[a]					
Owned	88.0	85.7	86.1	89.9	88.1
Rented	4.7	5.3	8.4	4.0	4.1
Sharecropped	2.5	3.6	1.0	2.7	1.3
Borrowed/free-leased	3.7	3.9	4.0	2.9	4.7
Communal	0.7	0.4	0.4	0.3	1.7
Other	0.4	1.1	0.1	0.1	0.1
Among all parcels owned					
Owner has land document (%)[b]	77.7	87.0	82.6	92.9	41.3
Years since household acquired parcel	21	18	18	25	18
Parcels (number)	7,814	1,561	849	2,217	3,187
Parcels owned (number)	7,074	1,413	845	2,115	2,701

Source: Constructed using MLCS 2017 (CSO 2019).

Note: [a] Excludes parcels rented out, sharecropped out, or given out for free for cultivation by other households. This is done to avoid overlap with parcels rented in, sharecropped in, or used for free.

[b] MLCS does not specify the type of land document. Hence, it may include Form 7, Form 105, a tax receipt, or any other document the respondent considers as evidence of the right of the household to use the land parcel.

crops (Boutry et al. 2017). Parcels for seasonal crops—particularly those designated for wet rice cultivation ("le" land)—have been the main focus of land registration since the British colonial period. Such parcels continue to be the most likely to have land use certificates today.

There are stark differences in the share of owned parcels with land documents across the AEZs (Table 6.4). The highest levels are found in the Dry Zone and the Delta, which are lowland areas with large areas suitable for paddy cultivation and where, historically, the reach of the state's agricultural land policies has been strongest (Belton et al. 2021). In contrast, in the Hills and Mountains, a far lower share of parcels has some type of document. The land registration and certification system is not well suited to the customary tenure systems and land use patterns, particularly shifting cultivation, prevalent in this zone (Boutry et al. 2018).

Smallholders

Table 6.5 presents descriptive comparisons of smallholder agricultural households—those cultivating up to 2 ha—with agricultural households cultivating more than 2 ha. The average area of land owned by smallholders is 0.9 ha, while they cultivate 1.0 ha on average. These levels are less than a quarter of

TABLE 6.5 Characteristics of smallholders and non-smallholders and parcels operated

Characteristic	Smallholder farm (≤2 ha)	Non-smallholder farm (>2 ha)	Statistical significance
At farm/farm household level			
Share of all farm households (%)	52	48	
Total land size owned (hectares)	0.9	4.0	***
Total land size operated (hectares)	1.0	4.3	***
Parcels owned (number)	1.2	1.8	***
Parcels operated (number)	1.4	2.0	***
Age of household head (years)	50	54	***
Has a land document for at least one parcel (%)	70	83	***
Type of crops grown			
Perennials (%)	17	13	***
Rice (%)	58	70	***
Beans/pulses (%)	34	52	***
Maize (%)	13	14	
Sesame (%)	12	20	***
Observations	2,883	2,153	
At parcel level (all parcels operated by smallholders and larger farms, respectively)			
Parcel size (hectares)	0.7	2.2	***
Parcel is owned (%)	84	92	***
Household has land document for parcel (%)[a]	69	83	***
Years since household acquired parcel[a]	18	23	***
Type of crops grown			
Perennials (%)	14	8	***
Rice (%)	45	45	
Beans/pulses (%)	28	38	***
Maize (%)	9	8	**
Sesame (%)	9	12	***
Left fallow minimum one season (%)	63	76	***
Seasons cultivated (number)	1.8	1.6	***
Irrigation source in any season			
Collected/harvested rainwater (%)	71	74	***
Government/community irrigation channel (%)	7	7	
Individual irrigation channel (%)	19	14	***
Other irrigation source (%)	4	1	***
Observations	3,814	4,414	

Source: Constructed using MLCS 2017 (CSO 2019).

Note: [a] Only for the owned parcels. * $p < .10$; ** $p < .05$; *** $p < .01$.

the average 4.0 ha owned and 4.3 ha cultivated by larger farmers. On average, smallholders cultivate 1.4 parcels, while non-smallholders cultivate 2.0 parcels. Smallholders also are less likely to own the land they cultivate and, of that which they report owning, to have documentation of their ownership.

Smallholder households have acquired their land more recently than non-smallholders and have younger household heads. This pattern may be a result of a life-cycle effect of farmers acquiring more land as they age (Boutry et al. 2017; Lambrecht, Mahrt, and Cho 2021). However, this pattern also supports the hypothesis that farm sizes are shrinking—which is different from, though does not necessarily contradict, the pattern of increased average agricultural land size per person active in agriculture discussed earlier.[3] However, the relatively small gap of only four years in the average age between heads of smallholder and non-smallholder agricultural households suggests that the life-cycle effect and shrinking farm sizes are not the only factors driving the divergence in farm size among agricultural households.

Given their smaller landholdings, it is reasonable to expect that smallholder farmers cultivate fewer crops than farmers with more land. Indeed, smallholder farmers are significantly less likely to cultivate rice, beans and pulses, and sesame than larger farmers, but they are more likely to grow perennial crops (Table 6.5). Smallholders may compensate for their smaller acreages by cultivating their land more intensively, such as by increasing productivity through irrigation during the usual cropping seasons or by expanding the number of cropping seasons through the use of irrigation. Indeed, smallholders cultivate their parcels somewhat more frequently (in terms of seasons cultivated) than non-smallholders and more often use individual irrigation channels or other sources for irrigation.

Land documents

We use probit regression analyses to explore which parcel and household characteristics are associated with land documents for parcels cultivated with seasonal crops, particularly looking at factors that are expected to affect either the landowner's or the authorities' interest or options with regard to documenting agricultural land ownership. By combining different variables into one regression analysis, we can see the association of one variable while controlling for other variables of potential influence.

3 For agricultural land size per person active in agriculture, these persons include both farmers and agricultural workers.

Table 6.6 shows four specifications of the model. Columns (1) and (2) include control variables for the different AEZs to illustrate the main regional patterns that are sustained after controlling for other characteristics. In columns (3) and (4), we control at the township level to account for smaller geographic units than the AEZs. Additionally, in columns (1) and (3), we control for the years since the parcel was acquired. In contrast, in columns (2) and (4), a dummy indicator is used instead, coded 1 if the parcel was acquired after 2012 and 0 otherwise.

Larger parcels and parcels with access to irrigation infrastructure more often have land documents. These parcels are of relatively high value, increasing owners' motivation to obtain such documents. Moreover, where government or community irrigation infrastructure is present, other infrastructure and services are often better developed and more accessible than elsewhere. Hence, the ability and motivation of authorities to provide land use certificates for parcels served by irrigation infrastructure may be relatively high.

Parcels cultivated with rice for at least one season in the past year are also more likely to have land documents than other parcels. This again aligns with government authorities' expected greater interest and reach in rice-producing areas to register land suitable for rice production. Moreover, farmers are motivated to document parcels on which they produce paddy so they can continue accessing loans from MADB. In columns (1) and (2), where we control only at the level of AEZs, cultivation of beans and pulses is also positively associated with having land documents, whereas growing maize has a negative association. However, these effects disappear when we control for a finer set of geographic units at the township level. Even when the model includes township-level controls, rice cultivation, in contrast, continues to be significantly associated with farmers having land ownership documents.

We also find that parcels that are rented out more often have land documents. Either owners with land titles feel more secure in renting, or owners who intend to rent out their land feel more obliged to obtain such documents. One might also expect that land titling efforts were more active in places with more active land markets. However, such impacts may be hidden in our analyses through our use of township-level fixed effects (specifications 3 and 4). Against our expectations, after controlling for the other variables in the regression analysis, we found that a rural landowner is no less likely than an urban landowner to have land documents.

Parcels obtained prior to 2012 (specifications 1 and 3) and parcels acquired further back in time (specifications 2 and 4) are shown in the analysis to be more likely to have land documents. That parcels obtained after 2012 less

TABLE 6.6 Characteristics associated with having land documents for parcels with seasonal crops, probit regression results, and marginal effects

	AEZ fixed effects		Township fixed effects	
Characteristic	(1)	(2)	(3)	(4)
Parcel size (hectares)	0.011** (0.005)	0.011** (0.005)	0.019*** (0.006)	0.019*** (0.006)
Government/community irrigation (0/1)	0.168*** (0.059)	0.166*** (0.058)	0.250*** (0.097)	0.249*** (0.091)
Individual irrigation (0/1)	0.060*** (0.022)	0.059*** (0.022)	0.061* (0.032)	0.060* (0.031)
Planted rice (0/1)	0.090*** (0.017)	0.090*** (0.017)	0.135*** (0.021)	0.134*** (0.020)
Planted beans/pulses (0/1)	0.038** (0.016)	0.038** (0.016)	0.013 (0.021)	0.013 (0.021)
Planted maize (0/1)	−0.059** (0.024)	−0.059** (0.024)	−0.005 (0.032)	−0.005 (0.030)
Planted sesame (0/1)	0.029 (0.022)	0.031 (0.022)	0.043 (0.028)	0.045 (0.029)
Parcel rented out (0/1)	0.143*** (0.035)	0.141*** (0.035)	0.138*** (0.037)	0.136*** (0.036)
Rural residence (0/1)	−0.011 (0.022)	−0.010 (0.022)	0.014 (0.030)	0.014 (0.032)
Parcel acquired after 2012 (0/1)	−0.040** (0.017)	NA	−0.063*** (0.020)	NA
Years since parcel was acquired	NA	0.002*** (0.001)	NA	0.003*** (0.001)
Age of household head (years)	0.002*** (0.001)	0.002** (0.001)	0.002*** (0.001)	0.001* (0.001)
Household head is female (0/1)	−0.017 (0.016)	−0.018 (0.016)	−0.016 (0.020)	−0.015 (0.021)
Education of household head (years)	0.009*** (0.002)	0.009*** (0.002)	0.005* (0.003)	0.004* (0.003)
Coastal Zone (AEZ base = Delta)	0.011 (0.032)	0.012 (0.031)	NA	NA
Dry (AEZ base = Delta)	0.050** (0.022)	0.046** (0.021)	NA	NA
Hills and Mountains (AEZ base = Delta)	−0.309*** (0.042)	−0.309*** (0.041)	NA	NA
Township controls	No	No	Yes	Yes
Observations	5,926	5,926	4,336	4,336

Source: Constructed using MLCS 2017 (CSO 2019).

Note: Standard errors are in parentheses. AEZ = agroecological zone. NA = not applicable. * $p < .10$; ** $p < .05$; *** $p < .01$.

often have documents suggests that there has not been a successful systematic continuation of land titling efforts in recent years. This also suggests that parcels with documents prior to 2012 (in particular Form 105) were more likely to have the new Form 7 required under the 2012 Farmland Law. Given that we do not know which document the owners have, it may also be that many of these older parcels had alternative documents and not the new Form 7.

Parcels owned by households with older household heads more often have land documents, even when simultaneously controlling for time since acquiring the parcel. Similarly, parcels owned by households in which the household head is more educated more often have land documents. However, there is no significant difference in land ownership document possession between male and female household heads.

The regressions in columns (1) and (2) confirm different regional patterns to documentation. Holding all else equal, parcels in the Dry Zone are 5 percent more likely to be documented than those in the Delta. This difference is much smaller than that between parcels in the Delta and parcels in the Hills and Mountains, where the latter are 31 percent less likely to be documented.

Conclusions

Like elsewhere in Southeast Asia, Myanmar's land tenure and cropping patterns are characterized by owner-cultivated small family farms (Hayami and Otsuka 1993; Rigg, Salamanca, and Thompson 2016). Half of all agricultural households are smallholders cultivating no more than 2 ha, and 89 percent operate small farms cultivating no more than 5 ha. However, although smallholder and small farms predominate in the agricultural landscape, the average farm size in Myanmar is slightly bigger than the average for South Asia, East Asia, and the Pacific (Lowder, Skoet, and Raney 2016).

Despite the importance of the agriculture sector in rural employment (Lambrecht, Mahrt, and Cho 2021), 51 percent of rural households are landless. The distribution of agricultural land is uneven, even within the subpopulation of landed households—the bottom 60 percent of landed households own only about 22 percent of total land, whereas the top 20 percent own about 55 percent. Land transfers have been officially allowed since 2012, but land sales and rental markets remain thin, with limited redistribution of land from landed to landless households. Moreover, temporary land acquisition through renting, sharecropping, borrowing, or other arrangements is uncommon. The economic and political crisis affecting Myanmar since the military takeover is expected to increase landlessness.

Smallholders generally cultivate fewer and smaller plots than farmers with larger landholdings, are less likely to own their land, and are less likely to have land documents for the parcels they own. Although they cultivate their land more intensively than larger farmers, this is unlikely to offset the disadvantage of having less agricultural land to generate a farm income. Other researchers have argued that agricultural households progressively acquire and operate more land over their lifetime, exiting their landless or smallholder status (Boutry et al. 2017). However, this process may also result in shrinking farm sizes on average. Both of these hypotheses seem plausible but could not be confirmed in the quantitative analysis.

The above findings, as well as a more in-depth analysis of factors associated with having land documents, confirm the role that Myanmar's history of rice-centered policies has played in shaping the current state of agricultural land tenure. Even after controlling for geographic, household, and parcel characteristics, we find that parcels on which rice is cultivated are more likely to have land documents.

The fact that land documentation is incomplete and less common among parcels acquired after 2012—the year when the major push for land use certification occurred—suggests that land certification efforts are incomplete and have not been sustained. In Myanmar, as elsewhere, the current land use certification system is not a panacea for land security or augmented crop productivity. Striving toward a system of land classification and land laws in line with and respectful of local realities—especially those aligned with customary land tenure systems—could further improve tenure security, enhance land use patterns, and support higher overall welfare for rural households.

The recent crises that have affected Myanmar may have affected land tenure patterns. However, few data are available on agricultural land ownership and use patterns during the COVID-19 pandemic and since the military takeover, especially at the national level. The Myanmar Household Welfare Survey data from this period suggest that distress sales have increased in frequency. In a recall period of only one month, on average 0.4 percent of agricultural households had sold agricultural land to cope with a lack of food or money (MAPSA 2022). Moreover, rural areas may see increased landlessness due to land abandonment in response to higher input prices, conflict, or an uptick in land confiscations. We may also see a move toward land policies similar to those of the past, including a possible return to command and control over crop choice (USDA 2021) and a renewed establishment of large-scale concessions, especially in ethnic minority areas (Frontier 2023).

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Chapter 7

AGRICULTURAL MECHANIZATION: DRIVERS AND CHARACTERISTICS

Ben Belton, Myat Thida Win, Xiaobo Zhang, Mateusz Filipski, Hiroyuki Takeshima, and Ian Masias

Widespread agricultural mechanization is a very recent phenomenon in Myanmar. In 2010, just 0.5 percent of farm households in the Delta used combine harvesters, and only 6 percent used threshers (Win, Belton, and Zhang 2018). A study of farm production economics in the country's main agricultural zones in 2013/14 found that only 1 percent of paddy-cultivating households used combine harvesters. This was attributed to a combination of low wages and surplus labor in rural areas, poor infrastructure, a poor regulatory environment, and a lack of access to long-term capital among farmers (World Bank 2016).

However, Myanmar's policy reforms and reintegration into regional and global markets between 2011 and 2020 contributed to increasingly dynamic conditions, including economic growth averaging 7 percent per year (ADB 2018), accelerating out-migration from rural areas (Filipski et al. 2020), and rapid rural transformation (Belton and Filipski 2019). This context gave rise to rapid and widespread agricultural mechanization (Win, Belton, and Zhang 2018).

This chapter compares data from two pairs of complementary surveys to assess the effects of these economic changes on the uptake of agricultural mechanization. We combine demand-side (farm household) and supply-side (agricultural machinery retailer) surveys implemented between 2016 and 2018 across two major agroecological zones—a deltaic rice-growing environment (the Delta) and a rainfed semiarid zone (the Dry Zone). This approach allows for triangulation of results and captures variations in mechanization across geographies. In addition, we use data from multiple rounds of rapid assessments to evaluate the impacts of COVID-19 and other recent shocks.

The chapter thus offers a detailed descriptive analysis of the country's recent extraordinarily rapid and pervasive agricultural mechanization, which has not previously been documented systematically. We draw links between these changes and transformations in the economy and policy environment between 2011 and 2020. This enables us to consider the implications of these findings for the viability of smallholder agriculture and to identify a range of factors conditioning the uptake of agricultural machinery beyond the simple substitution of capital for labor.

The chapter is organized as follows. First, we analyze temporal changes in the ownership and use of agricultural machinery. Second, we present data on trends in the geographic spread of machinery supply businesses and the growth of machinery sales. Third, we evaluate evidence of demand- and supply-side factors influencing agricultural mechanization. Fourth, we discuss developments associated with the COVID-19 pandemic and political instability. The final section concludes by summarizing key findings.

Rapid growth period (2011–2019)

We present results from two household surveys and two machinery retailer surveys conducted under the Myanmar Food Security Policy Project (MFSPP). All household-level data presented in the tables and figures originate from these surveys of rural households in two of Myanmar's most important agricultural zones: the Ayeyarwady Delta and the Dry Zone (for details, see Belton et al. 2021).

Demand side

Sequence and timing of mechanization. Ownership of agricultural machinery has grown quickly in both the Delta and the Dry Zone from a very low base, accelerating particularly rapidly from 2010 onward. Consistent with the generalized sequence of mechanization, stationary "power-intensive" operations, such as pumping water and threshing, have been mechanized before mobile "control-intensive" operations, such as harvesting (Pingali 2007).

In the Delta, mechanization began with two-wheel tractors (power tillers, used mainly for land preparation in paddy cultivation) and water pumps (used for many purposes but most importantly, for irrigating dry season paddy). Ownership of these items grew little between 1996 and 2007 but subsequently increased sharply. Delta households began acquiring mechanical paddy threshers and *trawlerji* (farm vehicles running on two-wheel tractor engines) in the mid-2000s. Acquisition of four-wheel tractors increased markedly after 2008 but remained at a fairly low level. Combine harvesters—the most control-intensive machines used—did not appear until 2014 (Table 7.1).

Mechanization in the Dry Zone followed a generalized pattern similar to the Delta but with differences in the composition of machinery, reflecting

TABLE 7.1 Machines acquired per 10,000 landed households, by time period

Machine type	1996–1998	1999–2001	2002–2004	2005–2007	2008–2010	2011–2013	2014–2016
Delta							
Water pump	97	176	14	155	850	805	797
Two-wheel tractor	122	28	157	131	609	454	844
Thresher	0	3	112	193	171	160	275
Trawlerji	0	0	27	33	204	480	81
Four-wheel tractor	0	0	26	6	41	26	21
Combine harvester	0	0	0	0	0	0	107
Dry Zone							
Water pump	4	12	47	40	10	146	138
Two-wheel tractor	33	12	57	118	50	261	296
Thresher	0	9	36	66	43	12	12
Trawlerji	7	0	0	9	19	8	34
Four-wheel tractor	7	0	0	0	6	50	91
Combine harvester	0	0	0	0	0	0	0

Source: Myanmar Food Security Policy Project (MFSPP) surveys.
Note: Machine ownership rates per 10,000 households were estimated using survey weights.

differences in agroecology. As in the Delta, two-wheel tractors and water pumps were the first machines to be used widely and over a similar period. The number of water pumps acquired in the Dry Zone was about half the number of two-wheel tractors, unlike in the Delta, where the number of water pumps exceeded that of two-wheel tractors. This reflects the more limited availability of water in the Dry Zone. The timing of acquisition of threshers follows a similar trend in both zones. However, threshers account for a smaller share of machines owned in the Dry Zone than in the Delta, consistent with the lower prominence of paddy in Dry Zone farming systems (Table 7.1).

Acquisition of four-wheel tractors in the Dry Zone began later than in the Delta but has grown rapidly since 2010, in line with the uptake of these machines to cultivate non-paddy crops. None of the Dry Zone households surveyed had ever owned a combine harvester, reflecting the lesser role of paddy in the cropping systems of the townships surveyed. Ownership of large machines (four-wheel tractors and combines) remains rare in absolute terms, but recent growth in ownership has been rapid—more than half of all four-wheel tractors recorded in the Dry Zone were purchased in just two years, 2015 and 2016. Given the large engine sizes of these machines relative to two-wheel tractors, their uptake represents a massive increase in mechanical power available to farmers. The total value of purchased machines has also increased dramatically over time. By 2017, four-wheel tractors accounted for most of the capital invested in agricultural machinery in the Dry Zone, underlining the speed of the shift to mechanized traction. Similar trends were apparent in the Delta for combine harvesters.

Rental markets and farm size. Despite recent growth in agricultural machinery purchases, absolute ownership levels remain low for most machine types. The likelihood of owning a machine is highly correlated with landholding size. For example, in the Delta in 2016, only 1 percent of all surveyed households owned a four-wheel tractor or combine harvester. No households in landholding tercile 1 (the third of landed households with the smallest landholdings) owned a four-wheel tractor or a combine; this rose to 20 percent and 7 percent, respectively, among households in tercile 3 that used these machines. Similar results were evident for four-wheel tractor ownership in the Dry Zone (Table 7.2).

Ostensibly, this finding supports the conclusion that machines are “lumpy” inputs that require high levels of initial capital investment and “reach their lowest cost of operation per unit at relatively large areas,” thus favoring adoption by large farms (van Zyl, Binswanger, and Thirtle 1995, 3). This logic led Pingali (2007, 2790) to argue, with reference to Southeast Asia, that “in the absence of land consolidation and the re-design of the rice land to form large contiguous fields, the prospects for large-scale adoption of the harvester-combines are limited.”

To the contrary, our data show that the growth of outsourcing services has enabled farms to mechanize irrespective of machine ownership and independent of farm size. Eighty-nine percent of the agricultural machinery used by farmers in the Dry Zone and 60 percent in the Delta is rented. This regional difference reflects relatively high levels of ownership of two-wheel tractors in the paddy-dominated Delta, but in both zones, four-wheel tractors and combine harvesters are accessed almost exclusively through renting (Table 7.2). There is no statistically significant difference in the use of two-wheel and four-wheel tractors by landholding tercile in either the Delta or the Dry Zone, no difference for combine harvesters in the Dry Zone, and no difference for threshers in the Delta. We conclude that the likelihood of a household using these types of machines is largely independent of landholding size.

The rapid growth of machinery rental markets has enabled smaller landholders to access many of the benefits of agricultural machinery use—for example, labor savings and timely completion of activities—that machine

TABLE 7.2 Farm households using agricultural machinery in the past 12 months, by landholding size terciles and machine ownership status

	Share of farm households (%)											
	Tercile 1 (smallest)			Tercile 2			Tercile 3 (largest)			All terciles		
	Use	Own	Rent	Use	Own	Rent	Use	Own	Rent	Use	Own	Rent
Delta												
Two-wheel tractor	76	15	85	72	35	65	70	90	10	73	43*	57
Four-wheel tractor	18	0	100	23	8	92	24	20	80	21	10*	90
Thresher	41	3	97	47	15	85	41	56	44	43	23*	77
Combine harvester	43	0	100	49	0	100	62	7	93	51*	3*	97
Any machine	96	12	88	96	32	68	97	81	19	96	40*	60
Farm size, range (hectares)	<0.1–0.9			1.0–3.2			3.3–33.6			<0.1–33.6		
Farm size, mean (hectares)	0.7			2.2			7.1			4.1		
Households (number)	110			111			108			329		
Dry Zone												
Two-wheel tractor	30	11	99	26	29	71	26	60	40	27	30*	70
Four-wheel tractor	50	0	100	44	0	100	54	10	90	50	4*	96
Thresher	39	1	99	34	2	98	22	10	90	33*	3*	97
Combine harvester	8	0	100	11	0	100	9	0	100	9	0	100
Any machine	80	4	96	72	9	91	79	22	78	78	11*	89
Farm size, range (hectares)	<0.1–1.2			1.2–2.8			2.8–21.7			<0.1–21.7		
Farm size, mean (hectares)	1.8			2.0			5.9			2.8		
Households (number)	339			282			315			936		

Source: MFSPP surveys.

Note: Interviews were conducted in mid-2016 in the Delta and in mid-2017 in the Dry Zone. The recall period for data presented in this table is the 12 months preceding each survey. "Use" is the share of crop-farming households that used the type of machinery per group, whether owned or rented. "Own" and "rent" are the shares of using households that owned or rented the type of machinery per group, conditional on use. The asterisk indicates that, for this parameter, there was a statistically significant difference between terciles at $p < 0.05$ (for at least one of the possible pairwise tests, T1 vs. T2, T1 vs. T3, or T2 vs. T3).

owners with relatively large landholdings obtain. Our findings suggest that, where outsourcing services exist, land consolidation is not a precondition for widespread uptake of even quite large agricultural machinery. We also find no evidence of accelerated land consolidation occurring as a result of the introduction of agricultural machinery. Such a process might be expected if only large farms could utilize these technologies and gained an advantage by doing so. In fact, average farm sizes in both zones are falling due to subdivision at inheritance (Belton et al. 2021; Boutry et al. 2017).

A vibrant informal private sector dominates the outsourcing services market. The rapid emergence of these small businesses reflects the existence of dense kin and community networks that serve as conduits for information (Faxon 2020). This has been magnified by the spread of mobile phone and internet communications, which accelerated at extreme speed between 2014 and 2020 (Belton et al. 2021). The extent and strength of informal social ties contrast with generally low levels of trust in strangers and government institutions as a result of Myanmar's repressive political history.

Although the government's Agricultural Mechanization Department (AMD) offers some machinery rental services, none of the households surveyed in the Delta reported using them, and only nine farmers in the Dry Zone did so, making up less than 1 percent of all machinery rentals by farmers. Machine rental by formal private businesses, such as machinery retailers, is also limited. This pattern seems to reflect the advantages that informal outsourcers with well-developed social networks in rural communities have in terms of flexibility and responsiveness, compared with centralized models of service provision.

Decentralized private service provision may provide other advantages. In a detailed study of green gram (mung bean) producers in Yangon, Okamoto (2008) found that farmers favored rental services provided by four-wheel tractor owners over those offered by AMD or the Myanmar Economic Holdings company, a large military-owned enterprise. This was because of the poor maintenance of machines from the latter two sources and the "negligence" of their operators, ascribed to the low wages the operators received.

Interzone differences in the form and extent of mechanization. Despite similarities across zones in the timing and pace of agricultural mechanization, important zonal differences in agricultural machinery use reflect variations in agroecology and associated crop choices. Paddy cultivation has undergone, by far, the most complete mechanization. The most pronounced interzonal difference relates to how tractors have been used as a substitute or complement for animal draft power. In areas of the Delta surveyed in 2016, machinery had almost wholly replaced animal traction in farming—94 percent of farming households reported using machinery for land preparation in the 12 months preceding the survey, while only 12 percent reported using draft animals (Table 7.3).

TABLE 7.3 Use by farm households of machines and draft animals, by activity and year

	Share of farm households (%)				
	2007/8 Using machine	2012/13 Using machine	2016/17 Using machine	2016/17 Using animal	Sample size
Land preparation					
Delta	35	72	98	12	329
Dry Zone	11	32	74	83	1,024
Harvesting					
Delta	5	10	57	1.5	329
Dry Zone	<1	3	12	2	1,024

Source: MFSPP surveys.

These findings contradict the traditional view that most farm households in Myanmar still rely on buffalo to plow paddy fields (Woods 2013). Soe and Kyaw (2019) report a similar recent shift from animal to machine traction in the uplands of southern Shan State. Based on a survey of maize and pigeon pea farmers, they found that machines had nearly replaced draft animals in land preparation, with around 80 percent of surveyed households using only machines for this purpose and 10 percent using draft animals.

A contrasting scenario prevailed in the Dry Zone in 2017, where widespread uptake of tractors coexisted with the continued use of draft animal power for land preparation by almost all farmers. Three-quarters (76 percent) of farm households reported using machines and draft animals, 22 percent relied exclusively on draft animals, and just 2 percent used machinery only (Table 7.3). This pattern appears to reflect differences in crop choice and soil quality between the zones. In scoping interviews, farmers indicated that, particularly when cultivating sesame and groundnut, they used tractors primarily to break up hardened soils during initial plowing and preferred animal power for subsequent harrowing and inter-cultivation.

The type of machinery used is influenced strongly by the dominant cropping system. Two-wheel tractors are deployed mainly in rice cultivation for puddling flood-irrigated soils, because the heavier four-wheel tractors tend to sink into the muddy ground. Four-wheel tractors are preferred for preparing land for planting rainfed crops on soils that require more power to break apart on first plowing. As a result, in the Delta, 73 percent and 21 percent of farm households used two- and four-wheel tractors, respectively, whereas in the Dry Zone, the corresponding shares were 27 percent and 50 percent.

Even more pronounced differences are found in harvesting and threshing. In the Delta, the use of machinery for this purpose is almost as widespread as its use for land preparation. Half of farm households (51 percent) surveyed in 2016 used a combine harvester, while 43 percent used mechanical threshers—that is, at least 90 percent of farms used machinery for harvesting or threshing, given that combines also thresh. In contrast, one-third of farm households surveyed in the Dry Zone reported using mechanical threshers for harvesting crops, and only 11 percent used a combine harvester. Phyo and colleagues (2019) report similar levels of combine harvester use, based on a survey conducted in 2017. They found that 55 percent of farm households in the Delta and 10 percent in the Dry Zone had used a combine harvester that year, up from 11 percent and 2 percent in 2014.

Nearly all crop-farming households in the Delta grow paddy, compared with only half in surveyed areas of the Dry Zone, and paddy occupies a much larger share of cultivated land in the former. To date, with the partial exception of green gram, there is little mechanized threshing and no mechanized harvesting of any crop other than rice in the two zones. As a result, the pool of harvesting and threshing machinery users is much smaller in the Dry Zone than in the Delta.

The extent of mechanization in paddy production varies by season in both zones. In the Delta, 19 percent of farm households used combines to harvest the monsoon paddy crop in 2015, compared with 35 percent of households that used combines during the following dry season.[1] In the Dry Zone, only 13 percent of paddy farming households used a combine during the monsoon season in 2016, compared with 41 percent of households that grew paddy during the following dry season (though far fewer households grew dry season rice).

Interseasonal variation is partly explained by the spatial concentration of paddy cultivation and harvesting services in irrigated or naturally well-watered areas, where large contiguous paddy areas give outsourcing service providers access to high concentrations of customers. Higher rates of combine harvester use during the dry season may also be linked to the ability to harvest and thresh paddy quickly, making it possible to plant the subsequent monsoon paddy crop in time. Respondents in the Dry Zone reported that combine harvesting could reduce the palatability and volume of rice straw used as fodder for draft animals, leading some farmers to be unwilling to use combines on

1 Most farm households in the Delta grow a monsoon rice crop followed by a post-monsoon pulse crop. In low-lying areas that are inundated by monsoon flooding, most households grow a single post-monsoon rice crop. Few households double-crop rice, and not all of these use a combine harvester in both seasons. The share of farm households using a combine harvester to harvest rice in any season is 51 percent.

monsoon paddy, which provides the bulk of the straw used as fodder (Mather and Belton 2018).

Supply-side trends

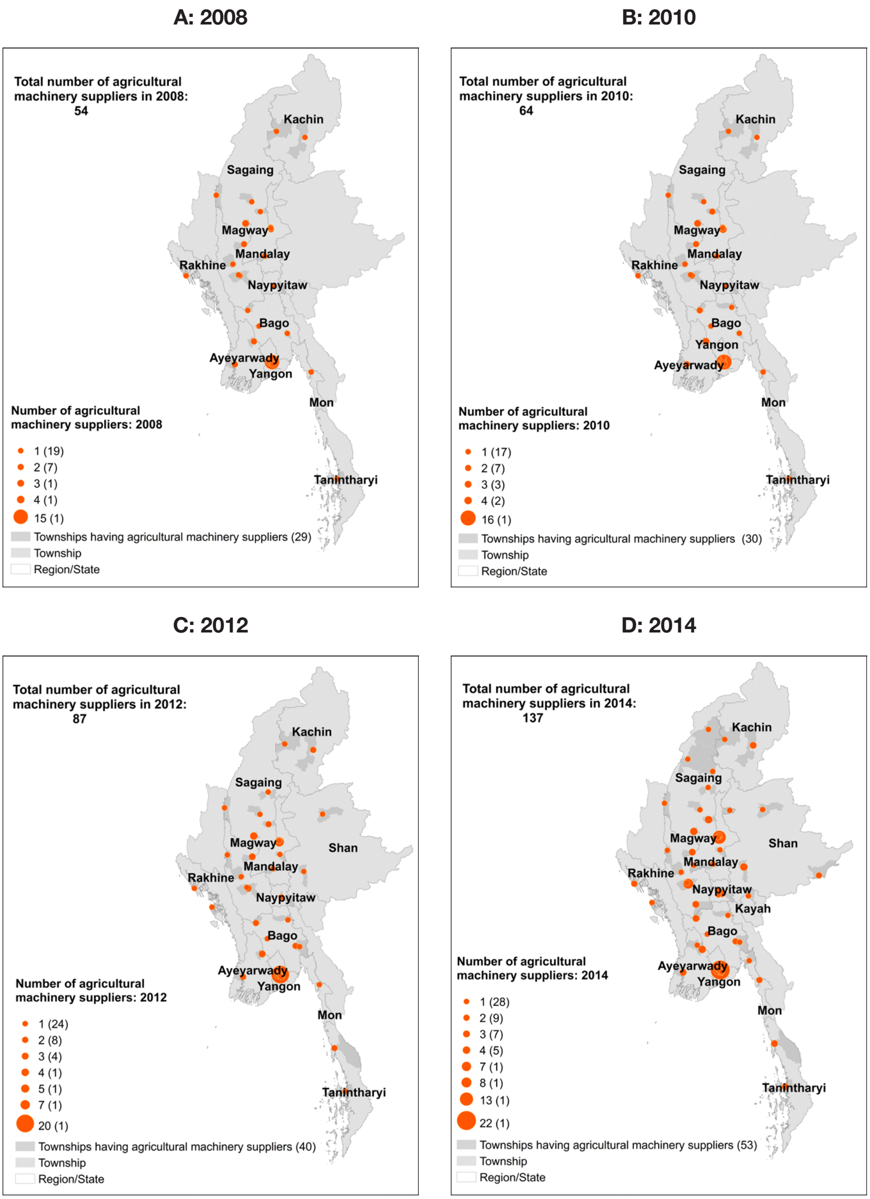
This section focuses on the supply side of agricultural mechanization, tracking the spatial and temporal spread of machinery supply businesses and growth and regional variation in machine sales.

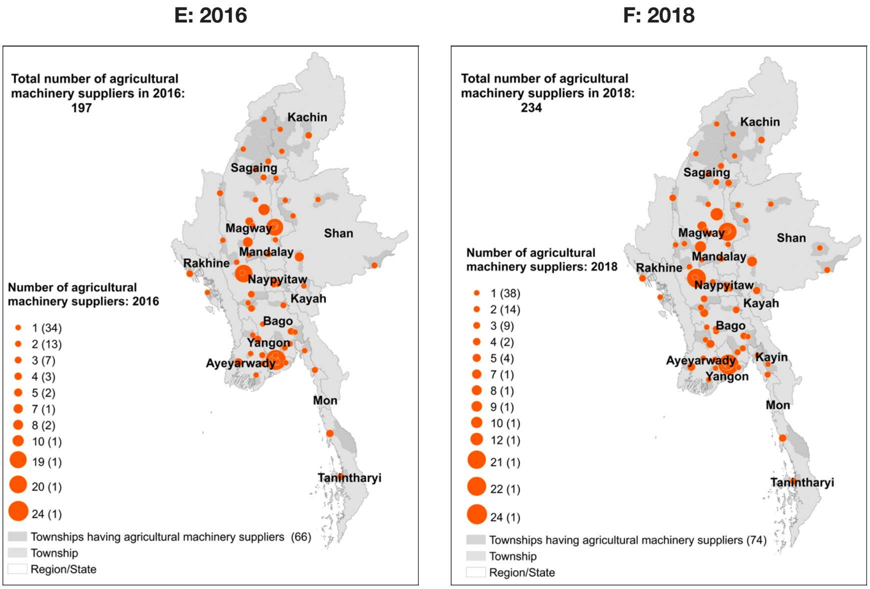
Spatial and temporal spread of machinery retailers. Machinery supply businesses were first established in urban centers adjacent to the "core" rice-growing regions that were the first to begin the process of mechanization. Over time, retail outlets have radiated outward to reach parts of the Dry Zone specializing in non-rice crops, finally extending to more "peripheral" zones in upland and border areas. The number of machinery supply outlets jumped 338 percent between 2008 and 2018, up from 72 to 315, while the number of townships that machinery retailers served rose from 36 to 88 (27 percent of townships in the country) (Figure 7.1). As a result, agricultural machinery has become locally available for purchase over progressively greater swathes of Myanmar, contributing to accelerating uptake. We recognize the potential for some "survivor bias" in our sampling methodology, as it was impossible to include enterprises that had gone out of business prior to the survey. However, given the extremely rapid growth of machinery retail businesses in the years immediately preceding the surveys and the close match between results in the supply- and demand-side studies, we are confident these trends are not inflated.

During the 1980s and 1990s, machinery retail businesses were concentrated in Yangon. The number of machinery retailers grew slowly during this period. From 2000 to 2010, their numbers increased gradually in the Delta, the Dry Zone, and southern Shan. However, machinery retailers remained concentrated in the Delta, especially in Yangon. The Delta accounted for more than half of all outlets during this time. The first machinery supply businesses outside of these three zones were established in 2006 in the Hills/Borders states of Mon, Tanintharyi, and Rakhine. New businesses opened in all zones from this time, resulting in the Delta's share of the national total of agricultural machinery retailers falling from 42 percent in 2012 to 34 percent in 2018.

The Dry Zone experienced an explosion in the number of machinery enterprises from 2015, as widespread uptake of agricultural machines advanced beyond pockets of irrigated paddy to rainfed areas dominated by pulse and oilseed production. Retailers opened branches in "new" hinterland areas to extend their customer base as markets for machinery in the country's

FIGURE 7.1 Location and number of machinery supply businesses over time, 2008–2018





Source: Belton, Win, Zhang, and Filipiski (2021), using data from MFSPP surveys.

TABLE 7.4 Machinery businesses by geographic zone over time, 2000–2018

	Share of businesses (%)						
Zone	2000	2003	2006	2009	2012	2015	2018
Delta	61	63	57	50	42	32	34
Dry Zone	14	20	24	29	34	43	43
Hills/Borders	25	18	19	21	24	25	23

Source: MFSPP surveys.

Note: Delta = Ayeyarwady, Bago, and Yangon. Dry Zone = Magway, Mandalay, Naypyidaw, and Sagaing. Hills/Borders = Kachin, Kayah, Mon, Rakhine, Shan, and Tanintharyi.

agricultural heartland started to mature. Numbers of machinery supply businesses in the Hills/Borders states also grew, though more slowly than in other zones, accounting for 23 percent of the national total in 2018. Mechanization in the Hills/Borders is concentrated in upland maize cultivation, for which two-wheel tractors and maize threshers are commonly used (Soe and Kyaw 2019) (Table 7.4).

Meanwhile, the machinery retail sector has become more concentrated over time. In 2003, retailers with a single outlet operated 38 percent of outlets,

TABLE 7.5 Total annual sales of surveyed agricultural machinery supply businesses in Yangon (2012–2016) and the Dry Zone (2013–2017)

	Number					
Machine type	2012	2013	2014	2015	2016	2017
Yangon						
Four-wheel tractor	275	420	870	1,662	3,200	—
Two-wheel tractor	4,959	6,450	7,457	8,772	13,824	—
Water pump	960	1,035	2,551	2,585	4,150	—
Engine/ dynamo	4,025	10,512	60,255	56,518	94,876	—
Combine harvester	0	40	237	955	2,372	—
Reaper	305	335	860	1,351	1,244	—
Thresher	0	30	220	167	46	—
Trawlerji	1,692	1,840	2,500	2,500	3,700	—
Dry Zone						
Four-wheel tractor	—	1,045	1,320	2,771	4,278	3,584
Two-wheel tractor	—	440	2,678	1,978	3,338	3,190
Water pump	—	110	155	130	171	146
Engine/ dynamo	—	480	2,690	2,002	1,969	2,672
Combine harvester	—	0	15	140	523	407
Reaper	—	10	10	229	248	273
Thresher	—	0	10	21	31	56
Trawlerji	—	5	263	345	349	553

Source: MFSPP surveys.
Note: — = data not available. NA = not applicable.

and retailers with 2–10 branches operated the remainder. By 2018, retailers with a single outlet operated only 16 percent of outlets, while retailers with more than 10 branches operated almost half—the largest operated 45 branches nationwide.

Composition of and growth in machine sales. Growth in sales by machine supply businesses between 2012 and 2016 occurred simultaneously with the upsurge in machine ownership reported in the previous section. The most rapid sales growth occurred between 2014 and 2015, when large numbers of new machinery supply outlets were established, particularly in the Dry Zone. More than one-third (37 percent) of all machinery supply businesses in the Dry Zone were established during these two years alone.

% change						
2012–13	2013–14	2014–15	2015–16	2016–17	2012–2016	2013–2017
53	107	91	93	—	1064	—
30	16	–28	18	—	179	—
8	146	–6	1	—	332	—
161	473	303	–6	—	2257	—
NA	493	303	148	—	NA	—
10	157	57	–8	—	308	—
NA	633	–24	–72	—	NA	—
9	36	0	48	—	119	—
—	26	110	54	–16	—	243
—	509	–26	69	–4	—	625
—	41	–16	32	–15	—	33
—	460	–26	–2	36	—	457
—	NA	833	274	–22	—	NA
—	0	2190	8	10	—	2630
—	NA	110	48	81	—	NA
—	5160	31	1	58	—	10960

The assortment of products stocked by machinery retailers matches regional customer preferences. For instance, four-wheel tractors were stocked by 95 percent of Dry Zone businesses, but only 44 percent of those in the Delta. Since 2012, small machines used in rice cultivation (water pumps, two-wheel tractors, and two-wheel tractor engines) have accounted for the bulk of sales for machinery retailers based in Yangon (Table 7.5). Sales of four-wheel tractors and combine harvesters grew particularly rapidly after 2014. Annual sales of combine harvesters by machinery retailers in Yangon increased nearly 6,000 percent (from an extremely low base) in four years, with 90 percent of sales occurring in 2015 and 2016. In the Dry Zone, four-wheel tractors and their attachments (disc plows and rotary tillers) are the most important items in terms of total sales. Dry Zone machinery supply businesses reported high, briskly growing sales of four-wheel tractors and their attachments throughout

2013–2017, roughly matching sales of two-wheel tractors. Sales of combine harvesters in the Dry Zone accelerated particularly rapidly from 2015 (Table 7.5).

By 2017, more retailers offered a wider assortment of agricultural equipment than ever before. At least 12 types of agricultural machines and equipment were available from Dry Zone retailers. In contrast, in the early 2000s, only engines, light trucks, and four-wheel tractors were sold. The number of businesses marketing each type of machine also increased sharply, with all items except trucks available from at least 10 surveyed businesses. Available brands of machinery also proliferated as retailers sought to differentiate themselves. For instance, from 2013 to 2017, the number of four-wheel tractor brands for sale grew from 6 to 24, while the number of combine harvester brands grew from 0 to 9.

However, the 2013–2016 boom in agricultural machinery sales appears to have peaked or plateaued in the Dry Zone in 2017. Sales of four-wheel tractors and combines by Dry Zone machinery retailers were 22 percent and 16 percent lower, respectively, in 2017 than in 2016.[2] This pattern was not yet apparent in Yangon at the time of the 2016 survey, however (Table 7.5).

Factors influencing mechanization

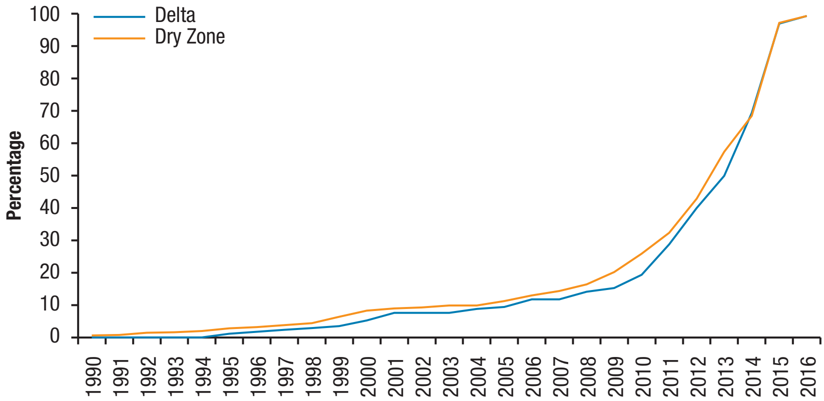
This section explains trends in farmer adoption of agricultural machinery with reference to key demand- and supply-side factors influencing adoption, including policies.

Structural transformation

We observe a strong correlation between the timing of rural–urban migration, rising rural wage rates, and the adoption of agricultural machinery in surveyed areas of Myanmar. The onset of agricultural mechanization coincides with an uptick in migration that began around 2010 and continued in parallel with rapid urbanization until 2020. Eighty percent of all individuals in surveyed areas of the Delta and Dry Zone who had ever migrated did so after 2010. In both zones, migration increased briskly but steadily from 2011 to 2014 before accelerating faster still. More than half of all reported migration in both zones occurred between 2013 and 2016 (Figure 7.2). Sixteen percent of households in surveyed areas of the Delta reported having at least one

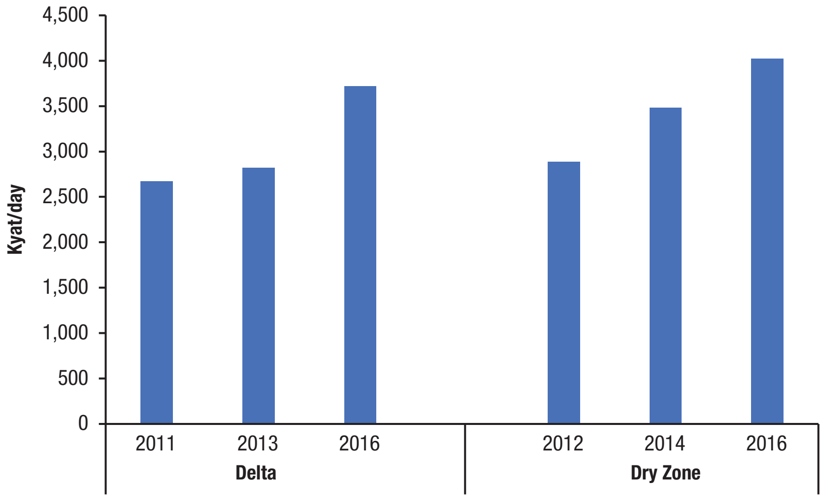
2 Sales figures were collected during December 2017, so they likely slightly underrepresent total sales for the full year.

FIGURE 7.2 Cumulative share of migrants from Delta and Dry Zone, by year of migration, 1990–2016



Source: MFSPP surveys.

FIGURE 7.3 Average daily wage rates for casual agricultural labor in the Delta (2011–2016) and the Dry Zone (2012–2016), kyat



Source: MFSPP surveys.

migrating member at the time of the interview. The figure for the Dry Zone was 24 percent. Other studies report similar figures (CHIME 2019; Filipski et al. 2021; Pritchard et al. 2017).

The average age of migrants when first migrating is in the early 20s, so they are concentrated disproportionately among the most economically active and productive segments of the labor force. This migration pattern resulted in a significant contraction in the pool of available agricultural workers during the period when the surveys were implemented, which our respondents mentioned frequently. In some cases, migrants' remittances provide money to purchase machinery or hire mechanization services (Faxon 2020).

Phyo and colleagues (2019) also report labor shortages at key times of the cropping calendar in both the Delta and the Dry Zone. They found that labor available for agriculture in these areas was insufficient to meet farms' requirements, estimating that farms double-cropping rice faced an average labor shortfall of 36 percent, while those growing rice followed by pulses faced a shortfall of 29 percent. They attributed these shortages to simultaneous increases in migration and nonfarm employment, noting that self-employment in nonfarm enterprises, services, and casual and salaried nonfarm work accounted for a substantial and growing share of employment in both areas.

These observations align strongly with results from MAPSA surveys, which indicate high levels of livelihood diversification and a proliferation of nonfarm enterprises in both the Delta and the Dry Zone over the same period as the upsurge in mechanization and migration. This pattern signals growing rural economic opportunities outside the sphere of agriculture and, with them, changing expectations, as nonfarm work is increasingly preferred to physical labor "under the sun" (CHIME 2019; Faxon 2020; Phyo et al. 2016). Improvements in access to post-primary education since 2011 have likely also reduced the supply of agricultural workers by delaying the age of first entry into the workforce. For example, in the rural Dry Zone, the share of 17-year-olds completing Grade 8 grew from 35 percent in 2010 to 60 percent in 2017 (Belton and Filipski 2019).

These changes appear to be responsible for a sharp increase in real agricultural wages. Recall data from our surveys show that real wages for casual farm workers (adjusted for inflation) increased by 37 percent in surveyed areas of the Delta from 2011 to 2016 and 39 percent in the Dry Zone from 2012 to 2016 (Figure 7.3). Hired labor is one of the largest categories of expenditure, even for small farms, amounting to between 20 and 30 percent of production costs depending on the crop. Almost all farms in the Delta (95 percent) and Dry Zone (93 percent) employ casual workers (Cho, Belton, and Boughton

2017; Mather et al. 2018). Increasing real wages, therefore, seems to have provided an important incentive for farmers to mechanize the most labor-intensive parts of their crop production where possible.

Timeliness, speed, drudgery, risk, and yields

Data from our survey of Dry Zone households point to a mix of benefits associated with mechanization beyond simple reductions in labor costs. These include (1) increased speed of operations and reduced drudgery, (2) enhanced timeliness of key activities, (3) improved ability to manage weather-related risks, and (4) reduced losses of grain during harvesting.

- Mechanization reduces the amount of time required to complete critical activities. Preparing 1 hectare (ha) of land for planting with draft animals takes an average of 31 hours, compared with 10 hours with a two-wheel tractor and 3 hours with a four-wheel tractor (Soe and Kyaw 2019). By shortening the duration of these tasks, mechanization reduces the amount of physically demanding work that members of farm households must perform. As the amount of hired labor and the opportunity cost of family labor that mechanized land preparation saves are quite small, the widespread uptake of machines for land preparation suggests farm households may consider their drudgery-reducing characteristics at least as important as pecuniary factors, such as lower expenses or higher margins (van der Ploeg 2013). A further advantage of mechanical tractors is that they require only occasional maintenance and outlay on fuel. In contrast, draft animals must be cared for constantly, with daily feeding, watering, and washing—requiring an average of 1.5 hours of labor each day. Fodder is often purchased, and hired labor and veterinary expenses may be required, equating to an average outlay of $58 per year by households owning draft animals (Soe and Kyaw 2019).
- Labor scarcity can make it difficult to marshal sufficient workers to perform time-dependent tasks. Some farmers seek to avoid this problem by offering advance wages to workers one to two months before harvest to guarantee their availability (Okamoto, Lwin, and Fujita 2021). Although this practice remains relatively common in the Delta and the Dry Zone, it can be difficult for farmers to raise sufficient funds to pay advances, so most workers are not contracted in advance. In contrast, our scoping interviews suggest that mechanization services can be scheduled some days or weeks in advance and that, particularly for harvesting, payment is often

made after crops have been sold, ensuring greater timeliness and reducing cash flow problems for farm households.

- Timeliness and speed of operations can facilitate risk management. In the Delta, timely harvesting of the monsoon rice crop is essential for farmers planting a post-monsoon pulse crop that relies on residual soil moisture. The timing of planting and harvesting is even more significant in the Dry Zone, where most farming is rainfed and weather patterns can be highly variable from year to year (Matsuda 2013). Excessive or inadequate rainfall early or late in the cropping cycle or heavy rain while the crop is drying cause sizable crop losses. One-quarter to one-half of Dry Zone farmers report weather-related yield losses for their major crops (Mather et al. 2018). Growers of dry-season paddy and groundnut who had used a tractor were less likely than those using only draft animals to report any pre- or postharvest crop losses, suggesting that mechanization may help moderate these risks. For example, 29 percent of dry-season paddy farmers who had used a tractor reported crop losses, compared with 40 percent of those who had not. Groundnut growers' shares were 16 percent and 33 percent, respectively.
- Farmers using combine harvesters report higher yields than those using mechanized threshers, and farmers using mechanized threshers report higher yields than those who thresh paddy manually. During the dry season, Dry Zone combine harvester users reported obtaining 640 kg more paddy per ha than did households practicing manual harvesting/threshing (a 19.5 percent yield difference). The yield gap between households using combines and those using mechanized threshers stood at 400 kg per ha, or 11 percent of the harvest (Mather and Belton 2018). Farmers interviewed during scoping research attributed these gains to reduced grain spillage during harvesting and threshing, implying higher realized yields through reduced waste rather than increases in biological productivity.

Financing and machinery prices

On the supply side, during the period covered by the surveys, increasing access to formal financial services made it easier for potential buyers to purchase agricultural machinery, while the real price of such machinery fell steadily following the removal of import restrictions. These developments placed agricultural machine ownership within the reach of a growing, though still relatively small, segment of the rural population.

At the time of the surveys, two main forms of consumer finance were available for agricultural machinery: (1) hire purchase loans offered by machinery retailers using their own working capital and (2) hire purchase arrangements offered by private banks and other commercial financial institutions in partnership with machinery retailers. Financing from banks helped overcome liquidity constraints for machinery retailers and their customers. Banking regulations prevent businesses from borrowing more than the value of their fixed assets, making it challenging for financial institutions to extend large volumes of credit, particularly for four-wheel tractors and combines, which cost between \$13,000 and \$31,000, depending on brand and country of origin. Under hire purchase arrangements offered by banks to customers, customers were vetted by machinery dealers, which served as guarantors to the bank. Customers made a down payment and repaid the remaining principal in installments with interest, usually over one to two years. Hire purchase loans thus removed the need for buyers to save the entire cost of a machine before making a purchase. Interest on loans issued by commercial lenders is capped at 13 percent per year. In contrast, informal lenders charge interest rates averaging around 5 percent per month (60 percent per year). Such terms make it unviable to fund machine purchases for either personal use or rental service provision, and respondents rarely reported using this source of credit.

Banks first began to offer hire purchase loans for agricultural machinery in 2013. The number of banks providing this type of finance increased quickly, from 5 in 2014 to 11 in 2017. Throughout this period, two banks, Yoma and Myanmar Citizens' Bank, dominated the provision of hire purchase finance. Yoma accounted for 41 percent of partnerships with machinery dealerships in 2014, rising to 48 percent in 2017, whereas Myanmar Citizens' Bank accounted for 23 percent of partnerships in 2014, remaining constant at 24 percent in 2017. The uptake of these financial services has been swift. Almost all (94 percent) machinery supply businesses surveyed in the Dry Zone in 2017 offered some form of hire purchase financing, among which 84 percent did so in partnership with banks. By 2016, hire purchase loans from banks financed most sales of combine harvesters and four-wheel tractors by retailers in Yangon (77 percent and 68 percent, respectively). Even higher levels of use were reported in the Dry Zone in 2017, where bank-supported hire purchases accounted for 98 percent of combine harvester sales and 62 percent of four-wheel tractor sales. In contrast, hire purchase finance direct from machinery retailers to customers accounted for just 5 percent and 2 percent of four-wheel tractor and combine harvester sales in Yangon in 2016, respectively, and 16 percent and 2 percent in the Dry Zone in 2017 (Table 7.6).

TABLE 7.6 Share of Yangon (2016) and Dry Zone (2017) machinery supplier sales, by source of finance and machine type

	Share of sales (%)		
Finance source	Combine harvester	Four-wheel tractor	Two-wheel tractor
Yangon			
Bank (hire purchase)	77	68	35
Dealership (hire purchase)	2	5	17
Customer (paid in full)	22	27	48
Dry Zone			
Bank (hire purchase)	98	62	74
Dealership (hire purchase)	2	16	17
Customer (paid in full)	0	22	9

Source: MFSPP surveys.

Over the same period, machinery—which is nearly all imported—became more affordable. This reflected the increased supply of machinery at competitive prices, primarily from neighboring China and Thailand, as well as Myanmar's policy of not levying tariffs on imports of agricultural inputs, including machines and machine parts. The real (inflation-adjusted) average cost of purchasing a water pump, as reported by households in the Dry Zone, dropped from \$800 in 2007 to less than \$300 in 2017, an average reduction of \$50 per year, while the cost of a two-wheel tractor dropped from nearly \$3,000 to well below \$1,000 over the same period. Households in the Delta reported similar figures.

Policies and interventions

Changes in the accessibility of machines and finance for machine purchases stem mainly from policy changes implemented during the period of reforms from 2011 to 2020. Donor-supported interventions played a complementary role.

Prior to 2012, private banks were not allowed to extend credit to farmers (OECD 2014). Relaxation of these restrictions played a critical role in enabling the provision of formal finance for machinery purchases. Myanmar's Farmland Law, passed in 2012, played a complementary role. This law made agricultural land use rights transferable, allowing the utilization of land use rights certificates ("Form 7") as collateral for formal loans. This change overcame an important obstacle to accessing finance, at least in lowland regions, where a high percentage of farm households possess formal title to the lands they occupy (Boutry et al. 2017). However, ownership and use of two-wheel tractors have increased rapidly in Shan, where most land is untitled and, thus, inadmissible for use as collateral for bank loans (Soe and Kyaw 2019). This suggests that, while likely contributing to the acceleration of the mechanization process, particularly for larger and more expensive machines, formal land titling is not a precondition for widespread mechanization (see Chapter 6 for more details).

Many banks offered hire purchase loans for agricultural machinery, but Yoma Bank dominated the provision of hire purchase finance, accounting for almost half of partnerships with surveyed machinery retailers in 2017. Yoma Bank's prominence was linked to a program initiated by one of Myanmar's main development actors, the multi-donor Livelihoods and Food Security Trust Fund (LIFT). LIFT allocated $18 million to Yoma in 2016 to serve as a buffer against any losses incurred by its hire purchase portfolio for financing agricultural equipment. This investment encouraged Yoma to reduce the size of down payments on agricultural machinery and increase the average duration of loans from 1 year to more than 2.5 years. Sales made under the scheme from 2016 to 2018 totaled $122 million, including more than 4,000 tractors and almost 1,000 combine harvesters (Yoma Bank 2019). This is equivalent to 86 percent of the four-wheel tractors and 103 percent of the combine harvesters sold by machinery retailers surveyed in the Dry Zone in 2016 and 2017 (Table 7.5).

The exemption of agricultural equipment and machinery from import controls, which began in 2012, had a particularly significant effect on the purchase of agricultural machinery. Imports of agricultural inputs, including machinery, were, in fact, exempt from import tariffs even before 2011. However, until 2012, they, along with many other categories of goods, were subject to strict controls by the Ministry of Commerce. The Ministry would issue import licenses only if companies could produce export receipts of equal value to the items imported, severely restricting the scope for large-scale trade (Htay 2016; WTO 2014).

Except for the LIFT–Yoma scheme, the initiatives listed above were part of wider policy reforms that did not seek specifically to boost agricultural mechanization. Their effectiveness can be contrasted with attempts to intervene directly in the provision of machine rental services and marketing. From 2010 to 2017, AMD invested heavily in purchasing agricultural machinery with the intent of providing rental services to farmers. Expenditure on machines and associated costs accounted for 18 percent of the total budget of the Ministry of Agriculture, Livestock, and Irrigation by the end of this period. Despite this large investment, AMD could meet only a fraction of the total demand for mechanization services, and the machinery AMD offered often did not include brands most preferred by farmers. Moreover, accessing services through AMD was reported to be more complicated and time-consuming than doing so through private providers, which are numerous, highly decentralized, and flexible in responding to customer needs. A report by the World Bank (2017, 63) notes that "very few farmers have access to AMD's rental services." This observation is supported by our survey in the Delta, in which no respondents reported having used AMD's machine rental services.

The Department of Cooperatives has also sought to accelerate mechanization by providing hire purchase finance arrangements, using a $100 million loan from a South Korean company to finance the purchase of agricultural machinery. Machines distributed under this agreement were manufactured by the company that provided the loan (World Bank 2017). According to several respondents, the scheme had a preferential four-year hire purchase term and a low rate of interest. However, the manufacturer failed to provide spare parts or after-sales repair services, and the equipment was poorly suited to local conditions. Demand for the machines, particularly combine harvesters, was somewhat limited as a result.

Crisis period from 2020

Mechanization service providers and machinery retailers have faced multiple crises since 2020. The COVID-19 pandemic and measures to contain its spread resulted in movement restrictions and reduced economic activity, leading to the closure of many private businesses. Meanwhile, the military coup has led to conflict and insecurity throughout the country, the exit of foreign investment, and disruptions in the banking and financial sectors. Global shocks resulting from rising fuel prices and measures taken by the military regime to control foreign currency reserves have compounded these issues.

This section presents the findings of rapid assessment phone surveys we developed to identify the impacts of COVID-19 and other shocks on mechanization service providers and equipment retailers.

Mechanization is particularly sensitive to restrictions on mobility and trade flows. The economic viability of service providers, as capital-intensive operations, is highly sensitive to capacity utilization, which generates the cash flow needed to repay loans, import capital goods, and hire machine operators. Meanwhile, the business operations of machinery retailers can be particularly sensitive to bottlenecks in trade flows and internal logistical disruptions that affect their inventory. Given the close linkages between service providers and machinery retailers, the financial and logistical challenges that each face can have repercussions for the other.

Movement restrictions

The COVID-19 pandemic prompted movement restrictions within Myanmar to prevent the spread of the virus. These restrictions were non-uniformly implemented at the local government level and included measures such as a mandatory 14-day quarantine to enter a village tract or township. In November 2020, approximately three-quarters of machinery retailers surveyed reported disruptions to their operational logistics, with one-third stating that they were unable to deliver on orders because of business closures or movement restrictions (Takeshima, Zone, and Masias 2020a). Similarly, for approximately three-quarters of mechanization service providers, operations were restricted to the township (Takeshima, Zone, and Masias 2020b). While tractors tend to operate within their locality (IRRI 1983; Takeshima et al. 2015), other machines, like combine harvesters, need to operate more regionally to be cost-effective (Diao, Takeshima, and Zhang 2020; Zhang, Yang, and Reardon 2017).

COVID-related movement restrictions had eased by January 2021, but the insecurity that followed the military coup in February 2021 had similar effects. Local authorities implemented arbitrary rules such as curfews, and security checkpoints were set up throughout the country. Because mechanization service providers typically travel at night, reserving the daytime for servicing farms, the threat of harassment, rent-seeking, and risk to personal safety served as deterrents. In July 2022, 93 percent of tractor service providers and 59 percent of combine harvester providers surveyed were restricted to the township level (MAPSA 2021).

Trade flows

The disruptions to international trade as a result of the pandemic had negative implications for the availability and cost of machines, attachments, and spare parts. In January 2021, 45 percent of machinery retailers surveyed reported a decline in the availability of agricultural equipment, with 30 percent reporting price increases for the equipment available. These retailers attributed the lower availability and higher prices to a combination of low levels of equipment imports, a reduction in local production of manufactured parts, and restrictions on the movement of equipment. Consequently, by January 2022, more than 50 percent of mechanization service providers surveyed reported lower availability, and 100 percent reported higher prices for agricultural equipment.

Reduced availability and higher prices of agricultural equipment negatively affect the provision of mechanized services, likely leading to higher costs, lower revenues, and delays in service delivery. It is less clear what the impacts are on machinery retailers, as higher prices can reduce the likelihood of reduced revenues. However, retailers are likely to face increasing challenges in recovering loans from buyers or increased transaction costs owing to disruptions in their logistics or because they have to service more distant buyers (Takeshima et al. 2021).

These supply-side challenges are likely to worsen. In July 2022, the military regime restricted all imports, including those of machinery and spare parts, as part of efforts to control foreign exchange reserves. Moreover, the Myanmar kyat has depreciated approximately 50 percent since the military coup. This is all being compounded by the global increase in fuel prices due to the Russia–Ukraine conflict.

Financial outlook

These businesses have a gloomy outlook for the short term. Approximately 90 percent of service providers and 73 percent of machinery retailers expected their revenues in 2022 and 2021, respectively, to be lower than in 2019, with 97 percent of service providers expecting their costs to increase in 2022. Meanwhile, both groups reported reduced demand. Ninety percent of machinery retailers surveyed reported year-on-year reductions in agricultural equipment sales from 2020 to 2021, including a significant number indicating sales reductions of more than 50 percent. Similarly, approximately three-quarters of mechanization service providers reported year-on-year reductions in demand for services from 2020 to 2021 and again from 2021 to 2022. In July 2022, less than 10 percent of service providers reported having no financial challenges.

In April 2020, the democratically elected government introduced the COVID-19 Economic Relief Plan (CERP), intended to mitigate the economic impacts of the pandemic. This plan included loans for small and medium enterprises, which mechanization businesses initially sought to cope with the financial challenges they faced. However, CERP disappeared after the military coup, and businesses that had received loans were asked to repay them right away. The uncertainty created by the political situation made lenders less willing to restructure loans or accept late payments. While mechanization businesses used other means to cope, such as the sale of assets, personal loans, and other sources of income, the prolonged crises largely exhausted many of these means.

In July 2022, 43 percent of tractor service providers and 59 percent of combine harvester service providers surveyed reported knowing other service providers whose machines had been repossessed since the beginning of the COVID-19 outbreak—an increase of more than 20 percent from the year before. Farmers have also made fewer capital investments since the beginning of 2021, with only 3.2 percent of all two-wheeled tractor acquisitions and 3.8 percent of all four-wheel tractor acquisitions made in this period.

Conclusions

We draw the following conclusions from the analysis presented above. We find many similarities between Myanmar and other Asian countries where rapid agricultural mechanization has occurred. Key elements include tightening rural labor markets linked to urban growth and rural out-migration and expanding rural nonfarm employment in an agrarian context where large numbers of small farms are already well integrated into markets, including the market for farm labor. These changes tend to come bundled together with, and to be reinforced by, the development and expansion of rural transport and communications infrastructure, electrification, and access to education, and they contribute to innovation. This is especially evident in the case of rice harvesting, leading to cost savings or the release of family labor for other work.

However, a variety of demand-side factors also contribute to the appeal of mechanization for farmers. Mechanization is associated with quicker and more timely planting and harvesting. These advantages may assist farmers in managing risks that become more pronounced in a context of labor scarcity and climate variability. A further and somewhat overlooked aspect is the reduction in physically demanding work that farm households must perform, including caring for draft animals, in a setting in which agricultural work is increasingly viewed as undignified (Faxon 2020). Further, with the growth in outsourcing services and mobile communications, the convenience of summoning a machine operator by phone, rather than contacting and overseeing multiple casual workers, may provide as significant an incentive to use machines as a purely economic calculus. Rather than representing a single transformational change, mechanization's broad appeal to farm households seems to result from an accumulation of incremental, complementary advantages.

On the supply side, rapid mechanization has coincided with the growth in decentralized, self-organized, private outsourcing services provided primarily by rural machine owners. Mechanization on such a wide geographic scale within such a short duration, in an agrarian setting comprising mainly small and medium-sized farms, would likely have been impossible without the emergence of these actors. Services provided are tailored to the requirements of this client base, making machinery accessible to farms of all sizes at prices similar to or below those paid for manual labor or animal traction. Machine owners and outsourcers have benefited from the proliferation of agricultural machinery retailers throughout all major agricultural zones. Retailers have been enabled by a lack of barriers to the import of agricultural machinery and spare parts. Coupled with Myanmar's location bordering China and Thailand—both major agricultural equipment manufacturers—this ensures direct access to a range of relatively inexpensive "off-the-shelf" technologies developed to suit similar agrarian conditions.

Extremely high uptake levels within a short period in varied agroecological settings strongly suggest that farmers find machines useful and that the modalities by which they are accessed are appropriate to the contexts in which they operate. While mechanization alone may not be sufficient to guarantee the long-term viability of small farms, these farms would face greater difficulties responding to the challenges of labor scarcity, rising rural wages, and climate variability if they could not access machinery on demand. Importantly, while machine rental services may offer a pathway to accumulation for the larger farms that typically operate such businesses, our results do not suggest a zero-sum game in which smallholder users of these services are disadvantaged.

The most critical supply-side intervention was the liberalization of import restrictions on multiple categories of goods, including agricultural machinery. The lack of tariffs on imported agricultural equipment and spare parts is also helpful but less fundamental than the ability of retailers to import equipment on demand. Myanmar's location among countries that manufacture and export large quantities of relatively low-cost agricultural machinery of appropriate design has also contributed significantly to the rapid uptake of farm machines.

The decision to allow banks to offer hire purchase loans was a key policy change that facilitated access by farmers and agricultural machinery retailers to substantial amounts of formal credit. This affected both the demand side and the supply side, as machine owners are often simultaneously customers of machinery retailer businesses and providers of outsourcing services. Amendment of the Farmland Law to enable land use rights certificates to be used as collateral for bank loans was complementary to this move. These changes have been particularly consequential for large, expensive machines, such as combine harvesters and four-wheel tractors, and helpful but not a precondition for the uptake of smaller machines, such as two-wheel tractors, which have become increasingly affordable over time.

Broad macro-scale policy interventions aimed at enhancing the enabling environment have tended to bring about bigger responses than those specifically designed to promote agricultural mechanization. A notable exception is the LIFT–Yoma loan guarantee scheme, which accelerated an ongoing process of machine acquisition by lowering barriers to loan access. These more general efforts contrast with the limited success of attempts to intervene directly in machinery supply via public–private partnerships or direct provision of rental services. It is worth reiterating that very few farmers access mechanization via state-owned hire centers, even though significant resources have been spent promoting such schemes.

Before the crises, the loosening effect of extremely rapid mechanization on labor markets was offset by high rates of migration and growth in nonfarm work. The combination of these processes resulted in continued pressure to push up rural wages across the country—even as opportunities for casual wage labor in agriculture declined with increased uptake of machines by farmers, new economic opportunities created jobs for those displaced in agricultural labor markets, to the benefit of those workers (Belton and Filipski 2019).

Contrary to expectations, the growth of agricultural mechanization has continued apace since 2020 despite the severity of the economic downturn (MAPSA 2023). Rural labor scarcities have intensified as many rural areas have been depopulated by conflict and internal displacement, and migration to urban areas and abroad has accelerated as a strategy to mitigate economic hardship and escape political oppression. The adoption of labor-saving technologies, including mechanized harvesting, direct seeded rice, and herbicides, has grown steadily in response. In contrast, the use of yield-increasing technologies, including fertilizer, improved seeds, and transplanted paddy, has declined (MAPSA 2023). This scenario suggests that coping with labor scarcity is now a higher priority for most farmers than raising crop yields and implies that mechanization will become even more important in helping labor-constrained smallholders continue farming.

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Chapter 8

CROP PRODUCTION: AN ENGINE IN NEED OF AN UPGRADE

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According to the Myanmar Living Conditions Survey (MLCS) undertaken in 2017, 54 percent of rural households and 8.4 percent of urban households earn some of their income from crop farming (CSO, UNDP, and World Bank 2020). As seen in Chapter 2, crop production has important value-added and employment linkages upstream and downstream from farms, including in fertilizer and chemical input supply, mechanization services, transport, processing, wholesale and retail distribution, and exports. Crop production also provides the majority of the nation's calorie intake as well as raw material for processed animal feed. However, as Chapter 3 shows, with maize as the one exception, the crop sector itself has not grown in recent years due to decades of underinvestment in agricultural research, limited transport infrastructure, and highly variable prices for export crops. This chapter provides a more detailed picture of the spatial distribution of crop production and production technologies, which is relevant to the discussion in Chapter 18 on regional variations in rural livelihoods.

The key decision-makers in Myanmar crop production are smallholder farmers who gain their livelihood from multiple economic activities on and off the farm. They allocate their limited time and resources in an environment characterized by high levels of uncertainty in weather and economic conditions, especially crop prices. Within the crop production subset of family economic activities, their choices depend on agroecological conditions, access to land and labor for farming, knowledge of and access to technology, access to financial resources, expectations of market prices, and perceptions of risk. Put simply, crop production is a very difficult juggling act.

Government support for crop production has often been ineffective. The rice subsector is a classic example. Here, large public investments in irrigation and seed production to ensure self-sufficiency have often been undermined by draconian marketing policies, such as forced quota sales at low prices (Boughton et al. 2020a). By 2013, most of these restrictions had been lifted, but they left many farmers indebted. Other crop sectors, such as pulses, maize, and horticultural crops, thrived (in a relative sense) because of government neglect. However, as pointed out in Chapter 3, limited public investment in agricultural research and extension and in transport and export logistics infrastructure has held them back.

This chapter has four objectives. First, we describe the composition of the crop sector and general trends over time—data limitations do not permit anything more precise. Second, we describe how a range of constraints to crop production—related to climate, technology, markets, and policies—interact to result in stagnation. Third, we consider how the military coup has affected farm households and crop production. In conclusion, we review the investments and policies necessary to make crop production a more viable enterprise in the small farm household portfolio over the long run. This chapter also provides links to other chapters in the book that explore in more detail specific drivers of (or influences on) crop production, such as mechanization.

This chapter does not aim to be comprehensive. We include all crops that make a major contribution to consumption, smallholder incomes, and value-added processing: rice, pulses, oilseeds, maize, horticulture, coffee, and tea. We omit others that are potentially interesting but of limited significance to agrifood system development, including cotton, palm oil, and rubber. The next section provides a brief overview of Myanmar's agroecological zones (AEZs) and cropping patterns, noting the significance of climate change. We then unpack the technology–markets–policy nexus affecting specific crop subsectors before presenting conclusions.

Agroecologies, climate change, and cropping patterns

Four AEZs are typically distinguished in Myanmar: Dry Zone, Hills and Mountains, Delta, and Coastal Zone (Figure 8.1). Rainfed agriculture is still the primary livelihood for most rural people (IMWI 2015). However, growing rainfed crops has risks: access to water for irrigation is critical to reducing these risks and expanding the production options available to farmers (Rosegrant, Xie, and Valmonte-Santos 2018).

The Dry Zone of central Myanmar covers roughly one-third of the country's cropping area and is the most water-stressed of the four zones. The rainfall pattern is bimodal due to a July dry spell during the May to October monsoon season (Herridge et al. 2019). The zone's climate has changed noticeably over the past two decades: the same amount of rain now falls on

FIGURE 8.1 Map of Myanmar's states, regions, and agroecological zones

Source: CSO, UNDP, and World Bank (2019).

one-third as many days as before. The irregularity and intensity of rainfall in the Dry Zone leads to both drought and flooding within a single season (Mather et al. 2018). In the monsoon season, rice is grown as a rain-fed crop, often with supplementary irrigation. The post-monsoon rice crop is dependent on irrigation. Other crops commonly grown in the Dry Zone include pulses, groundnut, sesame, and sunflower. Significant investments in gravity and pump irrigation expansion schemes were undertaken in the Dry Zone to increase paddy production, particularly in the 1990s (Boutry et al. 2017). However, the potential of irrigation to contribute to increased crop production has been undermined by drought, reducing reservoir stocks in the case of gravity irrigation. Moreover, pump irrigation in locations with sandy soils has often proven unprofitable.

The Hills and Mountains AEZ covers roughly one-fifth of Myanmar's agricultural land area. The zone surrounds the Dry Zone to the west, north, east, and southeast and borders India, China, Lao PDR, and Thailand. Adequate rainfall and moderate temperatures allow for diverse cropping patterns in the Hills and Mountains, including maize, tea, coffee, horticultural crops, and vegetables. However, the cultivation of annual crops on steep slopes incurs a high risk of erosion.

The Delta lies south of the Dry Zone and covers roughly one-third of Myanmar's land area. Until the late 1920s, the Delta provided farming opportunities for households that the colonial administration recruited to cultivate newly cleared agricultural lands (Boutry et al. 2017; Brown 2012; Vicol and Pritchard 2021). The AEZ has a humid tropical climate, with heavy rainfall during the May to October monsoon season. Rice is the main monsoon crop, with pulses grown on residual moisture in the post-monsoon season. Maize and vegetables can also be cultivated in low-lying areas and riverbeds as floodwaters recede. Yet, even within the Delta, there is a range of rice-growing environments. This is due to saline intrusion in the southern estuarine areas, deepwater flooding, and lowland flooding. The lower half of the Delta is especially vulnerable to cyclones, which can generate devastating tidal surges.

The Coastal AEZ contains the two coastal areas of Myanmar: Rakhine State to the west bordering Bangladesh and Tanintharyi Region to the southeast bordering Thailand. These areas contain coastal strips and mangrove areas, with lowland and upland ecologies further inland. Like the lower Delta, the western part of the zone is prone to cyclone and storm surge flooding, aggravated by the conversion of mangroves to rice cultivation or shrimp farming (San 2018; Soe, Thant, and Htun 2018). Tanintharyi, a thin strip of land and one of the least populated regions in the country, holds nearly one-third of the country's private agricultural concessions, particularly for oil palm and rubber (Byerlee et al. 2014; Woods 2015). Relatively low rainfall makes Tanintharyi only marginally suitable for oil palm production, however.

Crop sector characteristics and drivers

This section focuses on the production of major crops: rice, pulses, oilseeds, maize, horticulture (fruits and vegetables), and coffee and tea. As seen in Chapter 2, each of these crop subsectors contributes to economic well-being in different ways, such as through domestic food supply, diet quality (directly or indirectly through livestock feed), export earnings, and potential for downstream value addition. As indicated in Chapter 3, the military coup of February 2021, combined with a global surge in fuel, fertilizer, and vegetable oil prices, has resulted in multiple disruptions for the crop sector. The rapid depreciation of the Myanmar kyat, combined with import restrictions to preserve foreign exchange, has magnified the effects of international price changes on local price increases. To reduce the budgetary cost of imported supplies, Myanmar's Central Bank has required agricultural exporters to convert foreign exchange earnings at an artificially low rate, effectively taxing export crops such as rice and pulses. This section distinguishes these (hopefully) short-run economic shocks from longer-term structural factors.

Other shocks directly attributable to the coup are conflict and displacement. The Dry Zone, especially in Magway and Sagaing Regions, has seen widespread destruction of entire villages by the military. Conflict has also affected parts of the Hills and Mountains AEZ, especially Chin State in the west, Kachin State in the north, and Kayah State in the east. While the humanitarian costs of conflict—loss of life and livelihoods, health and social costs of displacement—are far greater than the costs of the loss of crop production (see Chapter 5), the effects of the latter are increasing over time. By the first quarter of 2023, 27 percent of farmers in a nationally representative survey considered their situation insecure or very insecure, 23 percent considered movement to be unsafe, and almost 9 percent had fields they could not use for cultivation (MAPSA 2023a).

Rice

There is no doubt about the central role of rice in Myanmar's rural culture as well as its economy. The United States Department of Agriculture (USDA) projected rice production of 12.35 million tons (milled) in 2021/22, consumption at 10.25 million tons, and exports at 2.2 million tons, implying a small reduction in ending stocks (USDA 2022a). Myint and colleagues (2016) estimated average domestic rice consumption to be 155 kg per capita, providing 51 percent and 62 percent of urban and rural calorie consumption, respectively. The World Bank estimated that rice accounted for just over half (52 percent) of agricultural GDP in 2016 (World Bank 2019). Rice has important multiplier effects in the economy, as approximately two-thirds of total paddy production is sold (Chapter 10), and rice milling accounts for 57 percent of manufacturing value added (MOPF and UNU-WIDER 2017).

Spatial distribution of rice production. According to the MLCS, 60 percent of farm households nationwide grew paddy in 2017. The 7.15 million hectares (ha) planted represents 36.5 percent of the country's total crop area (including permanent crops) and 43.6 percent of the annual cropped area. Estimates from the Ministry of Agriculture, Livestock, and Irrigation (MOALI) are similar. Almost 4 of every 5 acres (79 percent) of paddy were grown during the monsoon, and the remainder in the post-monsoon season (commonly referred to as summer paddy). The total area planted appears to have been relatively stable over the past decade, although the area planted in the post-monsoon season varies from year to year, depending on the availability of irrigation water. While MOALI invested heavily in dams during the 1990s, field-level water distribution and management systems have proven inefficient (World Bank 2017).

The spatial distribution of rice production is necessarily related to agroecological conditions, given the crop's high demand for water. Lowland areas account for 68 percent of monsoon cultivated area and submerged and deepwater rice for 13.5 percent, while upland, seawater intrusion, and drought-prone areas account for the remainder (Mon, Yamamoto, and Aung 2019). Just over half (52 percent) of the monsoon paddy area cultivated is in the Delta, where rainfall is highest, a further 23 percent in the Dry Zone (often grown where irrigation is available), 16 percent in the Hills and Mountains, and just 9 percent in the Coastal Zone. Summer paddy production reflects spatial patterns in (largely) public irrigation investment: the Delta accounts for 60 percent and the Dry Zone 30 percent of summer paddy.

Rice production technology and yields. USDA estimates that yields in Myanmar average 2.9 metric tons per ha (t/ha). While these yield estimates are much lower than those reported by MOALI, they are consistent with estimates of total use (domestic consumption, exports, and stocks).

Paddy yield is lower for the monsoon season crop than for the post-monsoon season crop by approximately 1 t/ha, as a result of fewer sunlight hours and a high share of area planted to photoperiod-sensitive varieties adapted to deeper water during the monsoon. Many of these belong to a group known as Pawsan varieties, whose grain attributes and aroma Myanmar consumers prize highly. Summer paddy has a higher yield potential because of longer sunlight hours and the use of improved Emata varieties with determinate (fixed maturity period), short straw length, and fertilizer-responsive characteristics. No accurate information is available on the level of adoption of improved varieties. However, the absence of any noticeable trend in paddy yields over the past 15 years suggests that, despite the release of many approved varieties by the Department of Agricultural Research, low farmer access to improved varieties is a constraint to paddy productivity growth.

A high proportion of paddy fields are plowed using two- or four-wheel tractors, although oxen are still widely used for leveling prior to dry seeding or transplanting. Since 2015, there has been a rapid increase in the availability and use of combine harvesting services (see Chapter 7). Combine harvesting dramatically reduces labor requirements and enables farmers to remove their crop from the field quickly once grain maturity is reached. This reduces the risk of spoilage from late monsoon rains (or, in the case of summer paddy, early monsoon rains). Combine harvesting of monsoon paddy also allows for earlier planting of post-monsoon crops that depend on residual soil moisture, especially pulses, thereby raising their yield potential.

Mechanization is not the only source of labor savings in rice production. In response to increased labor costs, broadcast seeding has become increasingly popular in place of transplanting, even though more seed is required for weed suppression and the higher seed rate depresses yield potential due to reduced tillering.

Fertilizer is widely used for paddy production but at relatively low intensity. Compound fertilizers containing a mix of nitrogen, phosphorus, and potassium macronutrients are recommended at planting time for root development and plant growth. Nitrogen fertilizers, notably urea, are applied during the grain formation phase. National average fertilizer application rates were 55 kg per acre in the 2021 and 2022 monsoon seasons—a median rate of just one 50 kg bag per acre (MAPSA 2023a). Potential returns to fertilizer are much higher in the post-monsoon season under irrigation because of more sunlight hours and the ability to use more fertilizer-responsive varieties. Myanmar's irrigation infrastructure is very poor in terms of water control at plot level, leading to inefficiency in water use and making it impossible to use techniques such as alternate wetting and drying that reduce greenhouse gases.

Perhaps surprisingly, only half of all paddy farmers sell to the market, and just 20 percent of producers account for 80 percent of paddy sales (Chapter 10). This pattern reflects the unequal distribution of cropland among farm households, reinforced by transport infrastructure constraints to market access.

Effects of the coup on paddy production and marketing. The military coup has had significant effects on rice production, as exchange rate depreciation has multiplied the impact of global increases in fuel and fertilizer prices, as well as the value of paddy. Estimates of the effects vary spatially and by information source. A survey of input retailers found that urea and compound fertilizer prices were 91 percent and 75 percent higher, respectively, in the 2022 monsoon season compared with a year earlier, leading to reductions in fertilizer sales (MAPSA 2022b). Tractor plowing and combine harvester services also increased in price by 66 percent and 50 percent, respectively, in the 2022 monsoon season compared with a year earlier (MAPSA 2022c).

Rice production during the 2021 post-monsoon season was estimated to be 25 to 40 percent lower than average and 13 percent lower than average in the 2022 monsoon season. This decline was attributed to reductions in area planted and higher input costs, especially for fertilizer (ADPC 2022; MAPSA 2023a).

A nationally representative survey of farmers conducted in early 2023 found that postharvest paddy prices were 81 percent higher on average in the monsoon season of 2022 compared with a year earlier (MAPSA 2023a). The increase in paddy prices reflects the combined effect of a 22 percent increase in international rice prices and a 46 percent depreciation of the Myanmar kyat for agricultural exports. Prices for paddy would likely have increased even more if it had not been for Myanmar's Central Bank policies that require exporters to convert 65 percent of their foreign exchange earnings at the official exchange rate.[1] The policy has a similar effect on farm paddy prices as that of a rice export tax. The implicit export tax rate was 19 percent between January and June 2023, rising to 30 percent by December 2023 as the depreciation of the Myanmar kyat led to diverging parallel and official exchange rates over the course of the year.

1 Rice millers with foreign ownership have not been subject to the same restriction, resulting in tension between domestic and international milling companies.

Pulses

After paddy, pulses and beans are the second most important crop group in terms of area, production, and value. More than 60 types of pulses and beans are grown across the country. Black gram, green gram (mung bean), chickpea, and pigeon pea are the "big four" among pulses, with butter bean, sultani, sultapya, lima bean, and kidney bean also important. According to traders, most of the production of the big four (except for chickpea) is exported, generating between $1 billion and $1.8 billion in foreign exchange earnings per year. India is the largest market, but unpredictable import quotas, asymmetric market information, and segmentation of domestic and international traders lead to high levels of price uncertainty (Boughton, Haggblade, and Dorosh 2018).[2]

Domestic consumption of pulses occurs in many forms. Flour made from a range of pulses is used for noodle production; chickpea flour is used widely in traditional dishes; lentils are boiled for soup; steamed cowpeas and garden peas are consumed with rice for breakfast; and fried beans are used in salads. Fried sprouted pulses are also used as a snack. Yet, despite the wide variety of forms in which pulses are prepared, the quantities consumed are small relative to their nutritional value as a source of protein, vitamins, and dietary fiber.

Spatial distribution of pulse production. According to the MLCS, 32 percent of farm households nationwide grew pulses in 2017. However, in contrast with the MLCS estimate of 5.32 million ha planted, the MOALI estimate for the same year was 4.66 million ha, decreasing to an average of 4 million ha for 2019/20 and 2020/21 (MOALI 2022).[3] USDA estimates of pulse cultivated area are close to MOALI estimates (USDA 2021). The decrease in area cultivated in recent years is due to a reduction in the cultivation of black gram and pigeon pea, for which the dominant market, India, is unstable because of its import quota policies. Approximately 70 percent of pulses are grown on residual moisture during the post-monsoon season, primarily in the Delta; most of the remainder is grown in the monsoon season in the Dry Zone. The Hills and Mountains account for less than 5 percent of the planted area. Black gram and green gram are the most common pulses in the Delta, while chickpea, green gram, and pigeon pea are most common in the

2 As an example of unpredictable policies, at the end of March 2022, after the peak marketing period for post-monsoon pulses in Myanmar, India's Directorate General of Foreign Trade lifted all quota restrictions on the import of black gram and pigeon pea for one year.

3 The geographic distribution of pulse production in the MLCS data suggests that the survey instrument may have conflated pulses with oilseeds, resulting in an overestimate of pulse area and an underestimate of oilseed area planted.

Dry Zone. Pigeon pea is also common in the Hills and Mountains as a rotation crop with maize.

Pulses production technology and yields. Production technology varies by AEZ, type of pulse, and whether it is managed as a sole crop or an intercrop. In the Delta, pulses are grown as sole crops in the post-monsoon season on residual moisture after the monsoon paddy crop. The introduction of tractor plowing and combine harvesting has greatly helped farmers, who can now plant early to maximize the use of residual soil moisture. In the Dry Zone, pulses are grown mainly in the monsoon season, often as intercrops.

Yellow mosaic virus is a serious disease of green gram and black gram. MOALI's Department of Agricultural Research has released resistant varieties to counter the threat. A concerted effort has also been made to promote improved varieties of chickpea. Pulses are also notoriously susceptible to pests, especially in the post-monsoon season. Hence, insecticide is the main purchased input cost besides tractor plowing services.

According to MOALI, average yields are 1.4 t/ha for black gram and chickpea, 1.3 t/ha for green gram, and 1.2 t/ha for sole crop pigeon pea (MOALI 2022). A community survey in the Dry Zone reported average yields of only half these levels: 0.62 t/ha for green gram and 0.55 for pigeon pea (Mather et al. 2018). Yields at the household level for chickpea in 2017, 0.64 t/ha, were also less than half the MOALI reported average.

Effects of the coup on pulse production and marketing. As noted, the concentrated nature of Myanmar's pulse exports makes them vulnerable to price uncertainty, aggravated by unpredictable import quotas imposed by India. The coup has amplified marketing uncertainty. Nevertheless, the large increases in fertilizer prices, combined with labor shortages, appear to have resulted in an increase in the pulse crop area at the expense of rice production (MAPSA 2023b). However, any expansion of pulse crop area could be offset by yield reductions due to higher costs resulting in lower use of fertilizer and insecticides: the prices of the latter increased by 38 percent between mid-2021 and mid-2022 (MAPSA 2022f).

In August 2022, a survey of agricultural traders with good coverage of pulse-growing areas found that chickpea prices were 32 percent higher and green gram prices 25 percent higher than a year earlier (MAPSA 2022a). A nationally representative survey of farmers in the first quarter of 2023 confirmed average price increases of 29 percent for green gram, 40 percent for black gram, and 39 percent for pigeon pea (MAPSA 2023a). Depreciation of the Myanmar kyat and the suspension of Indian import quotas were key drivers. Similar to the situation with rice exports, price increases for pulses would have been even higher in the absence of the Central Bank requirement for traders to deposit 65 percent of their earnings at the official exchange rate.

Oilseeds

Vegetable oils are a key component of diets, and households spent an average of 5.1 percent of their food budget on them in 2015. However, only 30 percent of the vegetable oil consumed nationally is produced locally; the remainder is imported, primarily in the form of palm oil (MAPSA 2022d). The main types of oilseed crops cultivated in Myanmar are groundnut and sesame, and a significant share of their production is exported. Sunflower, soybeans, and palm oil are cultivated on a smaller scale. Soybeans are used mainly for tofu production rather than for oil or animal feed processing.

The structure of Myanmar's oilseed sector changed dramatically following the liberalization of palm oil imports in 2011 (Belton and Win 2019). Imported palm oil is usually much cheaper than locally produced vegetable oil. Only wealthier consumers can afford groundnut or sesame oil, which fetch premium prices on the local market due to their preferred flavor and limited supply.

Spatial distribution of oilseed production. According to MOALI, the area planted to oilseed is approximately 1.1 million ha for groundnut, 1.5 million ha for sesame, and 0.25 million ha for sunflower (MOALI 2022). The 2017 MLCS estimate for sesame, the only oilseed for which information was collected in the survey, is similar to that for MOALI at 1.4 million ha, 88 percent of which was cultivated in the Dry Zone. According to the Myanmar Agricultural Performance Survey, 11 percent of farmers nationally cultivated groundnut, and 12 percent cultivated sesame (MAPSA 2022e). The share of farmers growing each crop rises to 25 percent in the Dry Zone, where agroecological conditions are relatively better suited (yet still far from ideal, owing to erratic rainfall patterns). This is lower than the MLCS estimate of 36 percent growing sesame in the Dry Zone in 2017, implying a significant reduction in the share of farmers growing the crop in 2022. As much of the expansion in sesame was driven by exports to China and South Korea, this may reflect border closures with China because of COVID-19.

Oilseed production technology and yields. In addition to tractor plowing services, fertilizer and pesticides are widely used for oilseed production. A

2017 household survey in 100 village tracts in four central Dry Zone townships found that 90 percent of groundnut producers used some kind of fertilizer, with 79 percent using inorganic fertilizer and 59 percent organic fertilizer (Mather et al. 2018). Application rates were quite low, however, averaging just 50 kg per ha. A similar frequency and rate of fertilizer use were found among sesame growers. Between half and two-thirds of groundnut farmers also used pesticide, depending on the season (monsoon or post-monsoon). Trichoderma bio-fungicide has been promoted on a small scale by a nongovernmental organization, Proximity Designs. Results have been promising, with 80 percent of users experiencing a reduction in yield loss, a median yield benefit of 17 percent, and a net income gain of $50 (Proximity Designs 2022).

According to MOALI, yields of groundnut (in shell) are 1.5 t/ha, sesame 0.5 t/ha, and sunflower 0.95 t/ha (MOALI 2022). A community survey in 2015 reported considerably lower yields for groundnut, however, at just over 1 t/ha (Mather et al. 2018). The same survey reported yields of 0.44 t/ha for sesame. Besides weather, low groundnut yields are also a result of the use of outdated varieties and poor seed quality (Boughton et al. 2020b). Mather et al. (2018) found that just 12 percent of groundnut farmers use improved varieties, compared with 23 percent of sesame growers.

Effects of the coup on oilseed production and marketing. Oilseed prices have increased even more than pulse prices because of domestic vegetable oil shortages resulting from a temporary Indonesian export ban on palm oil combined with import quotas imposed by the military regime to reduce foreign exchange expenditures. Average retail prices of vegetable oils rose 122 percent between March 2021 and March 2022 (MAPSA 2022d). An August 2022 survey of traders reported groundnut prices 77 percent higher and sesame prices 48 percent higher than a year before (MAPSA 2022a). As international and domestic vegetable oil prices stabilized, so did the prices of oilseed crops. A nationally representative survey fielded in the first quarter of 2023 found that postharvest prices for the 2022 monsoon season had increased by 41 percent for sesame and 47 percent for groundnut, compared with a year earlier (MAPSA 2023a).

Maize

Maize is a powerful example of how favorable agroecological conditions, access to improved technology, and growing domestic and international market demand can lead to rapid growth in production, with important nutritional spillovers, as noted in Chapter 2. Maize provides important lessons on how to unleash potential growth in other crop subsectors. Chapter 12 provides a detailed account of how this process has unfolded over two decades.

Spatial distribution of maize production. The MLCS estimated the maize area to be 0.93 million ha in 2017, which is considerably higher than MOALI estimates for the same year of 0.5 million ha (CSO, UNDP, and World Bank 2020). USDA's estimate for 2021 is 0.67 million ha (2022b). One possible reason for the discrepancy is that MOALI data may overlook maize produced for fresh consumption. According to the MLCS, 83 percent of the total maize area was in the Hills and Mountains, especially in Shan State; 11 percent in the Dry Zone; and 5 percent in the Delta.

Maize production technology and yields. USDA estimated national maize production to be 2.9 million tons in 2021 (2022b). The engine of the maize subsector's growth has been the introduction of and widespread access to hybrid varieties over the past 30 years (Chapter 12). Hybrid varieties are well suited to the temperate climate of the hilly areas, and a strong distribution network of input retailers has emerged to supply hybrid seed. There is also increasing competition among hybrid seed companies. The increase in maize production has also been made possible by an expansion of cultivated area. However, a new pest, fall armyworm, has manifested itself widely in maize-producing areas since 2019, but accurate loss assessments are not available.

Effects of the coup on maize production and marketing. Hybrid maize is a fertilizer-intensive crop. However, it is likely that farmers have reduced their application levels in response to recent dramatic fertilizer price increases (USDA 2023). Demand for maize in the domestic feed industry has weakened because consumers can no longer afford to consume poultry and eggs in the same quantities as before the military coup. Feed demand from the aquaculture sector has declined similarly (see Chapter 9). Although regional market demand for maize (China, Thailand, Viet Nam) is still strong, the Myanmar government's requirements that export earnings from overland trade be transferred in advance of receipt have led to a sharp reduction in exports (USDA 2023).

Horticultural crops

As seen in Chapter 2, the horticultural sector, especially fruits, has the highest potential of any crop subsector to contribute to agricultural employment, GDP growth, poverty reduction, and dietary improvement. Fruits and vegetables are underconsumed because of income constraints (Chapter 4).

Spatial distribution and trends in fruit production. The total horticultural crop-growing area in Myanmar is approximately 590,000 ha, occupying 6.6 percent of the total sown area of the country (Yadanar 2019). Watermelon, mango, and banana were the top 10 export fruits between 2018 and 2020 (Chapter 14). Myanmar has exported mango, watermelon, and muskmelon since 1999 and has recently exported small amounts of avocado and dragon fruit. Exports of banana began in 2015 and surged dramatically to reach 800,000 tons by 2020 due to controversial investments by Chinese-operated plantations in Kachin State (MOALI 2022).

Watermelon is the country's most lucrative cash crop and top export fruit. The major production areas in Myanmar are the central Dry Zone (Mandalay and Sagaing) and the Delta (Bago and Yangon). Around 150,000 farmers grow watermelons, of whom 80 percent are smallholders (Winrock International 2019). Between 65 and 80 percent of watermelons cultivated annually are sold to China across the border, especially during Chinese New Year celebrations. Heavy dependence on this market can lead to large price fluctuations when cross- border trade is disrupted.

Although mango is grown throughout the country, the major growing areas are Ayeyarwady, Bago, Mandalay, Sagaing, and Yangon Regions and Kayin and southern Shan States. Among the 300 mango varieties grown, Sein Ta Lone mango is the most famous among local and foreign consumers. Since 2000, it has been exported to China, Singapore, Japan, Dubai, Malaysia, and some European countries (Maung et al. 2020).

Commonly misclassified as a vegetable, chili pepper is a fruit widely used as a culinary spice. The annual area planted is about 110,000 ha. Chili pepper is grown primarily in the Dry Zone and in Ayeyarwady Region in the Delta (MOALI 2022).

Spatial distribution and trends in vegetable production. Vegetable crops can be divided into perishable and semi-perishable categories. Perishable vegetables, including tomato, cabbage, cauliflower, and carrot, are grown as monsoon season crops in highland areas and as post-monsoon season crops in the Dry Zone and the Delta when temperatures are lower. Ladyfinger (okra), eggplant, cucumber, green chili, baby corn, and gourds are also grown in the Dry Zone and the Delta.

Potato, garlic, and ginger are the main semi-perishable vegetables. They are cultivated primarily in Shan State. Potato was cultivated on 30,000 ha in 2021, showing a reduction of 20 percent over the previous five years. The area planted to garlic has been stable at just under 30,000 ha over the past decade.

Effects of the coup on fruit and vegetable production and marketing. Fruit and vegetable production is typically chemical input-intensive, and vegetable seed prices are typically high as a result of specialist production requirements. Because most chemical and seed inputs are imported, costs have risen dramatically, as for other input-intensive crops. Fruits and perishable vegetables are at high risk of price volatility as a result of the potential for conflict to interrupt domestic and cross-border marketing channels.

Coffee and tea

Coffee and tea are grown for domestic consumption and export. Myanmar is a tea-drinking culture. Moreover, fermented tea leaf is widely used in Myanmar dishes. Despite the country being the eighth-largest tea producer in the world, about 75 percent of tea production is consumed locally. Per capita annual consumption of tea products is 12.3 kg, comprising 5.7 kg of green tea, 5.2 kg of black tea, and 1.4 kg of pickled tea (ACDI/VOCA 2020). Coffee production was introduced in the colonial era, but local consumption on a large scale is a recent phenomenon, mainly in the form of imported instant coffee powder (Aye 2011). Although quantities are small compared with those of annual crops, Myanmar exports coffee and tea to 20 countries.

Spatial distribution of coffee and tea production. Coffee and tea thrive at high altitudes and in good soil conditions. Eighty-one percent of Myanmar's 20,000 ha of coffee and 81 percent of its 97,000 ha of tea are cultivated in Shan State (MOALI 2022). Approximately 85 percent of coffee is Arabica. The smaller area of Robusta coffee is concentrated in southeast Myanmar in Kayin, Kayah, and Mon States and the Tanintharyi Region. Most coffee and tea production is undertaken by smallholder farmers (ACDI/VOCA 2020).

Coffee and tea production technology and yields. Myanmar's soil and climate conditions allow for organic tea production (ILO 2019). Tea leaves can be harvested for nine months in the year, beginning around mid-March, before the rainy season, through to December. The first six months of the harvesting season produce peak yield, while the remaining three months yield less. Tea picked before the rainy season begins in May is famed for its stronger taste, higher quality, and better price. The average annual yield of tea increased from 1.2 t/ha in 2010 to about 1.4 t/ha in 2020.

Coffee plantations need intensive care for a minimum of five years before harvesting. About 90 percent of coffee is grown under shade trees, including fruit trees such as avocado, jackfruit, and macadamia. Coffee is harvested once a year between November and February and yields an average of 700 kg/ha. The processing methods used are important to obtain high-quality coffee and tea.

Effects of the coup on coffee and tea production and marketing. Production of both coffee and tea is labor intensive, both in the field and in processing. Most of the laborers for tea production in Shan State come from the central Dry Zone, where there has been a high level of conflict-induced insecurity, resulting in labor shortages. Reductions in consumer purchasing power since the coup have also resulted in lower demand and lower revenue for smallholders. One unanticipated effect of foreign exchange shortages and reduced imports of instant coffee has been a surge in small cottage industries producing domestic coffee powder.

Looking ahead

Even prior to the recent disruptions, Myanmar's crop subsector was underperforming in productivity and quality. Aside from pockets of innovation, such as the introduction of hybrid maize, the most important change has been the introduction of mechanization to help in the land preparation and combine harvesting of rice.

As discussed in Chapter 3, realizing Myanmar's agricultural potential will require significant public investments in agricultural research and irrigation management to adapt to climate change and raise yields and investment in transport infrastructure to reduce marketing costs. As discussed in Chapter 6, improved land laws and land administration are essential to protect smallholder land rights, including their freedom of choice of agricultural activities to allow for more profitable enterprise portfolios. Such improvements would also facilitate voluntary consolidation of or access to underused land. Land laws will also need to recognize the rights of farmers and local communities to invest in land conservation or management practices that generate revenue through carbon sequestration.

Innovations are also needed to improve the policy environment for farmers and other value chain actors that mediate market incentives. For example, bilateral trade negotiations must address the unpredictable and opportunistic trade policies of Myanmar's larger neighbors, China and India.

Once an end to the current conflict is achieved, investments in crop productivity, land tenure security, and a more predictable market environment will help crop producers recover and overcome many of the constraints now limiting the profitability of their crop production.

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Chapter 9

LIVESTOCK, CAPTURE FISHERIES, AND AQUACULTURE: STATUS AND RECENT TRENDS

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Livestock rearing and fishing have been central components of rural livelihoods in Myanmar for centuries and remain so today (Khin 1948). More capital-intensive forms of marine fishing, aquaculture, and poultry farming began to expand during the early 1990s and have grown briskly since then (Belton et al. 2020; Tezzo et al. 2018). Poultry and aquaculture commoditization accelerated between 2011 and 2019, stimulated by the demand-side pull of rapid income growth and by foreign and domestic investment in areas such as feed milling and food retail (for example, businesses such as Kentucky Fried Chicken, which opened in Myanmar in 2015). However, despite recent growth, both sectors lag behind those in more developed countries in the region in technological sophistication, scale, and regulation (World Bank 2019a).

This chapter summarizes the status of the supply side of livestock, capture fisheries, and aquaculture based on an analysis of nationally representative data extracted from the Myanmar Living Conditions Survey (MLCS) 2017 (CSO 2019) and a review of trends in these sectors using information drawn from other recent surveys and secondary sources. We analyze MLCS to sketch a picture of the contributions of livestock, capture fisheries, and aquaculture to household incomes in the four agroecological zones (AEZs—Delta, Dry Zone, Coastal Zone, and Hills and Mountains) into which MLCS results are categorized (CSO, UNDP, and World Bank 2019). The MLCS livestock and fishery modules asked questions about each household's ownership, production, sales, and consumption of livestock and livestock byproducts, as well as aquaculture and capture fisheries products in the previous 12 months. Respondents were asked to estimate the quantity or value of these variables, making it possible to calculate the value of livestock and fish income, expenditure, and consumption for each household.

We examine levels of livestock ownership, participation in capture fisheries and aquaculture, reasons for rearing livestock, ownership of fishing assets, and average household earnings from all three activities. We also discuss the characteristics of more geographically clustered, capital-intensive forms of poultry and swine farming, fishing, and fish farming and the downturn in these sectors since the multiple crises beginning in 2020. We conclude by discussing possible future directions and priorities for sectoral upgrading.

Contributions of livestock and fisheries to rural household incomes

Table 9.1 presents data from MLCS on the average value and share of rural households' gross income originating from crops, livestock, and fish among households engaged in any of these activities. Gross income is calculated as the value of sales plus the imputed value of consumption originating from own production and any production given away. We divide households by residence in the four AEZs used in the MLCS sample and by household consumption expenditure terciles.

The following points stand out. Overall, the total gross income from these three sources is highest on average in the Delta ($2,008 per household) and lowest in the Hills and Mountains ($1,220 per household). These variations are likely driven in part by differences in average landholding sizes among zones.

As expected, crop farming makes the biggest contribution to gross income among the three activities, averaging 86 percent nationally. The share of livestock in gross producer income is highest in the Dry Zone and the Hills and Mountains, underlining the importance of animal husbandry for livelihoods in these zones (Belton et al. 2021a), and lowest in the Coastal Zone. Conversely, the share of fish in gross income is by far the highest in the Coastal Zone, underlining the importance of marine fishing to the coastal rural economy. In the Delta, where most of Myanmar's freshwater fishing and aquaculture are concentrated, fish and livestock account for similar shares of producer income. Fish contributes only 1 percent of gross producer income in the Dry Zone and the Hills and Mountains.

Fish and livestock make proportionately greater contributions to the incomes of poorer households than to those of the better-off. We divide households into expenditure terciles as a proxy for income, where tercile 1 is the third of households with the lowest per capita expenditures and tercile 3 is the third with the highest per capita expenditures. The wealthiest third of households obtains higher average gross incomes than the poorest third from crops, livestock, and fish. However, fish contributes twice the share of producer income for households in the poorest tercile compared with those in

TABLE 9.1 Household average gross income from crops, livestock, and fish for producing households, by agroecological zone and consumption expenditure tercile

Income/source	All	Delta	Coastal Zone	Dry Zone	Hills and Mountains	Tercile 1 (poorest)	Tercile 2	Tercile 3 (richest)
Average gross income ($)								
Crops	1,450	1,737	762	1,561	1,101	830	1,535	2,316
Livestock	139	143	74	172	110	108	148	174
Fish	92	129	425	20	9	80	91	113
Total	1,681	2,008	1,261	1,753	1,220	1,018	1,774	2,604
Share of gross income (%)								
Crop	86	86	60	89	90	82	87	89
Livestock	8	7	6	10	9	11	8	7
Fish	5	6	34	1	1	8	5	4

Source: Authors' calculations using MLCS data.

Note: Table based on subset of MLCS sample households that reported engaging in crop farming, fisheries (aquaculture or fishing), or selling own livestock. Gross income is the aggregated value of sales, own consumption, and gifts given away.

the wealthiest. Similarly, livestock contributes 11 percent of gross producer income for the poorest third of households and 7 percent for the wealthiest.

The figures do not capture the full extent of the contributions of livestock and fish to Myanmar's rural economy because intensive livestock farming, commercial aquaculture, and larger-scale capture fisheries tend to be highly clustered spatially, often in peri-urban areas. Targeted oversampling or dedicated surveys in these locations would be required to ensure the representation of these enterprises. We discuss these specialized, highly commercial forms of livestock and fish production in more detail later in this chapter.

National survey results

Livestock

This section presents an analysis of data from MLCS, summarizing (1) the share of households involved in raising different types of livestock, (2) the number and value of livestock owned per household, and (3) the reported purpose of livestock ownership. Ownership of livestock is far more common in rural areas than in urban ones (although 12 percent of urban households own some form of livestock), so we limit our analysis to rural households.

Rural livestock-keeping is extremely common, even among households without agricultural land. More than half (59 percent) of rural households and 41 percent of landless rural households raise animals (Table 9.2). Among landed households (defined here as those owning any farmland), this share rises to 75 percent.

Chickens are the most common animals raised by rural households, followed by cattle and pigs. Less common animals include ducks, buffalo, and goats (Table 9.2).[1] Cattle are the most common animals kept by landed rural households (reared by 45 percent), consistent with their use in agriculture and with these households' access to fodder from farm crop residues, followed by chickens (39 percent). Among landless households, chickens (29 percent) and pigs (20 percent) are the most common animals raised.

Cattle are most common in the Dry Zone, where they are widely used as draft animals, kept by 42 percent of all rural households, rising to 69 percent among the landed. Chickens and pigs are most common in the Delta, followed by the Hills and Mountains. Ducks are most common in the Delta, and buffalo in the Hills and Mountains (Table 9.2).

The livestock-rearing activities captured by MLCS are predominantly small in scale. Households raise an average of 4 head of cattle or buffalo, 2.5 pigs, 29 chickens, or 20 ducks. Buffalo and cattle are the most valuable of these, worth an estimated total of $1,602 and $1,345, respectively, to the households that raise them. The average total value of goats and pigs owned is estimated at $405 and $196, respectively. The total value of chickens and ducks owned per household averages $36 and $46, respectively, reflecting small flock sizes. These numbers do not vary much by zone, with the partial exception of goats, herds of which are three to four times larger in the Dry Zone than in the rest of the country.

The average gross income earned by rural households rearing livestock is $143 per year (Table 9.3). This underlines the small-scale nature of most livestock rearing reported in the survey. Average gross income from most types of livestock ranges from $100 to $150, although for chickens it is only $36 per year. Gross income from livestock rearing is highest in the Dry Zone and lowest in the Coastal Zone.

Livestock rearing is used strategically to meet a variety of important functions within the rural household economy. Cattle and buffalo are kept mainly for draught and secondarily for the sale of the animal or its products (Table 9.4). Informal cross-border exports of live cattle to China increased steeply before 2020, leading to moves to formalize the trade (Diao, Masias, and Lwin 2020). This has increased commercial demand for cattle. Although

1 "Goats" includes a small number of sheep.

TABLE 9.2 Rural households owning livestock, by agroecological zone

	Share of rural households, by zone (%)				
Livestock type	All	Delta	Coastal Zone	Dry Zone	Hills and Mountains
Buffalo	4	2	4	2	11
Cattle	26	17	19	42	18
Goats	2	1	1	2	2
Pigs	24	29	13	20	29
Chickens	33	44	36	22	27
Ducks	5	12	3	1	2
Any livestock	59	59	54	60	58

Source: Authors' calculations using MLCS data.

TABLE 9.3 Average gross income per rural household by type of livestock owned and agroecological zone

	Rural household gross income, by zone (US$)				
Livestock type	All	Delta	Coastal Zone	Dry Zone	Hills and Mountains
Buffalo	153	206	115	152	142
Cattle	137	173	96	131	113
Goats	146	77	49	257	6
Pigs	101	111	68	119	66
Chickens	36	28	81	31	40
Ducks	54	61	5	10	15
Any livestock	143	146	113	160	116

Source: Authors' calculations using MLCS data.

Note: Gross income is the aggregate value of sales, own consumption, and gifts given away of livestock and their byproducts.

keeping cattle is widespread, there is little dedicated dairy farming. Fresh milk consumption is low and concentrated mainly in urban areas—averaging in 2015 just 1.4 kg per capita per year nationally and 0.5 kg in rural areas (Scott et al. 2023).

Pigs and goats are raised mainly for sale and, secondarily, as a form of savings and to cope with expenses (a similar function to savings). Only 1 percent of households rearing cattle and 6 percent raising pigs reported doing so for their own consumption. In contrast, households raising chickens and ducks reported that producing them for own consumption and for sale were of approximately equal importance (mentioned by more than half of

TABLE 9.4 Rural households reporting purpose for owning livestock, by livestock type

	Share of rural households, by livestock type (%)					
Purpose	Buffalo	Cattle	Goats	Pigs	Chickens	Ducks
Livestock or products for sale	30	29	83	87	56	60
Food for family	1	1	4	6	58	51
To cope with expenses	4	6	13	13	14	14
Draught power	72	74	0	0	0	0
Manure	14	18	2	0	0	0
Transport	8	14	0	0	0	0
Savings	7	5	14	22	4	4
Breeding	2	1	0	0	0	0

Source: Authors' calculations using MLCS data.
Note: Respondents could report more than one purpose for owning the type of livestock.

households). Coping with expenses is the next most important reported reason for raising poultry (Table 9.4).

Capture fisheries and aquaculture

Fishing and aquaculture are far more common in rural areas than in urban ones, with only 1 percent of urban households engaging in either activity. All results presented in this subsection refer to rural households. Table 9.5 presents the share and estimated number of rural households engaged in fishing or aquaculture by AEZ in 2017.

Aquaculture is comparatively rare, practiced by just 0.4 percent of rural households—34,000 households nationally. In contrast, 11 percent of the rural population engages in some form of fishing—over 26 times more than practice aquaculture. In the Delta and Coastal AEZs, 18 percent of households practice fishing, as do 13 percent of those in the Hills and Mountains (Table 9.5). About half of all fishers and fish farmers are in the Delta, which is the center of Myanmar's commercial aquaculture sector, the site of its main inland capture fishery, and a significant marine fishery. Participation in fishing and fish farming is lowest in the semiarid Dry Zone.

Most fishing households are landless (62 percent nationally; 75 percent in the Coastal Zone). Surprisingly, 31 percent of households practicing aquaculture are reported as landless, compared with only 11 percent of households involved in crop farming. This might reflect a tendency for fish farmers to access land via rental markets. It is also possible that the result is an anomaly

TABLE 9.5 Rural households engaging in fishing and aquaculture, by agroecological zone

Activity	All	Delta	Coastal Zone	Dry Zone	Hills and Mountains
Share of rural households involved (%)					
Fishing	11	18	18	2	13
Aquaculture	0.4	0.5	1.5	0.1	0.4
Number of rural households involved (weighted)					
Fishing	907,117	530,939	132,884	58,325	184,970
Aquaculture	34,157	16,273	10,766	1,458	5,660

Source: Authors' calculations using MLCS data.

driven by the small number of households practicing aquaculture in the sample.

Among landed fishing households, the average area owned is 2.6 hectares (ha)—almost the same as the average area owned by farming households (2.7 ha). In contrast, landed aquaculture households own an average of 4.9 ha, nearly double the average agricultural landholding. This suggests that they tend to be better off than the average rural household and may reflect their concentration in the Delta, where average landholdings are larger than in the rest of the country (Belton et al. 2020).

Ownership of fishing assets by fishing households is rather limited, reflecting the small-scale nature of most fishing activities practiced by households in the sample. Only 38 percent of fishing households own a boat, and just 15 percent own a boat engine, indicative of low average levels of capital intensity and fishing capacity (Table 9.6). About two-thirds of fishers own fishing nets, except in the Hills and Mountains, where only one-third do. About one-quarter of fishers own other fishing gear, such as fish traps. As expected, boat ownership and levels of motorization are highest in the Coastal Zone and lowest in the Hills and Mountains. Approximately 20 percent of fishing households reported processing part of their catch, such as by drying or fermenting. The share of fishing households doing so is similar across zones.

Table 9.7 presents the imputed gross annual income earned by fishing and fish-farming households, calculated as the total value of fish originating from own production, whether sold, consumed by the household, or gifted to others. The small sample size for aquaculture households makes it difficult to interpret or clean anomalies in reported costs of production, so we do not attempt to calculate average net incomes.

TABLE 9.6 Share of fishing households with fishing assets, by agroecological zone

	Share of fishing households (%)				
Asset	Total	Delta	Coastal Zone	Dry Zone	Hills and Mountains
Boat used for fishing	38	44	61	30	5
Engine for fishing boat	15	13	47	4	1
Nets	57	61	69	68	34
Other fishing gear (including traps)	26	28	29	20	22
Other fishing equipment	25	18	29	33	41
Household processing fish products	19	21	17	19	17

Source: Authors' calculations using MLCS data.

TABLE 9.7 Average gross household income from aquaculture and fishing, and marketed surplus (share of value of fish sold), by agroecological zone

Characteristic	Total	Delta	Coastal Zone	Dry Zone	Hills and Mountains
Aquaculture					
Gross aquaculture income ($)	735	965	654	1,119	166
Marketed surplus (%)	89	94	84	95	68
Observations	54	13	16	4	21
Fishing					
Gross fishing income ($)	524	453	1,426	561	59
Marketed surplus (%)	86	86	88	87	37
Observations	1,155	431	236	54	434

Source: Authors' calculations using MLCS data.

Average gross incomes earned from fishing and aquaculture are roughly 2.5 and 5 times higher, respectively, than gross incomes from livestock-keeping. Fishing incomes are highest in the Coastal Zone, consistent with the higher levels of motorized boat ownership in this area, and lowest in the Hills and Mountains. Aquaculture incomes are highest in the Delta and the Dry Zone (though with very small sample sizes in each) and lowest in the Hills and Mountains. Interestingly, despite the small-scale nature of much fish production captured by the survey, most of the fish produced is sold (89 percent of aquaculture fish and 86 percent of capture fish). This pattern is consistent across all zones, apart from the Hills and Mountains, where the marketed surplus is somewhat lower.

Characteristics of larger-scale production

Commercial poultry and pig farming

The data presented above indicate that most rural households raising chickens do so on a very small scale. In such “traditional” or “backyard” poultry systems, most birds are native breeds. Scavenging is the primary source of feed, supplemented by unformulated feeds, like rice and kitchen scraps. Most birds are unhoused (Birhanu et al. 2021).

Specialized larger-scale intensive poultry farms raise flocks of improved breeds of broiler (meat) or layer (egg-laying) chickens, usually numbering in the 1,000s, in enclosed feedlots using commercially manufactured formulated diets. Farms of this kind proliferated in the peri-urban zones around larger cities between 2011 and 2019 (Belton et al. 2020). Broiler production is concentrated in Yangon, Mandalay, and Eastern Bago, which together account for more than half of Myanmar’s broiler population. Southern Shan, where cooler average temperatures favor egg production, has the highest concentration of layer farms, accounting for 28 percent of Myanmar’s layer population (LBVD 2019).

Two-thirds of poultry farms in the peri-urban zone around Yangon are integrated with fishponds, whereby poultry houses are constructed above fishponds, making it possible to use poultry manure and uneaten feed as inputs for fish cultivation (Fang et al. 2021). Analysis of satellite images shows that the number of chicken feedlots built over fishponds within a 100 km radius of Yangon more than doubled from 2014 to 2018, growing from 1,898 to 3,868. The number of village tracts in this zone with integrated chicken–fish farms increased from 121 to 230 (Belton et al. 2020).

A national livestock census conducted in 2018 indicated that 10,747 holdings were raising broilers and 6,278 holdings layers, accounting for less than 1 percent of poultry producers. However, the combined population of broiler and layer farms was 29.2 million birds (16.2 million broilers and 13 million layers). In contrast, around 4 million holdings raised 45 million native chickens (LBVD 2019). These figures suggest that approximately 40 percent of Myanmar’s standing chicken population in 2018 comprised improved breeds reared under intensive conditions. The contribution of intensively reared chickens to Myanmar’s total poultry and egg production is likely higher still, given that broilers, with an average production cycle of 45 days, attain market size much more quickly than do native breeds (Fang et al. 2021). Similarly, layers produce eggs at a rate significantly higher than that of native birds.

It has been estimated that independent farms grow only 40 percent of broilers. The remaining 60 percent are produced by vertically integrated international firms and by contract farmers linked to them as outgrowers (Birhanu et al. 2021). The largest of these companies is CP Myanmar, a subsidiary of a Thai multinational. This was the first company to initiate broiler production in the 1990s. CP is estimated to command about 45 percent of Myanmar's broiler market. However, there was a significant increase in foreign direct investment in the poultry sector between 2011 and 2019. Companies from China (New Hope), South Korea (Sunjin), Viet Nam (Greenfeed), Indonesia (Japfa), and the Netherlands (De Heus) established over this period feed milling and distribution operations, as did many domestic companies (Belton et al. 2020).

Pig farming is undergoing a transformation similar to that in poultry. More than 2 million households raised 5.8 million pigs in 2018, predominantly as a traditional "backyard" activity, but swine production is becoming increasingly commoditized, particularly on the periphery of large cities (LBVD 2019). For instance, Hlegu, a peri-urban township on the northern outskirts of Yangon, has relatively large-scale pig farms of 70 or more pigs, including some with herd sizes numbering in the thousands (Ebata 2022).

A recent survey of mainly medium-scale pig farms in the Yangon peri-urban zone found that improved breeds were much more common than local breeds, with the latter accounting for only about 25 percent of pigs raised. Local breeds have a longer production cycle than improved breeds, and their meat is fattier and less valuable. However, they can be raised wholly or partly on a diet of low-cost ingredients, such as kitchen scraps. In contrast, improved-breed pigs must be raised using more expensive commercially manufactured formulated feeds for optimum performance. Until 2010, most surveyed farms used nonformulated feeds, but, by 2019, 89 percent reported using formulated feeds, reflecting the recent shift toward the intensification of pig production (Belton et al. 2020).

Marine and inland capture fisheries

Myanmar's fisheries statistics are unreliable, leading the Food and Agriculture Organization of the United Nations (FAO) to take the unusual step of revising Myanmar's national fish production statistics downward from about 5.6 million to 3.0 million metric tons in 2016 (Tezzo et al. 2018). The poor quality of official statistics means that it is impossible to estimate the share of catch landed by small- and large-scale fishers with any degree of confidence. However, as in the poultry sector, it is clear that small-scale fishers account for a large majority of households involved in fishing as owner-operators, whereas large fishing businesses are far less numerous but account for a major share of total fish landings. A high degree of concentration is evident in marine fisheries, where wealthy boat owners or fishing companies often own multiple large offshore fishing vessels, and in inland fisheries, where powerful leaseholders control fishing rights to many of the most productive fishing grounds (Tezzo et al. 2018).

Small-scale fishing activities occur wherever there are waterbodies containing fish and, thus, are widely distributed along the coasts, the Ayeyarwady Delta, and the courses of major rivers. Larger-scale marine fishing activities are concentrated mainly in a relatively small number of ports, including Kaw Thaung and Myeik in Tanintharyi, Ye in Mon, the city of Yangon, and Pyapon township in Ayeyarwady. Large-scale inland fishing occurs in fishing lots in the delta and floodplains of the Ayeyarwady River.

Myanmar's highly productive inland fisheries have long been an important source of state revenue, being administered as leasable fishing lots since the British colonial period (Reeves, Pokrant, and McGuire 1999). In contrast, marine capture fisheries development was very limited until the socialist period (1962–1988). It accelerated rapidly under the State Law and Order Restoration Council (SLORC), with the military government establishing international joint ventures with predominantly Thai vessel owners to generate foreign exchange to shore up the collapsing economy (Barbesgaard 2019). Most fish captured under these joint ventures were transshipped directly to Thailand.

Inflows of capital and technological advances, such as the motorization of boats, the introduction of new fishing gear, and the establishment of cold chain facilities, have contributed to the intensification of domestic fishing since the 1990s, both to meet domestic consumption needs and for export to China and other countries in the region (Belton, Marschke, and Vandergeest 2019). Most fishing licenses granted to foreign-owned vessels were revoked in 2010 under the Union Solidarity and Development Party government and transferred to Myanmar vessels (Tezzo et al. 2018).

Analysis of logbook records collected from offshore fishing vessels operating out of Tanintharyi region from 2009 to 2018 shows declines in catch per unit effort (a measure of the abundance of fish stocks) of between 27 and 64 percent for five types of fishing gear (Hosch, Belton, and Johnstone 2021). This pattern is consistent with stock assessments that show a decline of 89 percent in marine fishery biomass between 1980 and 2013 (Krakstad et al. 2014) and with reports of rapidly declining catches by inshore fishers (Belton, Marschke, and Vandergeest 2019; World Bank 2019b). Anecdotal reports also point to significant declines in inland fish catches in recent years (Radford and Lamb 2020).

Reports of fisheries conflicts are frequent, particularly in Tanintharyi and Rakhine, often sparked by large offshore vessels, which are legally required to fish at least 5 km from the coastline, encroaching on inshore fishing grounds that are allocated exclusively to smaller inshore vessels (Barbesgaard 2019; Hosch, Belton, and Johnstone 2021; World Bank 2019b). Since 2020, most vessels in Myanmar's offshore fishing fleet have been fitted with vessel monitoring systems (VMS), making it possible to track and record their position in real time to demonstrate an absence of illegal, unreported, and unregulated (IUU) fishing—a requirement for export to the European Union. By logging violations of spatial or temporal fishing restrictions, VMS could support a much more highly regulated fishery management regime. However, the extent to which this new information is used to enforce regulations, particularly since the beginning of the coup, is not well understood.

Conflicts between larger- and smaller-scale actors are also evident in the governance of inland fisheries. Reforms introduced by the regional National League for Democracy government in Ayeyarwady to support leasing some fishing concessions to groups of small-scale fishers met stiff political resistance from powerful absentee licensees. This ultimately led to the reversal of the policy and the clawing back of the redistributions of fishing rights that accompanied it (Nyein, Gregory, and Thein 2020; Zin 2019).

Recent research (Belton, Marschke, and Vandergeest 2019; Nyein and Mathew 2017) and media coverage from Myanmar (BBC 2018) highlight hazardous and exploitative working conditions in some marine fisheries. Offshore raft fisheries in Ayeyarwady and Mon State use domestic migrant workers who receive seasonal wages in advance, compelling them to spend about eight months at sea on bamboo rafts exposed to the elements without access to safety equipment or medical treatment. These workers are often subject to malnutrition and physical abuse, and large numbers (likely in the hundreds) are thought to die at sea each year.

Entrenched governance problems and declining fisheries' productivity result in large part from the tendency of successive governments to treat the fisheries as a source of rents to be maximized in the short term rather than a resource to be managed for long-run sustainability (Nyein, Gregory, and Thein 2020). Despite these issues, Myanmar's capture fisheries remain extremely important for domestic food and nutrition security, particularly for rural and lower-income consumers (Scott et al. 2023), providing an estimated

80 percent of the aquatic food consumed in 2015, with aquaculture supplying the remaining 20 percent (Aung et al. 2022).

Moreover, despite steep declines, Myanmar's fish stocks probably remain in better health than those in many other parts of the region, given the later onset of intensive exploitation of marine fisheries compared with the other countries of Southeast Asia (Butcher 2004) and the relatively intact nature of inland fisheries habitats—for example, there are far fewer hydropower dams in the Ayeyarwady Basin than in the Mekong. For these reasons, Myanmar's capture fisheries should be understood as a cornerstone of nutrition security and rural livelihoods that can be maintained over the long term, provided adequate governance and management approaches are in place.

Aquaculture

Similar to marine capture fisheries, the growth of aquaculture accelerated from the 1990s, driven by the SLORC government's policy of promoting export-oriented industrial-scale forms of agriculture and aquaculture to secure foreign exchange. Large tracts of "wasteland" (the official designation for land unregistered on cadastral maps) were allocated as concessions to individuals and companies linked to the military in the Ayeyarwady Delta west of Yangon. Land allocated to these concessions was a mix of uncultivated wetlands and agricultural land worked by farmers without formal land use rights. The appropriations of land also resulted in the loss of community access to former common pool fishing and grazing areas. Some land concessions in the Delta were initially intended for paddy cultivation and others for aquaculture. However, most were ultimately converted to fishponds because of their higher profits and less complex management requirements compared with paddy. The initial expansion of large-scale aquaculture was thus highly inequitable (Mark and Belton 2020).

Aquaculture has continued to grow since this time, driven by the continued expansion of very large farms and the emergence of numerous commercially oriented small and medium farms. Many of the smallest commercial farms are nurseries, raising fingerlings for sale to larger grow-out farms. Successive land use policies and legislation up to the present have sought to safeguard rice production by prohibiting the conversion of paddy land to nonagricultural uses. However, the implementation of these rules in areas of the Delta where clusters of large fish farms are already established has been partial. In these areas, local authorities have often turned a blind eye to the conversion of paddy land to ponds, perhaps facilitated by "unofficial" payments (Belton et al. 2015). Thus, although land use policies have slowed the speed and extent of aquaculture expansion, in some parts of the Delta they have also been widely circumvented, contributing to continuing brisk growth in aquaculture despite few new concessions being granted to fish farms during the past decade (Belton et al. 2018).

This history has given rise to a top-heavy distribution in the size of aquaculture farms in the Delta. Operations of 200 ha or more account for 1 percent of farms but 32 percent of farm area, while those with areas of 4 ha or less account for 49 percent of farms but only 4 percent of farm area. In most other parts of Asia, very large aquaculture farms account for a much smaller share of operations and total farm area (Belton et al. 2018).

This highly concentrated farm structure has important implications for the distribution of economic spillovers from aquaculture. Based on a Local Economywide Impact Evaluation model, Filipski and Belton (2018) estimate that large fish farms (defined as >4 ha) and small fish farms in the Ayeyarwady Delta both generate substantially larger economic impacts per hectare than crop farms, directly (through farmer profits) and indirectly (through wages paid to workers and use of farm profits and wages to purchase locally traded consumption goods and production inputs). However, while large and small fish farms generate similar levels of direct income, per hectare small fish farms generate considerably bigger indirect income spillovers because they are more labor-intensive and purchase more locally traded goods and services. Moreover, the authors find that putting additional land into production as part of large fish farms would increase economic inequality within the local economy, whereas increasing the area under small fish farms would reduce inequality, primarily through income spillovers to landless workers.

Myanmar's aquaculture is also somewhat unusual in being dominated by a single species, rohu, a carp species native to Myanmar and South Asia. Rohu accounts for 60 percent of production. Two similar native carp species, mrigal and catla, combined account for 21 percent. Pangasius catfish and tilapia are also produced. The mix of species farmed is diversifying gradually, but it remains far less diverse than in most other countries in the region. Some rohu is exported to the Gulf states, where it is mainly eaten by migrant workers from South Asia. However, most of Myanmar's farmed fish is destined for domestic markets, particularly in the cities, and has rapidly been assimilated into urban diets (Tezzo et al. 2021).

Fish farming techniques are generally simple, and average yields are modest at 4.8 tons per ha. Rice bran and peanut oilcake—byproducts from agricultural processing—are the most widely used feeds (Belton, Filipski, and Hu 2017). However, the use of floating pelleted fish feeds, which can support faster growth rates and more efficient feed use, has increased in recent years as several poultry feed manufacturers have begun to produce and distribute them. As noted, the rapid growth of poultry farming prior to 2020 also stimulated the co-expansion of aquaculture through the establishment of integrated chicken–fish farms on the Yangon periphery (Belton et al. 2020).

Myanmar once had a burgeoning export-oriented shrimp industry, concentrated primarily in extensively managed ponds in Rakhine State. The sector collapsed in the mid-2000s as a result of a confluence of factors, including sanctions, cyclone damage, shrimp disease, and a decline in the natural recruitment of shrimp larvae caused by mangrove destruction. It has shown no signs of recovery since then (Joffre and Aung 2012; World Bank 2019c).

Impacts of COVID-19 and the coup

The COVID-19 pandemic had severe impacts on Myanmar's economy. Movement restrictions during the earliest stages of the pandemic affected supplies of production inputs and the distribution of livestock and fish products to market. However, these logistical issues were overcome relatively quickly. Longer-lasting impacts were felt in the form of depressed consumer demand caused by the economic downturn associated with the pandemic, which was transmitted upstream along livestock and fish supply chains. Fang and colleagues (2021) found that only 69 percent of surveyed broiler farms around Yangon remained operational in June 2020, although many closures were temporary, and some farms subsequently reopened. In November 2020, 81 percent of surveyed broiler farms and 83 percent of layer farms were operational.

Broiler prices peaked during the first lockdown in May 2020 at 50 percent above average 2019 levels before slumping in September to around half of the 2019 average. They then gradually regained equilibrium by November. In contrast, between May and August 2020, the price of eggs increased by 30 percent, reflecting the slow response time of layer farms to market demand as a consequence of their long production cycle (Fang et al. 2021). Fang and colleagues found that more than 40 percent of chicken farm workers around Yangon had lost permanent employment by November 2020. They estimated a loss of approximately 10,000 full-time chicken farm jobs and a monthly wage loss of $1,200,000 for Myanmar's chicken sector nationally.

In the case of farmed fish, farmgate, wholesale, and retail prices were 10 to 20 percent lower in most months between March and September 2020 than before the pandemic began in February 2020. Conversely, fish feed prices increased by about 40 percent over the same period. These trends suggest that the profitability of farming operations became increasingly squeezed (Belton et al. 2021b). Two-thirds of surveyed actors in the fish value chain reported that the incomes they earned from these businesses were lower in 2020 than in 2019. Forty-one percent of all fish value chain businesses reported incomes that were between 10 and 30 percent lower in 2020 than in 2019, while 18 percent reported incomes 30 to 50 percent lower (Haas et al. 2021). The impacts of COVID-19 on fish value chains in 2021, compounded by the effects of the coup, were even more severe, causing sales of farmed fish to drop further relative to 2020 (Hoong et al. 2021).

Data from a national phone survey implemented by the International Food Policy Research Institute (IFPRI) in late 2021, almost a year after the coup, indicate that 69 percent of households reporting fish and 78 percent reporting livestock as their major source of income experienced difficulties related to production in 2021 (Table 9.8). Well over half reported challenges related to marketing in the three months prior to the survey. High input prices and difficulties hiring workers were the most common production challenges, especially for households dependent on livestock. The inability to acquire inputs was also a common problem for both livestock and fish-producing households, whereas the inability to reach fishing grounds or ponds affected 20 percent of fish-producing households. Low prices received for products was the most common marketing challenge reported, especially by livestock producers. Difficulties in accessing buyers was a common problem for both types of households.

Hoong and colleagues (2021) report that the most common coping strategies used by actors in fish value chains during these crises included borrowing cash to cover operating costs (reported by 40 percent of businesses), making transactions electronically (39 percent), drawing down savings (30 percent), buying inputs on credit (28 percent), and changing business working hours (25 percent). Notably, considerable numbers of businesses also reported donating (38 percent) or lending (25 percent) food to others, suggesting the existence of strong informal support mechanisms.

Reduced incomes are likely to have had negative impacts on the welfare of many fish and livestock producers. Belton and colleagues (2021b) found that the share of respondents in the fish value chain reporting that their household had purchased less food than usual rose steadily from 29 percent in May to 52 percent in September 2020. More broadly, the health status of low- and middle-income consumers, for whom fish and eggs are key sources of scarce micronutrients, is likely to have suffered substantially owing to reduced intake of these foods (Fang et al. 2020; Scott et al. 2023).

TABLE 9.8 Challenges facing livestock- and fish-producing households during the previous three months

	Share of households reporting (%)	
Challenge	Fish	Livestock
For production activities		
No difficulties	31	22
High prices of inputs	15	27
Difficulties hiring workers	4	36
Unable to acquire enough inputs	15	12
Cannot reach farm/fishing location	20	1
High price of fuel	7	0
Water/irrigation supply problems	4	1
Disruption to banking services, access to cash or loans	3	2
Electricity/energy supply problems	1	1
Difficulties in paying tax	1	0
For marketing activities		
No difficulties	46	39
Low prices for fish or fish products	29	38
Difficulty accessing buyers	18	19
High price of fuel/high transportation cost	2	3
Markets are closed	3	1
Payment problems	2	1
Observations (fish/livestock business households)	148	298

Source: Myanmar National Phone Survey (2021) data.

Future directions and priorities

The review above underlines the importance of the livestock and fisheries sectors for livelihoods, employment, the rural economy, and food and nutrition security, and their diversity in terms of production technologies, scale of operations, and organization of production. Here, we summarize key observations on the likely future direction for the sectors and areas for prioritization.

Prior to the COVID-19 pandemic and the coup, Myanmar's poultry, pig, and aquaculture sectors were growing rapidly and transforming, particularly in the peri-urban zones around major cities. Small backyard production units existed in large numbers alongside a growing segment of intermediate-sized specialized farms and a handful of large vertically integrated firms. The dynamism evident in these sectors corresponded with a period of rapid economic development that spurred rising real incomes and domestic urban demand for animal-source foods. Production growth was also supported by large foreign and domestic investments in sectors like feed milling, as well as by investments from small and medium enterprises such as traders, which also grew rapidly during this period (Belton et al. 2018).

The economy contracted by 18 percent in 2021, following very weak growth in 2020, to around 30 percent smaller than it would have been in the absence of COVID-19 and the coup (World Bank 2021). Human welfare declined dramatically: it is estimated that more than half of the population had fallen below the poverty line by the end of 2021 (Diao and Mahrt 2020; MAPSA 2022). Animal-source foods are relatively expensive and are highly income-elastic. The economic shock depressed domestic consumer demand for such foods, stalling, and perhaps partially reversing, the expansion of specialized intensive peri-urban animal husbandry. Moreover, international prices for maize, a key ingredient used in feed manufacturing, reached a 10-year high in 2022. Coupled with a weak Myanmar kyat, which will raise the price of imported feed ingredients such as vitamin premixes and high-grade fishmeal, these market conditions seem set to squeeze the profitability of specialized livestock and fish farming operations, many of which operated on quite thin margins even prior to the crisis.

Pressure on producer profitability is likely to result in concentration within the livestock and fish sectors—more efficiently operated farms or those benefiting from economies of scale (or political connections) will endure, while less well-managed and smaller farms will fail. It may also result in extensification as producers seek to reduce costs by lowering stocking and feeding rates or substituting low-cost feeds, such as rice bran or brewery waste, for costlier, but more nutritionally complete, formulated feeds. Concentration is likely to be most pronounced in the feedlot poultry sector, where the bio-economics of production offer farmers little flexibility in modifying production practices (Fang et al. 2021). Extensification is likely to be most common in aquaculture, as fish can be raised using naturally occurring feed (plankton), and in small- to medium-scale pig farming, as local pig breeds can be grown using low-cost feeds, such as kitchen waste and broken rice.

Urban and rural food insecurity has increased sharply since 2020 (Headey et al. 2022). Consumption of animal-source foods—a particularly rich source of multiple micronutrients essential for human health—has almost certainly declined during this period. Such a trend is likely to have reversed modest improvements in nutrition indicators achieved over the preceding decade, exacerbating levels of malnutrition that were persistently high even prior to 2020 (Scott et al. 2023). However, the high income elasticity of animal-source foods means that demand could rebound quite quickly if economic conditions improve in the future, prompting remaining producers to scale up production or stimulating investment by new entrants.

Over the longer term, climate change is likely to present increasing challenges to both sectors by affecting the production of feed crops such as maize, causing feed prices and production costs to fluctuate unpredictably or increase. Climate change is also likely to lead to shifts in the geographic distribution of wild fish stocks in ways that are difficult to predict. A changing climate is also set to increase the risk of flooding, with potentially negative implications for aquaculture profitability, as occurred in 2016 when many fish farms in the Delta lost a substantial share of their crop (Belton, Filipski, and Hu 2017). Saline intrusion in coastal and deltaic areas is also likely to increase, possibly altering the mix of aquatic animals farmed in favor of saline-tolerant species such as shrimp.

Rapid and widespread agricultural mechanization over the decade prior to 2020 is likely to have reduced cattle and buffalo populations, as many farms, particularly in the Delta and the Hills and Mountains, have substituted power tillers and rented four-wheel tractors for animal traction. However, rising demand for beef from neighboring China in recent years has stimulated the growth of cross-border exports of live cattle, which were in the process of being formalized prior to the crisis (Diao, Masias, and Lwin 2020). In the future, resurgent demand from China may encourage more rural households to raise cattle primarily for sale rather than as draft animals.

However, weakly regulated cross-border movements of live animals are highly risky, given the potential of such animals to act as vectors for potentially catastrophic animal diseases, some of which are also potential zoonoses. Pig grandparent stock and piglets are often imported to Myanmar, particularly from Thailand. Day-old chicks are also imported on occasion. Live cattle are also thought to enter Myanmar from Bangladesh and India. Much of this trade is informal or semiformal, and there is very limited animal quarantine capacity (Belton et al. 2020).

Access to veterinary services and information is patchy and mainly obtained through private providers. Few livestock or fish farmers have ever received formal training on farm management, and farmers' knowledge of important livestock diseases, such as African swine fever, is limited (Belton et al. 2020). Indiscriminate use of antibiotics, particularly in intensive poultry farming, also gives rise to health concerns, given the high potential for antimicrobial resistance to emerge. Food safety and standards are likely to become an increasing public health concern in the longer run (Ebata 2022), particularly if the growth of modern retail resumes, and could contribute to farm consolidation if significant investments are needed to ensure compliance.

Marine and inland capture fisheries face serious governance challenges and unsustainable levels of resource exploitation. These challenges must be addressed if their important contributions to livelihoods and nutrition security are to be maintained over the long run. However, doing so would require a high level of political commitment to enacting the necessary changes, including shifting from governance strategies that favor resource extraction in the short term to those promoting long-term stewardship.

Our analysis reveals that the population engaged in fishing activities exceeds that involved in aquaculture by a factor of 26. Approximately half of all fishing and fish farming households live in the Delta. Future donor-sponsored programs aiming to alleviate poverty or improve nutrition by promoting aquatic food production should be attentive to the relative size of the two sectors and their geographic concentration when prioritizing resource allocation and site selection.

Finally, data on the livestock and fish sectors are very patchy. Little is known about the important dynamic segment of specialized livestock enterprises that have emerged over the past decade or the larger-scale commercial fishing fleets. Given the unique characteristics of businesses in these sectors and the high level of spatial clustering of larger enterprises, specially designed targeted surveys may be required in the future as an alternative to the random household sampling approach of MLCS.

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Chapter 10

FARM COMMERCIALIZATION: A TRANSFORMATION ON HOLD OR IN REVERSE?

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When food systems transform, farmers' interactions with markets change dramatically. With changes from traditional to transitional to modern systems—as defined by Reardon and Minten (2021)—farmers move from mostly subsistence-oriented agriculture with few market interactions toward heavy reliance on spot markets for inputs, outputs, and services, and ultimately to contract farming. Such reliance on markets during these transformation processes has been shown to lead to significant improvements in farm performance and in agricultural households' welfare (Carletto, Corral, and Guelfi 2017; Minten, Koru, and Stifel 2013; Stifel and Minten 2017; von Braun and Kennedy 1994).

However, in a number of low- and middle-income countries, there is often a lack of clarity regarding which stage of transformation farms have reached and how to expedite such transformations. There is limited understanding of agricultural markets and farm commercialization in Myanmar in particular because of a lack of nationally representative and updated data on the farm sector. Moreover, over the past decade, the country has undergone substantial changes in its economic and agricultural market policies, as well as major COVID-19 and military coup shocks. This has all had significant impacts on the farm commercialization situation. To understand farm commercialization and its evolution, then, we first need an overview of these policy changes and shocks.

At the beginning of the 2010s, Myanmar implemented an economic policy reform program focused on deeper liberalization of the country's agricultural economy. Before 2011, the main objective of agricultural policies had been ensuring stability of low-cost rice supplies through a government-managed system. Reliable access to low-cost rice was viewed as necessary to avoid social unrest (Okamoto 2008). Achieving this involved government intervention in domestic and export rice markets, compulsory cropping plans, and state ownership of farmland. The move away from the socialist legacy at the beginning of the 2010s took the form of new farmland legislation, a relaxation of cropping controls, and a shift from the focus on production quantities toward quality of life, as demonstrated in the setting of poverty reduction targets (Okamoto 2020). This gradual liberalization of Myanmar's economy led to significant economic growth and poverty alleviation over the next decade (CSO, UNDP, and World Bank 2020; Ferreira, Salvucci, and Tarp 2021). The different policy reforms and, later, the crises—together with external developments in the region (see Chapters 1 and 13)—have greatly affected the functioning of farms and their engagement with markets.

The objective of this chapter is fourfold. First, it reviews the state of commercialization in agricultural input markets and the ongoing transformation. Second, we assess farmers' crop output markets and commercial surpluses. Third, we look at the issue of market access and its influence on farm performance and commercialization—important given the low levels of urbanization and poor infrastructure in the country (World Bank 2017). Fourth, we assess the impact of the recent crises on farm commercialization.

Agricultural input markets

Commercial agricultural input use: Levels and associated factors

Using data from the 2017 Myanmar Living Conditions Survey (MLCS), Table 10.1 shows average expenditure on all major (nonlabor) agricultural inputs used in crop production as well as income from crop sales and overall crop income (valuing own consumption) nationally and by agroecological zone (AEZ). Three-quarters of farm households purchased inorganic fertilizer, 60 percent bought other agrochemicals, and 54 percent rented agricultural machinery.[1] We see significant differences across different AEZs. The adoption of modern inputs (inorganic fertilizer, agrochemicals, and machinery rental) is overall higher in the Delta and the Dry Zone than in other areas, possibly linked to greater access to credit from the Myanmar Agricultural Development Bank (MADB) in lowland regions.

In 2016, farmers spent $380 per farm annually on commercial agricultural inputs—equal to an estimated 20 and 26 percent of the value of crop production and crop sales, respectively (Table 10.1). These farm expenditures need to be paid upfront before crops are sold, so they often require farmers having access

1 Mechanization use is higher given that a number of farmers own machines themselves and do not rely on rental markets.

TABLE 10.1 Average expenditure on crop inputs per farm, by agroecological zone

Input	National	Delta	Coastal Zone	Dry Zone	Hills and Mountains
Share of households that purchased each input (%)					
Inorganic fertilizer	75	84	62	77	66
Organic fertilizer	15	12	17	17	16
Seed	50	55	35	50	48
Agrochemicals	60	77	27	66	41
Renting machinery	54	66	35	62	35
Hiring cattle	18	10	12	30	12
Irrigation	3	1	3	7	1
Cost ($)					
Inorganic fertilizer	108.1	155.3	67.4	83.9	98.5
	(179.6)	(226.4)	(139.9)	(142.2)	(163.3)
Organic fertilizer	12.3	11.9	11.1	10.5	15.6
	(60.3)	(70.4)	(58.4)	(50.6)	(60.7)
Seed	53.6	71.6	15.5	55.5	40.6
	(119.1)	(139.1)	(37.7)	(126.0)	(92.3)
Agrochemicals	54.3	104.3	9.0	43.8	24.1
	(118.6)	(164.0)	(39.5)	(97.6)	(68.2)
Renting machinery	77.9	107.5	34.5	98.7	27.2
	(421.0)	(237.3)	(81.2)	(658.6)	(75.6)
Hiring cattle	12.0	9.2	11.5	16.1	9.9
	(42.3)	(39.1)	(43.8)	(46.1)	(39.5)
Irrigation	0.5	0.6	1.1	0.6	0.1
	(4.7)	(6.8)	(8.2)	(3.0)	(0.8)
Purchased inputs	380.3	568.4	213.0	359.8	239.2
	(822.0)	(878.8)	(411.3)	(1,024.5)	(352.2)
Inorganic fertilizer per hectare	66.2	108.5	35.4	46.7	53.1
	(197.0)	(307.4)	(124.1)	(127.5)	(98.5)
Organic fertilizer per hectare	13.1	18.5	17.0	8.7	11.8
	(126.2)	(203.4)	(133.9)	(52.7)	(66.7)
Seed per hectare	29.5	42.8	12.0	26.6	22.8
	(106.6)	(173.2)	(40.2)	(52.8)	(64.5)
Agrochemicals per hectare	35.5	69.8	6.9	27.0	15.9
	(165.1)	(260.7)	(48.1)	(119.5)	(58.8)
Rent machinery per hectare	33.6	45.0	17.5	39.2	17.2
	(96.2)	(85.2)	(44.1)	(128.5)	(55.5)
Hiring cattle per hectare	8.4	6.4	7.6	11.6	6.6
	(32.4)	(30.9)	(28.3)	(37.8)	(26.2)

(continued)

TABLE 10.1 (continued)

Input	National	Delta	Coastal Zone	Dry Zone	Hills and Mountains
Cost ($) (continued)					
Irrigation per hectare	0.6 (10.3)	0.7 (9.6)	2.9 (32.4)	0.4 (2.5)	0.0 (0.8)
Purchased inputs per hectare	257.1 (979.7)	468.5 (1,575.2)	176.8 (1,251.8)	181.2 (423.2)	141.9 (246.6)
Share in total purchased inputs per farm					
Inorganic fertilizer (%)	28.4	27.3	31.6	23.3	41.2
Organic fertilizer (%)	3.2	2.1	5.2	2.9	6.5
Seed (%)	14.1	12.6	7.3	15.4	17
Agrochemicals (%)	14.3	18.4	4.2	12.2	10.1
Renting machinery (%)	20.5	18.9	16.2	27.4	11.4
Hiring cattle (%)	3.2	1.6	5.4	4.5	4.1
Irrigation (%)	0.1	0.1	0.5	0.2	0
Crop sales income ($)	1,467 (3,384)	2,331 (4,524)	898 (2,167)	1,292 (3,309)	878 (1,553)
Crop production ($)	1,942 (3,885)	2,873 (5,361)	1,330 (3,065)	1,774 (3,511)	1,278 (1,830)
Households	4,772	1,002	510	1,194	2,066

Source: Authors' calculations using 2017 Myanmar Living Conditions Survey (MLCS) data.

Note: Other inputs include fuels, hiring of storage, and seedlings. Households with missing harvest data (5 percent of agricultural households) were dropped. Standard deviations are in parentheses.

to credit. At the time of the survey in 2017, credit had been mostly provided by the government through MADB and by microfinance institutions, cooperatives, and government-supported village credit schemes (Okamoto 2020).

Myanmar farmers spent an average of $108 on inorganic fertilizer in 2016. The Delta had the highest fertilizer expenditure in the country, at $155 per farm and $108 per hectare (ha), significantly higher than in other AEZs. Average fertilizer expenditure for the other zones was $98 per farm in the Hills and Mountains, $84 per farm in the Dry Zone, and $67 per farm in the Coastal Zone. Standard deviations for fertilizer expenditure per farm are high, indicating large variations in fertilizer use by farms within each zone, particularly in the Delta.

Table 10.1 further shows that fertilizers are the largest agricultural input purchase for Myanmar farmers, at 28 percent of all inputs purchased. Machine rental and agrochemicals come in at 20 and 14 percent, respectively. While absolute expenditure on fertilizer is highest in the Delta, overall expenditure on purchased inputs is also almost 50 percent higher in the Delta compared with the national average. Thus, the share of inorganic fertilizer in overall purchased inputs in the Delta is the same as in the rest of the country.

To analyze the associates of expenditure on agricultural inputs (in US dollars per farm per year) at the farm level, we run a tobit regression based on data from MLCS (Table 10.2).[2] The regression is left-censored because a number of agricultural households do not use any commercial inputs. The righthand side variables used in the regression are types of crops grown, operated land size, irrigation access, intensity of land cultivation within a year, and household characteristics. This analysis is done at the national and AEZ levels.

Several important associations show up:

- Maize, dry season paddy, and pulse cultivation are associated with greater commercial input use. Maize (mostly in Shan State) is a high-input cash crop relative to most other crops cultivated in the country (Fang and Belton 2020). Paddy planted in the dry season is also highly commercialized and uses more commercial inputs than during the monsoon (World Bank 2016). Pulses are Myanmar's most important export crop. These data, therefore, suggest that more market-oriented crops are associated with higher commercial input use.

- Irrigated land is associated with a 53 percent ($169) higher expenditure on agricultural inputs, often linked to more reliable water supply and, therefore, more secure returns to input use.

- Larger farms are associated with more input use. An additional hectare of land operated is associated with an $87 higher expenditure on agricultural inputs, an increase of 27 percent.

- Household characteristics matter for the adoption of commercial inputs. Knowledge levels are a dimension of this—households whose head has an education level above primary school spent 21 percent ($67) more on agricultural inputs than did other households. At the same time, an additional worker in the household is associated with a $14 lower expenditure on agricultural inputs, possibly because of a substitution of labor in place of commercial inputs.

- Across the four AEZs, similar associates are seen.

2 As data on input use by crop were not available, we rely on an analysis of associates at the aggregate level of the farm.

TABLE 10.2 Associates of input expenditures, by household

Variable	Mean of variable	National	Delta	Coastal Zone	Dry Zone	Hills and Mountains
Grows paddy in wet season (0/1)	62.2%	37.808 (31.032)	106.460*** (33.162)	180.354*** (64.962)	−90.096 (64.264)	−29.550 (36.396)
Grows paddy in dry/cool season (0/1)	15.5%	101.123*** (34.639)	128.105*** (45.019)	59.257 (83.766)	165.778** (66.924)	−27.529 (29.667)
Grows pulses in a year (0/1)	43.2%	71.804** (32.583)	176.377*** (40.929)	94.986* (49.796)	−44.065 (79.541)	23.449 (51.879)
Grows maize in a year (0/1)	13.3%	167.120*** (41.834)	22.906 (35.303)	509.334* (283.841)	−67.373 (114.805)	220.590*** (44.061)
Grows sesame in a year (0/1)	15.8%	−13.641 (37.624)	−117.005 (80.581)	−1,398.722*** (261.908)	−7.392 (40.556)	185.446 (151.149)
Total operated area (hectares)	2.6	87.095*** (11.099)	95.976*** (15.486)	25.223*** (5.366)	110.587*** (30.396)	54.053*** (9.057)
Share of land irrigated (%)	24.6%	1.692*** (0.264)	0.744** (0.352)	0.855** (0.432)	2.875*** (0.498)	1.469*** (0.383)
Times land used in seasons in a year	1.8	−4.268 (23.391)	87.668*** (25.275)	−9.738 (35.202)	−32.230 (45.058)	−19.963 (21.417)
Head has more than primary education (0/1)	59.0%	67.396*** (20.474)	38.459 (29.276)	−2.696 (22.644)	108.173** (49.552)	85.489*** (20.562)
Head is female (0/1)	15.7%	−15.035 (20.246)	21.577 (37.367)	−11.779 (25.680)	−21.481 (34.865)	−12.768 (25.816)
Age of head (years)	52.1	−16.317** (7.665)	−12.963 (10.814)	−5.172 (9.479)	−40.440** (18.456)	7.628 (8.686)
Adults ages 15 years and older (number)	2.9	13.509* (7.040)	13.236 (11.669)	7.716 (6.565)	8.695 (12.194)	13.359 (9.264)
Coastal Zone (base = Delta) (0/1)	8.0%	−269.566*** (41.142)	NA	NA	NA	NA
Dry Zone (base = Delta) (0/1)	36.0%	−142.134*** (42.880)	NA	NA	NA	NA
Hills and Mountains (base = Delta) (0/1)	26.0%	−209.852*** (39.298)	NA	NA	NA	NA
Observations		4,772	1,002	510	1,194	2,066
Pseudo R-squared		0.0166	0.0377	0.0225	0.00908	0.0300

Source: Authors' calculations using 2017 MLCS data.

Note: Agricultural inputs consist of chemical and organic fertilizer, seed, and agrochemicals. Means of age of household head are in their original form, not the transformations used in the regression. NA = not applicable. Robust standard errors are in parentheses. * $p < .1$; ** $p < .05$; *** $p < .01$.

Changes in modern agricultural input use over time

Transformation has been occurring in agricultural input markets over the past decade. As described in Chapter 7, agricultural mechanization has taken off rapidly and is now being used by a large majority of farmers (Belton et al. 2021). Increasing mechanization has been driven by better access to machinery and rapid increases in rural wages. Figure 10.1 illustrates changes in imports of combine harvesters and pedestrian tractors over the past decade. While very few tractors or combine harvesters were imported in 2010–2012, these imports took off quickly, with peak imports seen in 2015 and 2016. It is noteworthy that imports dropped significantly in the 2021 crisis year. Imports of agrochemicals have also increased rapidly. Myanmar imported $8 million of agrochemicals in 2010. This value was 15 times higher—at $120 million—by 2021. Over time, we have seen more reliance on purchased seed, specifically hybrid seed, particularly in the case of maize (Fang and Belton 2020).

Large changes have occurred in chemical fertilizer imports as well. Local inorganic fertilizer production makes up a relatively small share of total inorganic fertilizer use in Myanmar (IFDC 2017), with most imported from abroad.[3] Figure 10.2 shows levels of imports of chemical fertilizers between 2011 and 2021, based on Comtrade (2022) data. It is estimated that Myanmar spent just over $400 million in 2019 to import approximately 1.3 million tons of inorganic fertilizer.[4] There have been rapid increases over time: values of fertilizer imports have almost tripled in the past decade, and the quantities imported had quadrupled in 2020 compared with 2011. However, fertilizer imports dropped significantly in the crisis year of 2021—the quantities imported fell back to the level seen in 2015.

These changes in imports show up in farm surveys as well. Looking at the extensive margin and comparing the share of households using modern inputs between 2009 and 2021, we see some noticeable differences (Table 10.3). In 2016, 73 percent of crop farmers were using chemical fertilizers, whereas in 2021, 80 percent were doing so. (Surprisingly, similar usage levels were seen

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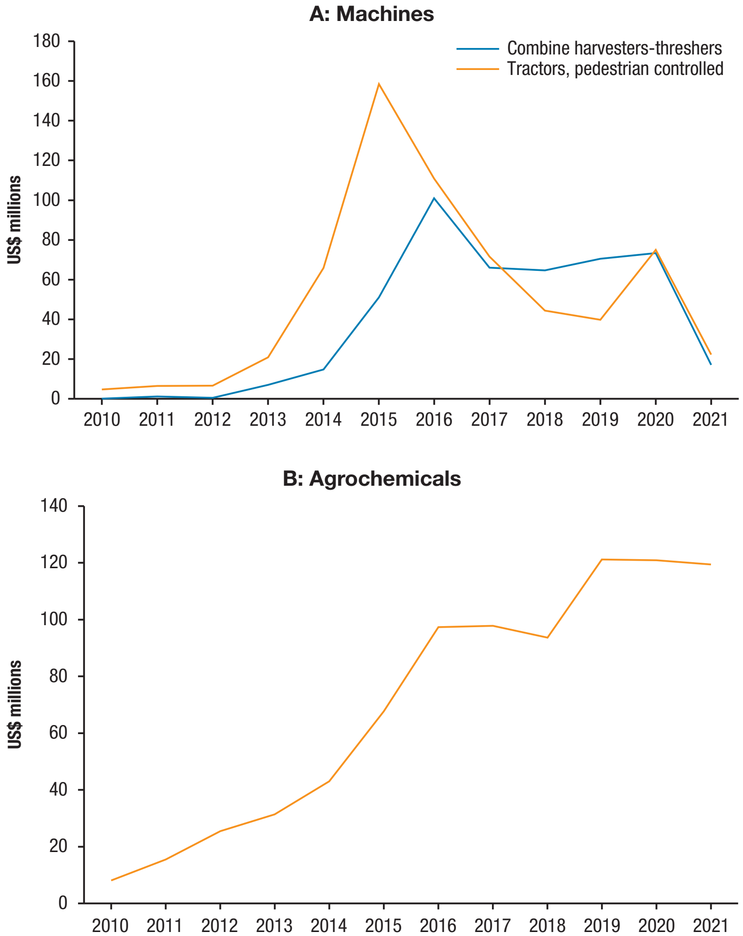
3 In 2016/17, an estimated 7 percent of the fertilizers consumed in Myanmar was locally produced (IFDC 2017). This local production consists mostly of urea, using the abundant natural gas resources in the country. While annual domestic production of urea—primarily by parastatal firms—was as high as 200,000 tons in the mid-2010s, it had declined to approximately 50,000 tons in 2017, a small share of the more than 1.3 million metric tons of inorganic fertilizer used in the country (Knoema 2022).

4 Given the lack of quantities available in the UN Comtrade dataset, we used the international urea price (Black Sea f.o.b. price) and divided the value of imports by that price to understand trends in quantities imported. Urea is the most imported fertilizer used in Myanmar (MAPSA 2022c). These data were downloaded from IndexMundi (2022).

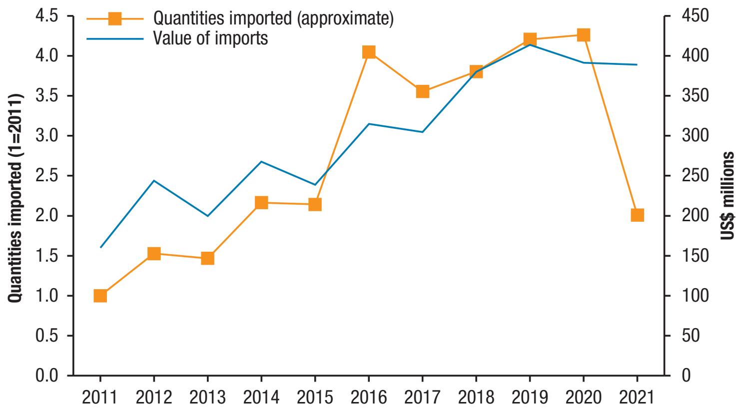
FIGURE 10.1 Imports of machines and agrochemicals, 2010–2021



Source: Authors' analysis using Comtrade (2022) data.

in 2009.) The share of farmers using agrochemicals and renting in machinery increased by 10 and 55 percentage points, respectively, over the 12-year period. Given that the questions in the Myanmar Agricultural Performance Survey (MAPS) survey in 2020 and 2021 focused on the monsoon season only, while the Integrated Household Living Conditions Assessment (IHLCA) data in 2009 covered the whole agricultural year, increasing use in the later years may be an underestimation. Renting in machinery has increased, but we also note significant increases in machine ownership over time, with 24 percent of farmers reporting owning a tractor—mostly a power tiller—in 2021 compared

FIGURE 10.2 **Quantity and value of fertilizer imports into Myanmar, 2011–2021**



Source: Authors' analysis based on Comtrade (2022) data.

TABLE 10.3 **Share of crop farmers using modern inputs**

Input	Share of farmers (%) 2009 IHLCA	2014 MPLCS	2016 MLCS	2020 MAPS	2021 MAPS
Farm households using:					
Inorganic fertilizer[a]	81	73	73	84	80
Pesticides[a]	61	58	58	71	71
Rented in machinery	10	45	54	65	65
Farm households that own a tractor or power tiller	10	24	17	24	24

Source: Authors.

Note: [a] "paid for" in IHLCA and MPLCS. IHLCA = Integrated Household Living Conditions Assessment. MPLCS = Myanmar Poverty and Living Conditions Survey. MLCS = Myanmar Living Conditions Survey. MAPS = Myanmar Agricultural Performance Survey.

with only 10 percent in 2009. The Myanmar Poverty and Living Conditions Survey (MPLCS) also shows 24 percent ownership of tractors or power tillers in 2014. However, the sample was small, so the 2014 estimates are less precise than those from the other surveys.

Although we have seen significant transformation over the past decade, the decline in imports in the crisis years is disconcerting, seemingly indicating a transformation on hold or even in reverse. Imports of combine harvesters and tractors dropped to one-quarter of the 2020 level in 2021. While the value of imports of agrochemicals and chemical fertilizers was stable in the last three years—at $120 million for agrochemicals and about $400 million for fertilizers—the quantities imported had dropped because of substantial international price increases (Hebebrand and Laborde 2022). In the case of chemical fertilizers, it is estimated that imported quantities may have dropped by half in 2021 compared with 2020 (Figure 10.2). In the case of agrochemicals, prices for glyphosate, an important herbicide, were two to three times higher in 2021 than they were in 2020, and quantities imported may have dropped accordingly (Li 2022).

Agricultural output markets

Table 10.4 presents the average and variations in the value of crop production and sales per farm by crop category nationally and by AEZs. We group the crops into the following categories: paddy rice, other cereals (mostly maize), pulses, oilseeds, vegetables, fruits, and cash crops.

We further define the commercialization rate by dividing the value of crops sold by the value of total production in Table 10.5. We present the share of each crop in total sales income for the farm nationally and by AEZs. An estimated 76 percent of all crop production is sold. Commercialization rates are highest in the Delta, where 81 percent of all production is sold, followed by the Dry Zone. Coastal areas have the lowest commercialization rate but still sell two-thirds of crop production.

Paddy rice dominates production and sales, having the highest annual value of production nationally, with a mean of $901 per farm per year (Table 10.4). Paddy makes up 46 percent of the total value of crop production and is also value-wise the most important crop in every AEZ. Average paddy production per farm in the Delta is considerably higher than in the other three zones (2 to 3.5 times as high). Paddy is also the most important crop in crop sales, making up 39 percent of crop sales of an average farm. Average paddy sale per farm is highest in the Delta (2 to 8 times higher than in the other zones). The commercialization rate of paddy is also highest in the Delta: three-quarters of paddy produced by farm households is sold (Table 10.5). This rate drops to 55 percent in the Dry Zone and one-third in the Hills and Mountains, where the majority of paddy appears to be produced for own consumption. We estimate that 56 percent of all paddy production and two-thirds of commercial surplus of paddy in the country originates from the Delta.[5]

5 These numbers are consistent with official data showing that paddy production in the Delta accounts for 57 percent of total national production (CSO, MOALI, and MONREC 2019).

TABLE 10.4 Values of crop production and sales per farm, by agroecological zone, US$ per year

Variable	National	Delta	Coastal Zone	Dry Zone	Hills and Mountains
Paddy production	901	1,682	700	592	488
	(2,581)	(4,093)	(2,570)	(1,275)	(1,045)
Paddy sales	574	1,278	375	328	164
	(1,974)	(3,123)	(1,747)	(1,001)	(780)
Other cereals production	112	26	2	28	354
	(618)	(169)	(26)	(391)	(1,060)
Other cereals sales	99	23	1	22	318
	(506)	(161)	(15)	(387)	(817)
Pulses production	324	634	5	342	34
	(1,252)	(1,278)	(64)	(1,671)	(163)
Pulses sales	276	525	4	301	31
	(1,175)	(1,091)	(60)	(1,641)	(157)
Oilseeds production	173	46	31	408	35
	(585)	(387)	(140)	(837)	(203)
Oilseeds sales	117	38	24	270	23
	(441)	(333)	(118)	(627)	(134)
Vegetables production	127	155	89	133	97
	(1,268)	(2,083)	(611)	(792)	(424)
Vegetables sales	118	154	81	120	82
	(1,253)	(2,082)	(600)	(748)	(358)
Fruits production	57	42	96	76	39
	(613)	(270)	(1,086)	(827)	(287)
Fruits sales	52	41	59	72	38
	(528)	(268)	(457)	(783)	(272)
Cash crops production	208	247	344	173	175
	(1,916)	(2,203)	(1,187)	(2,302	(841)
Cash crops sales	198	233	321	164	171
	(1,894)	(2,170)	(1,129)	(2,284)	(837)
All crops production	1,942	2,873	1,330	1,774	1,278
	(3,885)	(5,361)	(3,065)	(3,511)	(1,830)
All crops sales	1,467	2,331	898	1,292	878
	(3,384)	(4,524)	(2,167)	(3,309)	(1,553)
Observations	4,772	1,002	510	1,194	2,066

Source: Authors' calculations using 2017 MLCS data.
Note: Standard deviations are in parentheses.

TABLE 10.5 Commercialization rates (value of sales/value of production) for each crop (group)

Crop	National	Delta	Coastal Zone	Dry Zone	Hills and Mountains
Share of crop (group) produced that was sold (%)					
Paddy	64	76	54	55	34
Other cereals	89	89	61	79	90
Pulses	85	83	82	88	91
Oilseeds	67	81	79	66	66
Vegetables	93	99	91	90	86
Fruits	91	97	61	94	96
Cash crops	95	95	93	95	98
All crop sales	76	81	67	73	69
Share of each crop (group) sales in total crop sales (%)					
Paddy	39	55	42	25	19
Other cereals	7	1	0	2	36
Pulses	19	23	0	23	4
Oilseeds	8	2	3	21	3
Vegetables	8	7	9	9	9
Fruits	4	2	7	6	4
Cash crops	13	10	36	13	20
All above crops (groups)	98	98	96	99	94
Share of total paddy production and sales by AEZs (%)					
Total paddy production	100	56	6	24	14
Total paddy sales	100	67	5	21	8
Observations	4,772	1,002	510	1,194	2,066

Source: Authors' calculations using 2017 MLCS data.
Note: AEZ = agroecological zones.

The second most important crop group is pulses, with a production value of $324 per year per farm nationally. Much more than paddy, pulses are a commercial crop, with 85 percent of production being sold.[6] Nationally, pulses represent 19 percent of crop sales income. Pulses as a source of crop sales income are especially important in the Delta and the Dry Zone. In the Delta, they represent $525 per year but are still significantly less important than paddy (sales are equal to 41 percent of paddy sales). In the Dry Zone, income from pulses is at almost the same level as paddy, at $301 per year per farm.

6 What is retained is mostly seed; farm households in Myanmar do not often consume pulses.

The cash crop group—including tobacco, betel nut, tea, coffee, sugarcane, cotton, rubber, and medicinal plants for this analysis—is the third most important source of sales income nationally ($198 per year per farm). Maize—included under other cereals—is the most important commercial crop in the Hills and Mountains. More than 90 percent of the maize produced there is sold. Oilseeds are produced and sold mainly in the Dry Zone. About two-thirds of oilseeds produced are sold. While for both vegetables ($127 per year) and fruits ($57 per year), production is low relative to other crops, they are highly commercialized: about 90 percent of vegetables and fruits produced are sold.[7]

While paddy dominates in production and sales, over time, we see only relatively small changes in the share of paddy in gross area sown (taking into account areas that are cultivated twice or more over the year). There has been no substantial diversification to other crops over the past decade. Based on data from the Ministry of Agriculture, Livestock, and Irrigation (2022), paddy made up 34 percent of the sown area in 2012/13; this had increased slightly to 36 percent in 2021/22 (Figure 10.3).

To analyze associates of commercialization, we group crop farmers into three categories based on commercialization rates: (1) "subsistence farmers"—farmers who reported no sales of crops produced, (2) "commercial farmers"—farmers who sold less than 80 percent of their crop production, and (3) "highly commercial farmers"—farmers who sold more than 80 percent of their crop production. These three categories represent 18, 40, and 42 percent of crop farmers, respectively. We run a multinomial logistic regression to explore the associates of a household being grouped into one of these three commercialization categories. Table 10.6 presents the descriptive statistics for each group as well as the relative risk ratio (RRR) based on the multinomial regression.[8] The RRR shows how a 1 unit change in the value of the explanatory variable changes the relative probability of a household being in the category of the dependent variable compared with the base category (commercial farmers).

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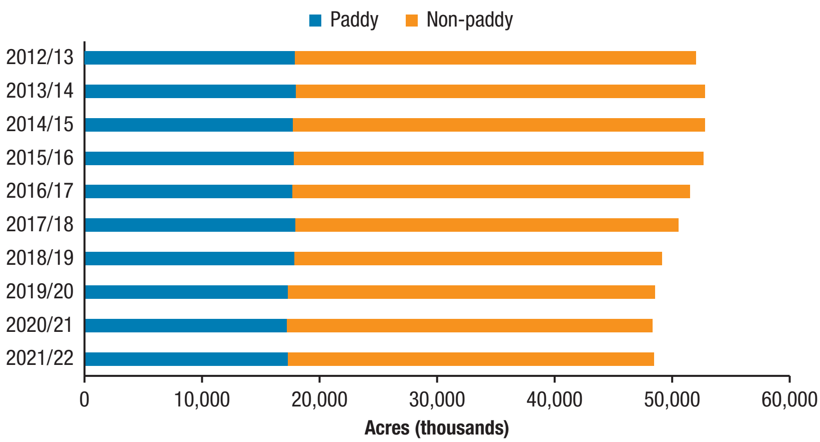
7 Households with only small garden parcels—growing vegetables or fruits on land smaller than 0.1 ha—are not considered farm households, so they are not included in this analysis. These households are likely high-income nonagricultural households or landless workers and, thus, tend to grow vegetables and fruits for their own consumption. While this land can be considered relatively important for their own food consumption, this topic is beyond the scope of this chapter.

8 RRRs are analogous to the odds ratio used in bivariate logit models. RRR $>$ 1 means a higher probability of being in the compared category relative to the base category, while RRR $<$ 1 is the reverse.

FIGURE 10.3 Area cultivated (gross area sown) of paddy and non-paddy crops



Source: Ministry of Agriculture, Livestock, and Irrigation (2022).

TABLE 10.6 Associates of commercialization rates, multinomial regression

	Mean of variables			Multinomial logit: RRR	
Variable	Subsistence	Commercial	Highly commercial	Subsistence	Highly commercial
Crop choice					
Household grows wet season paddy (%)	84	79	43	1.182 (0.233)	0.151*** (0.022)
Household grows dry/cool season paddy (%)	12	17	15	1.111 (0.260)	0.725** (0.113)
Household grows pulses in a year (%)	19	50	42	0.451*** (0.090)	0.749** (0.107)
Household grows maize in a year (%)	11	11	16	0.430*** (0.122)	1.273 (0.240)
Household grows sesame in a year (%)	7	21	13	0.545** (0.148)	0.635*** (0.110)
Farming practices					
Total operated area (hectares)	1.5	2.8	2.6	0.677*** (0.047)	1.037* (0.021)
Share of land irrigated (%)	17	23	28	0.683 (0.169)	1.518*** (0.219)
Times land used in various seasons in a year	1.3	1.7	1.9	0.467*** (0.077)	1.511*** (0.131)

(continued)

TABLE 10.6 (Continued)

	Mean of variables			Multinomial logit: RRR	
Variable	Subsistence	Commercial	Highly commercial	Subsistence	Highly commercial
Off-farm incomes					
Income from nonfarm enterprise ('000 US$)	0.46	0.37	0.38	1.010 (0.038)	0.979 (0.016)
Income from agricultural wage work ('000 US$)	0.18	0.12	0.15	1.034 (0.145)	1.188* (0.122)
Income from nonagricultural wage work ('000 US$)	0.3	0.24	0.27	1.115 (0.111)	1.042 (0.063)
Household characteristics					
Household head has more than primary education (%)	44	59	63	0.778* (0.102)	1.227** (0.112)
Household head is female (%)	14	16	16	0.861 (0.152)	0.926 (0.115)
Age of household head	51	53	51	1.019 (0.054)	0.897*** (0.031)
Workers: household size (% ratio)	62	67	64	0.530** (0.137)	0.503*** (0.094)
Household size	4.9	4.8	4.4	1.028 (0.036)	0.908*** (0.024)
Coastal Zone (base = Delta)	NA	NA	NA	1.288 (0.393)	0.244*** (0.057)
Dry Zone (base = Delta)	NA	NA	NA	1.477 (0.385)	0.271*** (0.048)
Hills and Mountains (base = Delta)	NA	NA	NA	2.138*** (0.528)	0.372*** (0.077)
Observations	868	1,897	2,007	4,772	
Pseudo R-squared				0.205	

Source: Authors' calculations using 2017 MLCS data.

Note: There are three categories of farmers based on commercialization level: subsistence—no sales of the crops they produced; commercial (base category for multinomial logit model)—sold some crops, but less than 80 percent of the crops they produced; and highly commercial—sold 80 percent or more of the crops they produced. RRR = relative risk ratio. Standard errors are in parentheses. * $p < .1$; ** $p < .05$; *** $p < .01$.

The explanatory variables included relate to crop choice, farming practices, off-farm income, and household characteristics.

We find that households that grow paddy are more likely to be commercial than highly commercial, indicating that some paddy is used for household own consumption and rarely all sold. Growers of other crops (pulses, maize, and sesame) are significantly more likely to be commercial relative to subsistence (and this is in contrast with paddy growers, where this category is not significant). Maize, pulses, and sesame are mostly sold but still partially used for own consumption. Maize tends toward high commercialization (with a coefficient higher than 1.0 for commercial farming), but the coefficient is statistically insignificant.

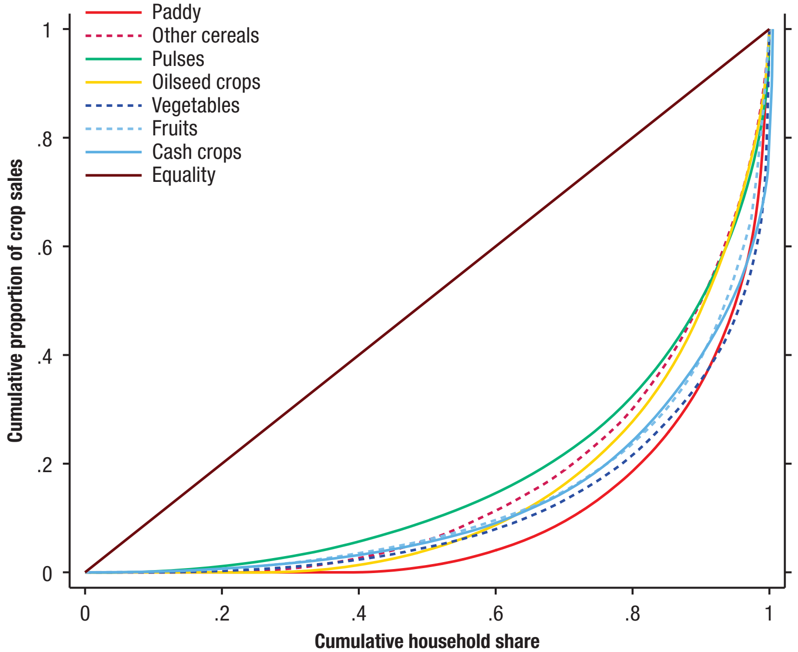
Larger land area and more intensive use of land are associated with greater commercialization. Farmers with larger cultivated land area are less likely to engage in subsistence production—that is, they have sufficient land to produce the crops their household requires and can produce some surplus for sale. Access to irrigation is strongly associated with commercialization. Households engaging in subsistence production have the lowest share of irrigated land, while highly commercial farmers have the highest share of irrigated land. Households that cultivate more seasons in a year on a parcel are less likely to be subsistence producers and more likely to be highly commercial farmers.

Household characteristics also matter for commercialization. Household heads with more than primary education have higher levels of commercialization, whereas households with older heads are less likely to be highly commercial. Households with a higher ratio of workers in the household to household size are more likely to be commercial than either subsistence or highly commercial. In contrast, those with a larger household size are more likely to keep part of the crops produced for their own consumption instead of selling all and, therefore, being highly commercial.

To further show the contribution of large and small farms to aggregate sales, Figure 10.4 presents Lorenz curves of the value of crop sales for respective crop growers. To construct this Lorenz curve, households are ranked from lowest to highest in terms of crop sales. Then, their importance (share) in total crop sales is calculated and shown on the y-axis. The closer the line to the diagonal line (perfectly equal), the more equal the distribution. Crop sales are shown to be highly concentrated among large producers, as the bottom 80 percent of paddy growers account for only about 20 percent of total paddy sales. Almost half of paddy growers grow paddy only for their own consumption and do not sell any. Across all crops, paddy sales distribution is the most unequal. For the other crop categories, the bottom 80 percent of the respective growers account for between 20 and 35 percent of total sales.

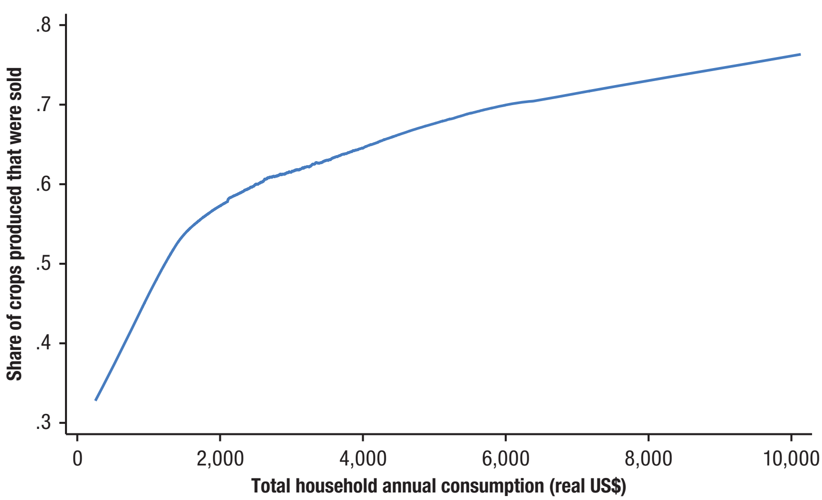
We further assess the link between crop commercialization and welfare. Figure 10.5 shows that the overall agricultural commercialization rate is positively associated with household income. Households with a commercialization rate of 60 percent have an annual consumption level of approximately $3,000, while those with a commercialization rate of 70 percent have

FIGURE 10.4 Cumulative distribution graph (Lorenz curve) on value of crop sales



Source: Authors' analysis using 2017 MLCS data.

FIGURE 10.5 Commercialization and welfare linkages



Source: Authors' analysis using 2017 MLCS data.

Note: USD = US dollar.

consumption levels that are double that level. Association is not causality. Richer households may participate more in agricultural markets, and households that participate more in markets may be able to achieve higher incomes. Further studies are needed to understand this relationship better.

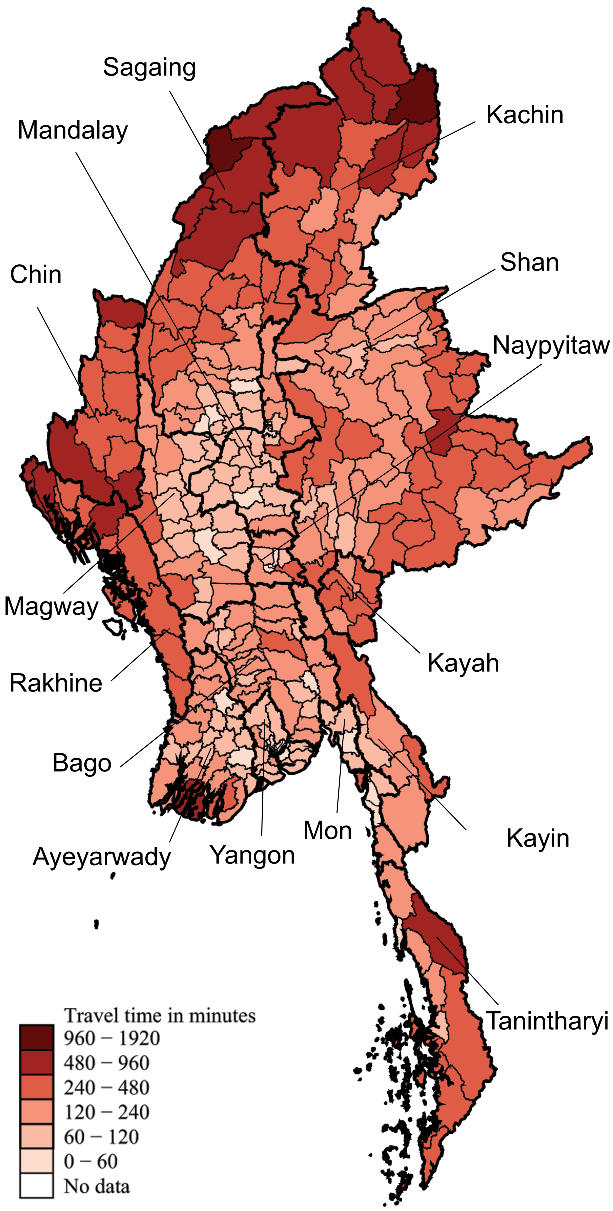
The role of market access

Market access has been shown to be an important determinant of farm commercialization as well as welfare (Stifel and Minten 2017; Vandercasteelen et al. 2018; Vandercasteelen, Minten, and Tamru 2021). Remoteness and lack of access to urban markets are seemingly major constraints for rural Myanmar and its agricultural economy. The urban share of Myanmar's population is 35 percent, significantly below that in most other Asian countries (MAPSA 2022b). Almost 40 percent of Myanmar's rural population and 27 percent of its overall population are located further than 2 km away from a paved road, a larger share than in other Asian countries. Around 20 million people live in villages without access to an all-season road, and about 25,000 villages and 9.2 million people reside in villages that are not connected by any road (World Bank 2017). Another 20,000 villages and 11.3 million people are connected by a road that is not all-season, likely leading to increased seasonal stress. Market access is, therefore, still a major issue for a large part of the country's rural population, likely hampering agricultural performance for these remote villages.

To evaluate the market access of farmers, we calculate travel times of farmers to a major city (of 50,000 people or more).[9] Figure 10.6 shows these travel times for all townships of the country. The outer and less populated parts of the country—mostly townships in the Hills and Mountains and the Coastal Zone—are the most remote. Nationally, an estimated 20 percent of farmers can travel to a city in two hours or less (Figure 10.7). On the other hand,

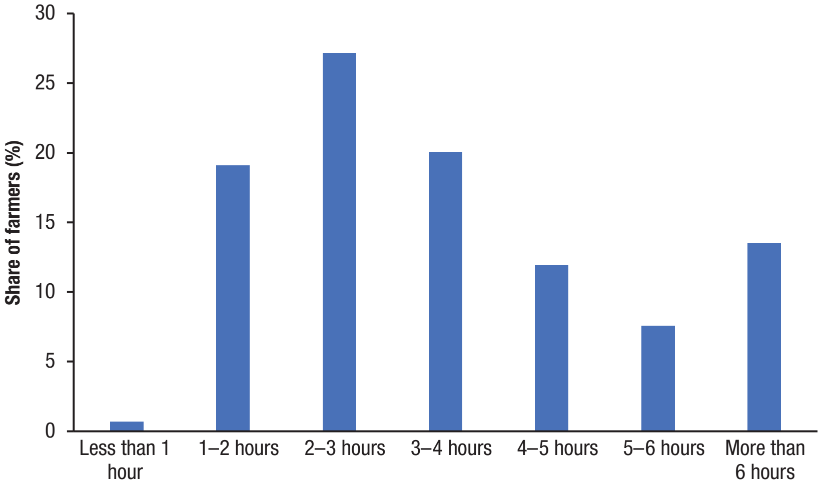
9 Travel times are estimated from the center of the township using transport infrastructure and landscape features (land use, rivers, lakes, and slope obtained from the Myanmar Information Management Unit [MIMU 2022]). We assigned a travel speed to each of the road types (major, secondary, tertiary, tracks/other) in the geographic information system (GIS) data, ranging from 75 to 10 km per hour. Then, we combined the GIS layers into a friction (or impedance) grid converted into 1 km grid cell raster layers. Slope is also considered to model uphill and downhill movement. The survey asked farmers their travel time to the center of the township. We added both these measures to obtain total travel times. As travel times to the centroid of the township (as calculated through the GIS friction model) and the center of the township (as asked in the farm survey) are not exactly the same, there are likely measurement issues with this remoteness variable. It will, however, be a good approximation of the travel times—and remoteness—that a farm household faces.

FIGURE 10.6 Remoteness of townships (travel time to a city of minimum of 50,000 people)



Source: Authors' analysis.

FIGURE 10.7 Travel time of farmers to a city of at least 50,000 people



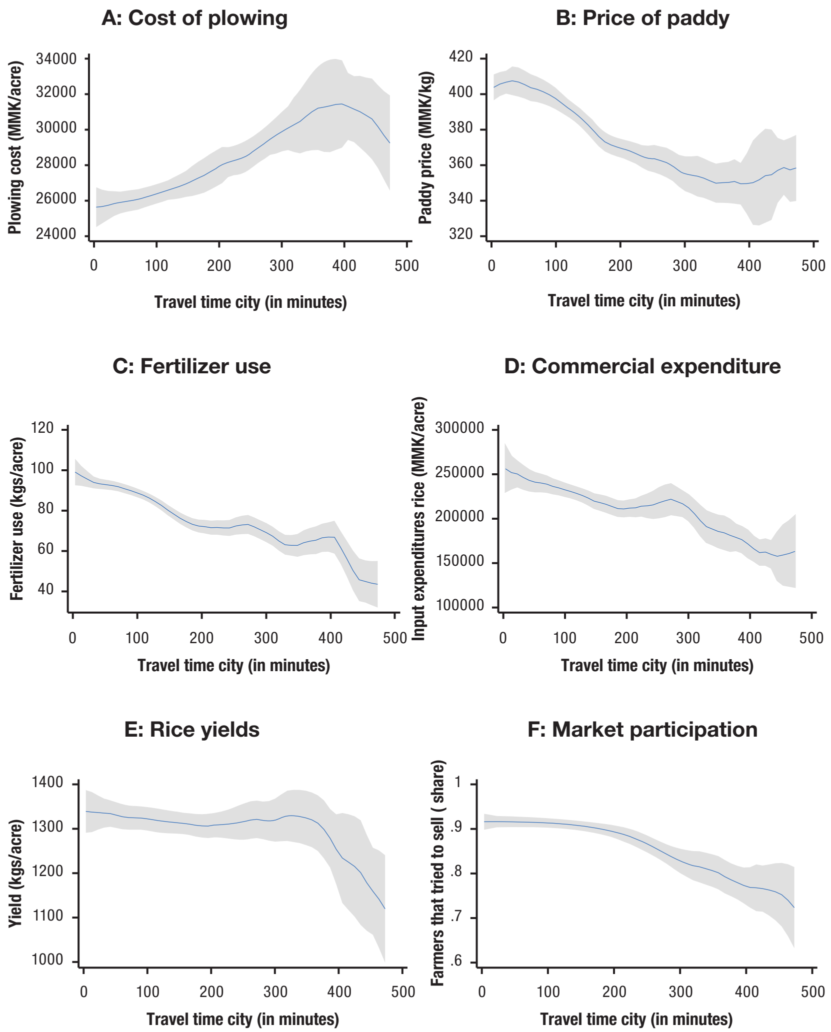
Source: Authors' analysis using MAPS data.

one-third of farmers would need more than four hours, while 13 percent would need more than six.

Figure 10.8 further shows the relationships between these travel times and paddy production and commercialization, based on MAPS 2021 data. Remoteness reduces incentives for commercialization in two ways. First, prices of commercial inputs are significantly higher. Panels A and B in Figure 10.8 illustrate that, over the domain of travel time considered, the cost of plowing 1 acre of land is 20 percent higher for those villages located farthest from a city compared with those that are well connected. As mechanization service providers operate from better-connected areas, the travel costs to remote rural areas must be reflected in the prices they charge those farms. Second, output prices are lower if villages are more remote (panel B). Farmers located in villages farthest out received prices for their paddy that were 15 percent below those for well-connected farmers.

These reduced incentives for the use of commercial inputs are shown in panels C and D. Remote farms use significantly less fertilizer and spend less on commercial inputs. The most remote farmers use less than half the level of chemical fertilizer used by farms close to cities, while commercial expenditure drops by 40 percent. This lower use of commercial inputs has important implications for yields—as shown in the case of rice yields (panel E) dropping by 20 percent for the most remote farmers—as well as on market participation

FIGURE 10.8 Market access and prices, commercial input use, yields, and output market participation, monsoon 2021



Source: Authors' analysis using MAPS data.

for more remote farmers. Panel F shows that 70 percent of the most remote farmers are participating in output markets (of any crop), whereas this share is as high as 90 percent for the best-connected farmers.[10]

Farm commercialization and the triple crisis

Large changes in international commodity markets combined with local crises—COVID-19 and political problems resulting from the military takeover—have hit the agrifood sector hard and have raised doubts about the performance of the agriculture sector overall (Boughton et al. 2021; Goeb et al. 2022; MAPSA 2021a; World Bank 2022). Externally, there were large changes in commodity markets in 2021 and 2022. International fertilizer prices increased by 125 percent between January 2021 and January 2022 as a result of high feedstock prices (Hebebrand and Laborde 2022) (Figure 10.9). Moreover, international shipping costs in 2021 were substantially higher as a consequence of a global shortage of containers, which was especially problematic in Asia because of COVID-related trade reductions. International freight costs in the Southeast Asian region in 2021 were estimated to be two to four times higher than during normal times (USDA 2021). Following Russia's invasion of Ukraine in February, fertilizer prices increased even further because Russia and Ukraine are major suppliers of feedstock for fertilizers (Hebebrand and Laborde 2022). Fertilizer prices increased by 17 percent between January and March 2022. These higher prices of fertilizers led to large worries about food security, especially in low- and middle-income countries.[11]

Input prices for rice farmers have changed dramatically between the monsoon season of 2020 and that of 2021 (Table 10.7). First, chemical fertilizer prices, reflected by the price of urea, the most important fertilizer used by rice farmers, had increased by 56 percent on average (the median by 68 percent) during the monsoon of 2021 compared with a year earlier. These high fertilizer price increases were driven mostly by international price changes, by the

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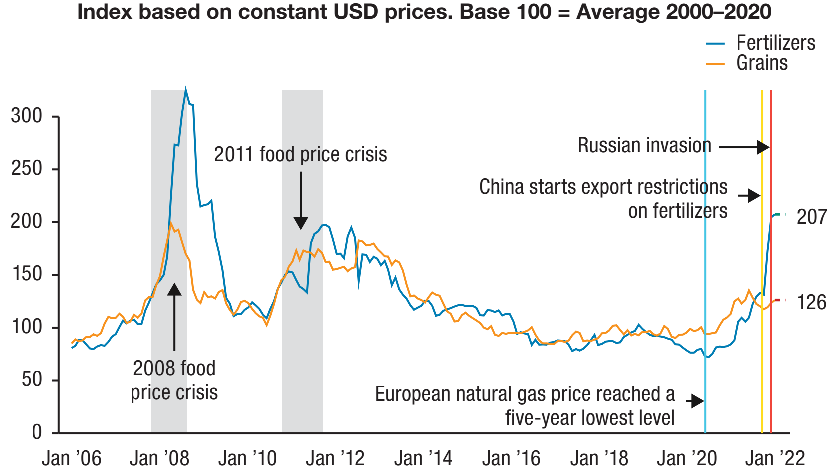
10 Travel time can reasonably be considered an exogenous variable. However, these are simple binary relationships—done through a local polynomial smooth plot procedure—without any control for other explanatory variables. Caution in interpretation, therefore, is warranted. The results show only simple associations and should best be further analyzed in a regression framework. For a more detailed discussion on remoteness using these data and relying on such a framework, see Steinhübel and Minten (2023).

11 For food markets, we note important price increases for some major staples. Grain prices in March 2022 were, on average, 23 percent higher than a year earlier, and were especially driven by high price increases for wheat (Hebebrand and Laborde 2022).

FIGURE 10.9 International price evolutions: Real prices for food and fertilizer



Source: Hebebrand and Laborde (2022), using data from World Bank and U.S. Bureau of Labor Statistics.
Note: USD = US dollar.

TABLE 10.7 Input and output prices in paddy rice cultivation, monsoon 2020 and monsoon 2021, kyat

Input/Output	Unit	Monsoon 2020 National	Monsoon 2021 National	Monsoon 2021 Delta	Monsoon 2021 Coastal Zone	Monsoon 2021 Dry Zone	Monsoon 2021 Hills and Mountains
Inputs							
Urea price (kg)	Mean	805	1,257	1,174	1,393	1,320	1,253
	Median	740	1,240	1,160	1,500	1,300	1,240
Costs for plowing 1 acre (four-wheel tractor)	Mean	29,010	34,503	32,291	46,900	30,906	40,161
	Median	25,000	30,000	30,000	45,000	30,000	35,000
Man (daily wage)	Mean	6,200	6,666	6,615	8,083	6,224	6,835
	Median	6,000	6,000	6,000	8,000	6,000	6,000
Woman (daily wage)	Mean	4,972	5,315	5,120	6,085	5,076	5,654
	Median	5,000	5,000	5,000	6,000	5,000	5,000
Output							
Paddy price (kg)	Mean	351	380	362	347	401	401
	Median	335	359	340	335	383	360
Observations		2,667	2,672	954	178	1,002	538

Source: Authors' calculations using MAPS data.

depreciation of the local currency, and by increased fuel and transportation costs locally (MAPSA 2021b). Table 10.7 also shows that urea prices are relatively higher in the Coastal Zone and the Hills and Mountains compared with the rest of the country, likely reflecting distances from the entry points of fertilizer imports from abroad.

Second, as a measure of the costs of mechanization, Table 10.7 presents the prices for plowing one acre of land with a four-wheel tractor. Farmers reported that those costs had increased by 19 percent on average, mostly reflecting the higher fuel costs in the country over these two seasons. However, a survey of mechanization service providers during the monsoon of 2021 showed that these providers faced financial challenges and fears of foreclosure on machinery loans as a result of worsening demand in the country overall (MAPSA 2021a), possibly contributing to further price increases for farmers.

Third, use of wage labor in agricultural activities is very common. It has been shown that nominal and real wage levels before the COVID-19 pandemic were increasing fast because of the increasing availability of alternative employment in cities and neighboring countries (Chapter 14). This increase in wages has stalled, seemingly because of mobility restrictions linked to COVID-19 as well as widespread economic problems related to the political crisis (MAPSA 2021a; World Bank 2022). Table 10.7 shows that the average daily wages of hired labor of men and women increased by 7 percent, while median wages did not change in nominal terms over the two seasons. However, wages actually decreased in real terms because of high inflation in the country (Chapter 15). Based on a large food vendor survey in different parts of the country conducted at the same time as the MAPS, it is estimated that the costs of a typical food basket increased by 41 percent compared with a year earlier—substantially more than the increase in wages (MAPSA 2022a).

While we see increases in prices for most agricultural inputs, we see a smaller change in output prices at the time of the survey, affecting the profitability of rice production. Table 10.7 shows that, nationally, average prices for paddy increased by 8 percent (the median changed by 7 percent). Paddy prices were relatively lower in the Delta and the Coastal Zone, likely reflecting their surplus status and the distances from these communities to end markets in big cities, such as Yangon and Mandalay, as well as export markets (rice is shipped from Yangon or over land borders).

Table 10.8 presents the share of farmers who tried to sell crops during the monsoons of 2020 and 2021, the types of crop they wanted to sell, and the challenges encountered during marketing. A large majority of farmers tried to sell their monsoon crops, and we see only a slight change between

TABLE 10.8 Sales of crops and challenges, 2021, percentage of farmers reporting

		2021				
Crop/challenge	2020 National	National	Delta	Coastal Zone	Dry Zone	Hills and Mountains
Tried to sell crop of monsoon harvest	91	88	95	86	86	84
Main crop that they tried to sell						
Rice	47	46	68	62	38	23
Maize	7	7	0	0	2	32
Groundnut	7	6	1	1	14	1
Sesame	6	5	1	1	8	4
Pulses	6	8	5	1	14	3
Betel leaves	3	4	7	4	3	0
Other crops	24	24	17	31	21	37
Faced challenges during marketing	20	21	18	24	20	23
Type of challenges						
Low prices for crops	16	15	12	21	15	17
High price of fuel/transportation	9	12	10	18	12	12
Payment problems	5	5	4	9	4	7
Have to sell crops on credit	6	6	8	8	5	8
Markets are closed	6	6	5	8	7	8
Not many traders	9	10	8	16	11	11
Farmer and buyers/traders cannot reach each other	8	9	7	10	10	10
Insecurity during travel	3	5	3	5	7	6

Source: Authors' calculations using MAPS data.

the two years in the share who wanted to sell. As expected, rice was the main crop that farmers wanted to sell after the monsoon (Table 10.8). This pattern has changed little over the years. In 2020, 41 percent of the farmers considered rice the main crop they wanted to sell, compared with 39 percent in 2021. In the Delta, rice was the main crop for sale in the monsoon of 2021 for 68 percent of farmers. It was much less important in the Hills and Mountains, where only 23 percent of crop farmers reported that this was the main crop they tried to sell; in contrast, 26 percent of crop farmers in this zone reported that maize was their main crop for sale. Pulses were relatively important in the Dry Zone.

Table 10.8 further shows that 21 percent of farmers indicated that they had faced marketing challenges—the same share in 2020 as in 2021. Low prices for crops was reported most commonly as the major challenge. While 16 percent mentioned this challenge for the 2020 season, this declined slightly in the 2021 monsoon season, possibly an indication of increasing farmgate prices for some crops. However, "low prices" still was the main challenge mentioned in 2021, possibly reflecting the much higher prices seen in agricultural input markets, as noted earlier. The second most commonly mentioned challenge was high fuel and transportation costs. Other problems noted included lower numbers of traders available, and that farmers could not reach traders or traders could not reach them.

We also asked farmers to estimate how overall sales income from crop farming had changed by the beginning of 2022 compared with the same time a year earlier (Table 10.9). Strong heterogeneity is seen in crop farmers' reports on evolution of crop sales income over the previous year: 36 percent reported lower sales incomes compared with a year earlier, whereas 35 percent indicated higher crop sales incomes, and 24 percent reported that incomes were about the same. There are no strong regional patterns in these responses, indicating that some farmers in each region or state were doing better, while others were not.

Relying on an ordered probit model (reflecting the first five categories in Table 10.9, going from a decline of 20 percent or more to an increase of 20 percent or more), we further analyze how different factors were associated with differential developments in crop sales income after the 2021 crisis year (Table 10.10). The location of the household mattered enormously, as travel became more complicated because of increased transportation costs as well as insecurity. This is shown by the highly significant effect of travel time to a major city of at least 50,000 people. Farmers located farther away from such cities saw lower crop sales increases than did those close by. Farmers who were remote within the township also saw negative effects, but the coefficient is not significant at conventional statistical levels. Bigger farms were able to achieve better increases in sales income than smaller farms.

The security situation of the household mattered for crop sales performance. Households stating that they were in a secure situation were able to achieve higher income increases than those that were not. Finally, the choice of crops grown was also a major reason for households doing better. Households that were growing export-oriented crops, such as maize and pulses, saw significant price increases locally because of international market developments as well as the depreciation of the kyat, enabling them to realize significant increases in crop sales incomes.

TABLE 10.9 Changes in crop sales income, early 2022 relative to year earlier, percentage of farmers reporting

Change	National	Delta	Coastal Zone	Dry Zone	Hills and Mountains
Decline of more than 20%	17	17	12	18	18
Decline of less than 20%	19	20	22	19	16
The same	24	26	25	22	24
Increase of less than 20%	23	23	33	20	23
Increase of more than 20%	12	10	6	15	11
Do not know	6	4	3	5	8

Source: Authors' calculations using MAPS data.

TABLE 10.10 Associates of changes in sales income during the crisis of 2021, ordered probit

	Descriptives		Regression results		
Variable	Unit	Mean	Unit	Coefficient	*Z* value
Travel time to major city	Hours	172.8	Log (hours)	–0.06	–2.12**
Distance to township center	Hours	0.83	Log (hours)	–0.06	–1.19
Area of land owned	Acres	8.42	Log (acres)	0.09	4.21***
Perceived security situation					
Very insecure	Share	0.04		[base]	
Somewhat insecure	Share	0.14	Yes = 1	0.05	0.50
Secure	Share	0.44	Yes = 1	0.20	2.05**
Very secure	Share	0.38	Yes = 1	0.17	1.76*
Crops grown					
Paddy	Share	0.69	Yes = 1	–0.04	–1.01
Maize	Share	0.09	Yes = 1	0.45	6.53***
Pulses	Share	0.31	Yes = 1	0.21	5.00***
Agroecological zones (AEZs)					
Delta	Share	0.30		[base]	
Dry Zone	Share	0.41	Yes = 1	–0.06	–1.33
Coastal Zone	Share	0.06	Yes = 1	0.14	1.95*
Hills and Mountains	Share	0.22	Yes = 1	–0.07	–1.25
Observations			3,681		
Pseudo R-squared			0.01		

Source: Authors' calculations using MAPS data.

Note: Robust standard errors. * $p < .1$; ** $p < .05$; *** $p < .01$.

Conclusions

Over the past decade, commercial farm use of chemical fertilizer, agrochemicals, and mechanization services has increased significantly. These increases are linked to better crop performance, all other things being equal. On the output side, three-quarters of crop production is sold, indicating high market orientation. Paddy and pulses are the two most important sources of sales income, accounting for about 40 and 20 percent of total crop sales, respectively. The share of paddy in crop area sown is stable over time, seemingly indicating that farmers are not diversifying out of paddy.

A major constraint in farm commercialization is market access: a substantial number of farmers do not have access to year-round road infrastructure or are remote from major cities. While 20 percent of farmers can travel to a city in two hours or less, one-third of farmers would need more than four hours. More remote farmers have poorer incentives for crop production, use fewer commercial inputs, have lower yields, and participate less in output markets.

COVID-19 and the political crises in 2020 and 2021, as well as international market developments, have led to increasing worries about a stalled agricultural transformation toward commercialization. Price changes in modern input markets, currency policy changes, and reduced profitability for most crop farmers may reverse gains made over the past decade. Import statistics show that purchases of agricultural machinery have declined significantly and that quantities of chemical fertilizer imported in 2021 had fallen to half of 2020 levels. The value of agrochemical imports in 2021 was similar to that of previous years. However, quantities dropped substantially as a result of large international price increases—for example, prices of glyphosate doubled or tripled in 2021, depending on the month, compared with 2020.

Transformation has occurred in Myanmar's agriculture sector, but the country is still lagging behind its peers (Takeshima and Joshi 2019). To improve farm commercialization and, therefore, agricultural performance, several issues need to be addressed.

First, the business environment needs to be improved to enable businesses to deliver required products and services. The World Bank (2019) has developed an international index—the Enabling the Business of Agriculture index—to measure the status of enabling environments for agribusiness.[12] The results of this index in Table 10.11 show that regulatory measures limit

12 The World Bank assesses regulations in eight sectors in agriculture: supplying seed, registering fertilizer, securing water, registering machinery, sustaining livestock, protecting plant health, trading food, and accessing finance. These data are then weighted and combined in one overall indicator, called the Enabling Business of Agriculture score (World Bank 2019).

TABLE 10.11 Enabling the Business of Agriculture measures for Myanmar and neighboring countries

Index component	Unit	China	India	Malaysia	Myanmar	Thailand	Viet Nam
Quality of seed regulation	0–9	5	6	4	3	6	7
Quality of fertilizer regulation	0–6	4	4	0	1	3	5
Securing water	0–10	8	2	2	0	0	6
Quality of manufactured feed	0–5	3	2	4	0	4	5
Quality of veterinary medical products	0–6	6	4	5	1	3	3
Quality of phytosanitary regulation	0–5	3	3	3	1	3	3
Trading food	0–7	5	5	6	3	3	3
Warehouse receipt	0–5	3	5	0	0	3	0
Inclusive finance	0–5	3	3	3	3	3	4
Enabling the Business of Agriculture score		70.3	62.2	51.7	31.3	58.5	61.4
Rank, out of 101 countries globally		40	49	69	91	59	58

Source: World Bank (2019) data.

private agribusiness growth and lessen the availability of appropriate services for farmers. In 2019 (that is, before the triple crisis), Myanmar ranked 91 out of the 101 countries assessed, more than 20 places behind the lowest-ranked neighboring peer country, Malaysia. Of all neighboring peer countries, China ranked highest.

The agribusiness index also indicated that Myanmar could improve its regulation and business environments by reforming seed and fertilizer regulation, securing water, and improving the quality of manufactured feed and veterinary medical products. Phytosanitary regulation could also be improved. With respect to agricultural output businesses, Myanmar is not doing well, but it is not trailing peer countries as much as it is on the input side. For example, Myanmar scores three on inclusive finance—the same score as for four of its five peer countries. Warehouse receipt financing is problematic, but the same is true in Malaysia and Viet Nam.

Second, it will be necessary to improve farmers' market access. Investing in rural road infrastructure should be a priority, as this will bring a large, mainly agriculture-dependent, remote population into local and international agricultural value chains. Investments in rural roads have been shown to have high rates of return, as they enhance agricultural performance through access to cheaper modern inputs and higher agricultural output prices. They further increase agricultural and nonfarm incomes, improve nutrition, and alleviate rural poverty (Stifel, Minten, and Koro 2016). Improved market access can also be achieved through improving the security situation. At the beginning of 2022, 18 percent of farmers indicated that they felt they were living in an insecure situation. This affected their sales incomes, as traders had greater difficulty traveling there or because farmers themselves faced travel problems.

Third, we have noted no diversification away from rice over the past decade. Rice remains overwhelmingly important in Myanmar's agricultural and rural economy: 36 percent of cropland in 2021/22 was devoted to rice, and 40 percent of farmers' commercial crop income was from rice.[13] While rice has an important role to play in Myanmar's agricultural economy and in commercialization, further diversification into high-value commodities should be encouraged to increase crop incomes, improve availability of nutritious foods, as well as reduce the risks in having a farm sector that is hugely dependent on one crop, especially given changing demand among consumers and international markets.[14]

Fourth, international trade has contributed to better performance of the agriculture sector in the past decade, helping reduce rural poverty (Ekanayake, Ambrosio, and Jaffee 2019) and ensuring some economic resilience during the triple crisis (MAPSA 2022c). Increased engagement with trading partners has resulted in wider adoption of modern inputs and better farm performance. On the output side, we note that farmers who were able to export their crops in 2021/22 saw stable or even increased income from crop sales. Recent international trade hurdles arising as a result of licensing and foreign exchange distortions are, therefore, a hindrance to agricultural trade, farm performance, and, consequently, overall rural welfare.

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13 Public policy choices partly explain this lack of diversification. For example, during the socialist period (and beyond), Myanmar relied heavily on cropping controls and stringent land use planning, with an important emphasis on assuring appropriate area allocation to rice because of the government's food security concerns. Agricultural credit provided by the public sector is also often disproportionally directed toward rice production.

14 However, several of these alternative agricultural markets are thin. Major efforts to promote diversification into these crops might overwhelm local demand.

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Chapter 11

THE RICE SECTOR

Paul Dorosh, Nilar Aung, and Bart Minten[1]

Recent major local shocks have negatively affected Myanmar's economy and its people. Disruptions in the world economy linked to the outbreak of COVID-19 in early 2020 and the Ukraine war in 2022 and 2023 have led to sharp price increases for petroleum products, wheat, vegetable oils, and other food products, as well as agricultural inputs, such as chemical fertilizers. Myanmar's rice sector has also been adversely affected by increases in insecurity in rural areas, higher world prices, and reduced cross-border exports to China.

This chapter explores the implications of these shocks for Myanmar's rice exports, domestic rice production, and domestic rice prices. First, we discuss Myanmar's rice economy. Next, we describe the equations, database, and parameters of the partial equilibrium model of Myanmar's rice economy used in this analysis. We then present model simulation results, covering the effects of the income and price shocks in 2022, negative rice production shocks accompanied by lower rice exports in 2023, and implications of a cessation of cross-border rice exports to China. The final section summarizes the results, discusses policy implications, and suggests areas for further work.

Overview of Myanmar's rice sector

Rice production

Paddy rice is a very important product for farmers' livelihoods in Myanmar. Almost two-thirds of farm households grow rice during the monsoon period (Chapter 10). Paddy made up 36 percent of all land sown in the country in

1 We thank the Myanmar Rice Federation for providing data and other information on Myanmar's rice exports and Olivier Ecker and Andrew Comstock for econometric estimates of household elasticities of demand for rice. An earlier version of this chapter was presented at the Myanmar's Agrifood System: Assuring Resilience to Adversity Conference, Bangkok, Thailand, May 31–June 1, 2023.

2019/20 (MOALI 2022). Rice production data vary substantially by source, with sharp increases and decreases in some years (Dorosh, Win, and van Asselt 2019).[2] USDA data indicate that from 1990 to 2000, Myanmar enjoyed relatively rapid growth in paddy production, primarily due to area growth (USDA 2023a; Table 11.1 and Figure 11.1). Overall, production of paddy increased 35.6 percent, while area and yield growth were 25.1 percent and 8.8 percent, respectively. Total production stagnated from 2000 to 2010, however. Area increased by 17.5 percent, but yields fell by 21.0 percent.[3]

Since 2010, the rice area harvested has remained nearly constant, decreasing by only 0.7 percent. Yields have risen by a total of 13.9 percent, however, so that paddy production increased by 13.0 percent. All of this increase in yields is pre-COVID. Yields increased by 16.3 percent from 2010 to 2020 and fell by 4.9 percent between 2020 and 2022, but then recovered a bit in 2023.[4] For the 2010 to 2023 period in total, area declined by an annual average of 0.1 percent per year; yields rose by 1.0 percent per year, and production of paddy rose by 0.9 percent per year.[5]

Rice production systems and consumption patterns are diverse. Among other differences, there is a large variation in paddy rice varieties planted and consumed in the country. Emata and Pawsan are widely grown varieties. Aromatic and short-grain Pawsan varieties typically have lower yields, and they are more expensive than the long-grain Emata varieties (Goeb et al. 2022). The former became popular only relatively recently (Proximity Designs 2016). Pawsan is almost exclusively grown during the monsoon season and mostly consumed by rich urban domestic consumers, while Emata varieties are both consumed domestically and exported.

Chemical fertilizer is one of the most widely used but also the most costly inputs in paddy production. Fertilizer use is lower than in other countries in the region (Chapter 3), but it has seemingly increased compared with the

2 Numerous phone surveys in recent years have also provided information on rice production and markets, though these data are not necessarily comparable to earlier estimates of production. See, for example, MAPSA (2023c).

3 Note that there is a sharp break in the data between 2003 and 2004. Area increased by 7.9 percent, but yields fell by 17.3 percent from 2.94 to 2.43 tons of paddy per hectare. As a result, production fell 10.8 percent.

4 Other sources indicate more substantial declines in recent years. Using area estimates done by the Asian Disaster Preparedness Center (ADPC) for major paddy rice areas in the country, paddy rice production at the national level was estimated to have decreased by 13 percent in 2022 compared with 2021 (ADPC 2023).

5 Trends in milled rice production from 2007 to the present are the same as those for paddy (unmilled rice). USDA data from before 2007 use a milling ratio of 0.58 tons of milled rice per 1.0 ton of paddy. For data since 2007, a milling ratio of 0.64 is used. See, for example, USDA (2023a).

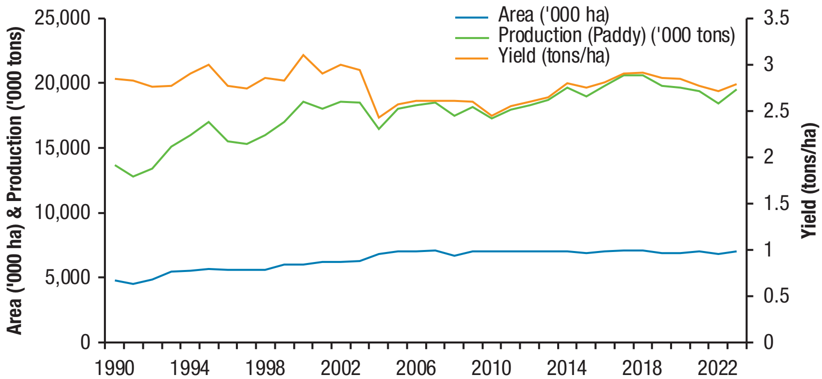
TABLE 11.1 Rice area, yield, and production, 2011–2023

Year(s)	Area ('000 ha)	Yield (tons/ha)	Production, milled rice (million tons)
1990	4,797	2.85	7.94
2000	6,000	3.10	10.77
2010	7,050	2.45	11.06
2018	7,080	2.91	13.20
2019	6,900	2.86	12.65
2020	6,900	2.85	12.60
2021	7,000	2.77	12.40
2022	6,800	2.71	11.80
2023	7,000	2.79	12.50
Percentage change			
1990–2000	25.1%	8.8%	35.6%
2000–2010	17.5%	–21.0%	2.7%
Annual average percentage change			
2010–2020	–2.1%	16.3%	13.9%
2020–2023	1.4%	–2.1%	–0.8%
2020–2023[a]	0.1%	–0.9%	–0.7%
2004–2023	2.9%	14.8%	18.4%
2004–2023[a]	0.2%	0.7%	0.9%

Source: Authors' calculations using USDA (2023a) data.

Note: [a] Yield of unmilled rice (paddy). The milling ratio from 2007 to 2023 was 0.640 kg milled rice per kg of paddy; the milling ratio from 1990 to 2006 was 0.580. ha = hectare(s).

FIGURE 11.1 Rice area, yield, and production, 1990–2023



Source: Data from USDA (2023a).

mid-2010s (World Bank 2019). Table 11.2 shows fertilizer use on the largest rice plots of paddy farmers during recent seasons. Higher use of fertilizer occurred in the dry season compared with the monsoon, seemingly because returns to fertilizer use during the latter period are riskier given less predictable water availability, leading to lower use. Over the three monsoon seasons, there was an important reduction in fertilizer use of 20 percent, partly explained by the war in Ukraine leading to significantly higher fertilizer prices internationally. A slight reduction in use was also noted for the dry season in 2022. However, this lower level was reversed in 2023, seemingly because of the improved profitability of fertilizer use linked to lower fertilizer prices and higher paddy prices.

The reduced availability of agricultural labor in the country, as well as the availability of alternative agricultural technologies, is leading to important changes in rice farmers' technology choices. The adoption of labor-saving agricultural technologies—mechanization (tractors and combine harvesters), herbicides, and direct seeding of rice—increased rapidly over the period of economic reform before 2020 (MAPSA 2023d). Over the span of only 10 years, the share of rice farmers who used tractors for plowing increased by 43 percentage points, combine harvesters by 41 points, herbicides by 39 points, and direct seeding (or broadcasting) of rice—instead of transplanting—by 20 points. Table 11.2 shows that tractor use for plowing has changed little since 2020.

Overall, we note significant increases in input expenditures in paddy rice cultivation in recent years, mostly driven by high input price increases. Despite these increases, productivity has been negatively affected by the crisis. Table 11.2 shows that monsoon productivity in 2022 was 9.5 percent lower than two years earlier, which is higher than the decline reported by USDA (2023a). Yields during the dry season were, however, more stable than during the monsoon. MAPSA (2023b) shows that a typical inverse productivity–plot size relationship exists in Myanmar, with small rice plots having higher productivity levels. The same study shows, however, that rising mechanization fees—more so in conflict-affected townships—attenuated this inverse relationship. Increases in fatal violent events during the first year after the coup also reduced rice total factor productivity by about 4 percent on average in the short run (MAPSA 2023a).

Myanmar's rice exports

Myanmar was the world's leading rice exporter for much of the early 20th century, exporting nearly three million tons per year in the 1930s. The country's

TABLE 11.2 **Productivity and input use on the major rice plot of rice farmers, by season and year**

Season/use	Level 2020	Level 2021	Level 2022	Change (%) 2021 vs. 2020	Change (%) 2022 vs. 2021	Change (%) 2022 vs. 2020
Monsoon						
Fertilizer use (kg/acre)	68	59	54	–12.8	–8.4	–20.1
… of which urea (kg/acre)	38	33	33	–13.4	1.2	–12.4
Used tractor for plowing (%)	85	86	83	0.6	–3.8	-3.3
Commercial expenditures ('000 kyat/acre)	204	223	301	9.3	35.0	47.5
Yield (kg/acre)	1,285	1,257	1,163	–2.2	–7.5	–9.5
Dry season						
Fertilizer use (kg/acre)	75	71	99	–6.2	39.9	31.2
… of which urea (kg/acre)	50	45	66	–10.4	46.7	31.4
Used tractor for plowing (%)	92	92	95	–0.2	3.4	3.2
Commercial expenditures ('000 kyat/acre)	265	306	459	15.5	50.0	73.2
Yield (kg/acre)	1,681	1,657	1,677	–1.4	1.2	–0.2

Source: Authors' calculations based on MAPS (IFPRI 2023).

exports declined precipitously, however, from 1.2 million tons per year in the 1960s, to only 500,000 to 600,000 tons per year in the 1970s and 1980s, to just 400,000 tons per year in the first decade of the 2000s (Dorosh, Win, and van Asselt 2019; World Bank 2014).

Myanmar's macroeconomic policies played a role in this decline, as a steady appreciation of the kyat raised the price of inputs in Myanmar rice in dollar terms. Improvements in the quality of rice of other exporters also increased their competitiveness relative to Myanmar's rice. In part, this was due to insufficient investment in rice production technology and irrigation infrastructure in Myanmar, along with state control of markets that provided little incentive for private investment in rice milling. In contrast to the stagnation of the Myanmar rice sector, Cambodia and Viet Nam modernized their rice industries and captured a significant share of the international market (Wong and Wai 2013; World Bank 2014).

Beginning in 2012, however, Myanmar began exporting lower quality rice across land borders to China. This trade increased rapidly, so that trade across land borders (mainly to China and Thailand) accounted for more than half of exports each year from 2012/13 through 2017/18. Rice trade with China has declined sharply since then, however. From 2018/19 through 2021/22, exports through seaports accounted for 79 percent of exports (Figure 11.2). Despite the reduction in trade with China, total rice exports averaged 2.3 million tons per year from 2019 to 2022, equal to approximately 18 percent of domestic production, and 740,000 tons (50 percent) more than average annual rice exports from 2012/13 to 2016/17. Trade across land borders (mainly to China and Thailand) fell from an average of 1.1 million tons per year from 2012/13 through 2017/18 (59 percent of total exports) to only 470,000 tons per year (21 percent of total exports) from 2019/20 to 2022/23.

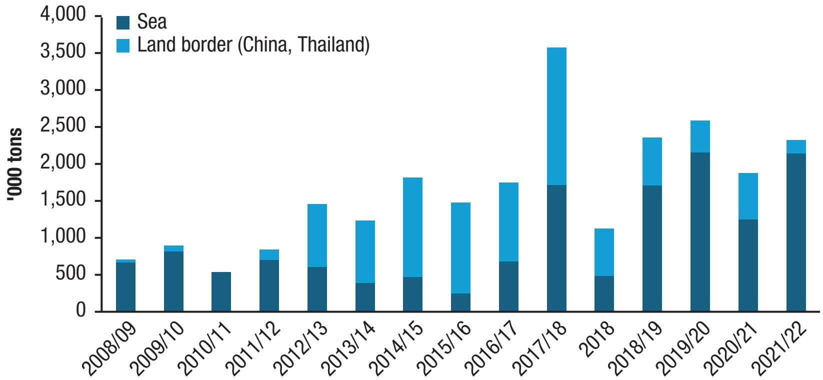
Myanmar's rice exports are typically of lower quality, so have a lower price than the major grades traded in international markets. For example, the average price of all exports in February 2023 was $469 per ton, equal to 85.1 percent of the free on board (f.o.b.) Bangkok price of A1 rice (Figure 11.3). One hundred percent broken rice—A and B grades—respectively accounted for 11 percent and 28 percent of the quantity of exports in 2022/23. These grades were mainly traded across land borders with China and to Europe for use by breweries and for feed. The price of rice exports over land borders was 11 percent to 17 percent below the average price of exports (5 percent broken) by sea.

Important changes have happened over the last 30 years regarding barriers to international rice exports from Myanmar (Figure 11.4). Lower export taxes were imposed on rice in most recent years: they were, on average, 25 percent during the period from 1996 to 2000 but declined to 4 percent between 2016 and 2021. On the other hand, the importance of nontariff measures has surged over time, with more stringent requirements for sanitary and phytosanitary measures, technical barriers to trade, and pre-export inspection. Using data on nontrade measures—from the TRAINS database of UNCTAD (2024)—and estimating ad valorem equivalents of such nontrade measures using the gravity model approach developed by Kee and colleagues (2006)—the ad valorem equivalent of the nontariff measures has increased substantially over time, from 3 percent in 1996–2000 to 21 percent in 2016–2021. Few changes in the combined total rates are therefore observed over time, as total rates were only reduced from 27 to 25 percent between the 1996–2000 and 2016–2021 periods.

Domestic and international prices

Given the substantial export trade, it is not surprising that Myanmar's domestic prices are correlated with international prices. The correlation is far from perfect, however, and the gaps between domestic and international prices

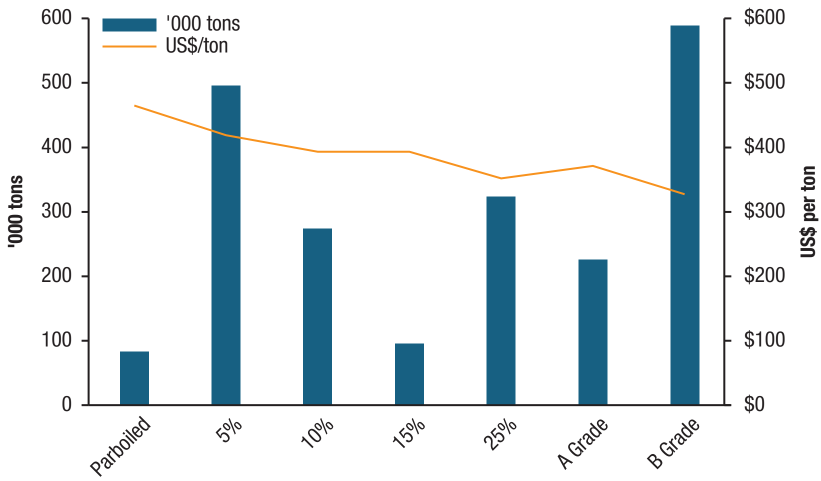
FIGURE 11.2 Myanmar rice exports (tons), 2008/09 to 2021/22



Source: Data from MRF (2023).

Note: All exports to Thailand across land borders are milled rice (not broken). Exports across land borders to China include both broken and nonbroken rice. Data for 2008/09 to 2017/18 are for the period from April to March; for 2018/19 to 2021/22, from October to September; and for 2018, from April 2018 to September 2018.

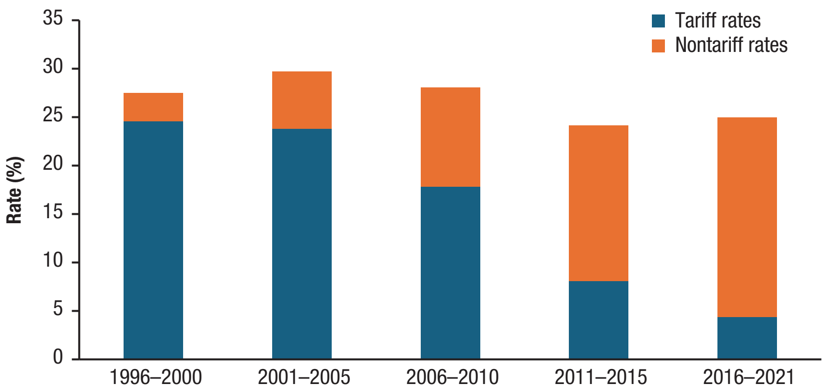
FIGURE 11.3 Myanmar rice exports by type of rice (tons), April 2022–February 2023



Source: MRF (2023).

Note: A Grade (also called A 1:2) and B Grade (also called B 1:2) are 100 percent broken and sold mainly for export to China and Europe. Both are well-milled Sortex rice; A grade is polished rice; B grade is not polished.

FIGURE 11.4 Trade barriers to rice exports, 1996–2021



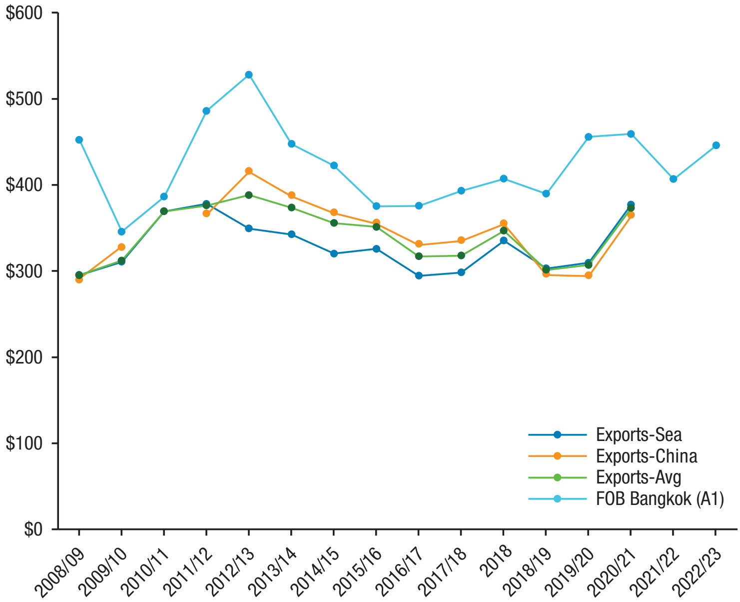
Source: Authors.
Note: The authors thank Dr. Yuhang of Zhejiang University for providing these calculations.

have varied substantially in recent years. As shown in Figure 11.5, Myanmar's annual average export price was only about 15 percent below Thailand's export price (f.o.b., A1 grade) between 2014/15 and 2017/18. The correlations in prices are seen most clearly by comparisons of monthly data of individual varieties and qualities of rice (rather than average prices across several types of rice).

As shown in Figure 11.6, the wholesale price of Emata rice in Yangon closely tracked export prices of Thai A1 rice (converted to kyat at the official exchange rate) from 2014 through 2018. The two series diverged in 2018/19 and 2019/20. However, average export prices of Myanmar rice in 2020/21 were still only 19 percent below the average export price for Thailand (f.o.b., A1 grade). Over this period, exports of some grades of rice were still profitable, as evidenced by a large volume of trade, especially to China. However, from early 2023, local prices rapidly climbed higher than Thai prices.

Deflating both series of prices by Myanmar's consumer price index highlights the stability in real prices from 2013 to 2021, as well as the sharp rise in real prices after mid-2021 (Figure 11.7). The average real (inflation-adjusted) export price of Thai A1 rice from July 2014 to June 2021 was 821 (2023) kyat/kg, 23 percent higher than the average real wholesale price of Emata rice in Yangon (670 [2023] kyat/kg). Real prices of both types of rice rose between July 2021 and January 2024. However, the real price of rice in Myanmar (Emata wholesale, Yangon) rose by 76 percent, while Thailand's price rose by only 13 percent.

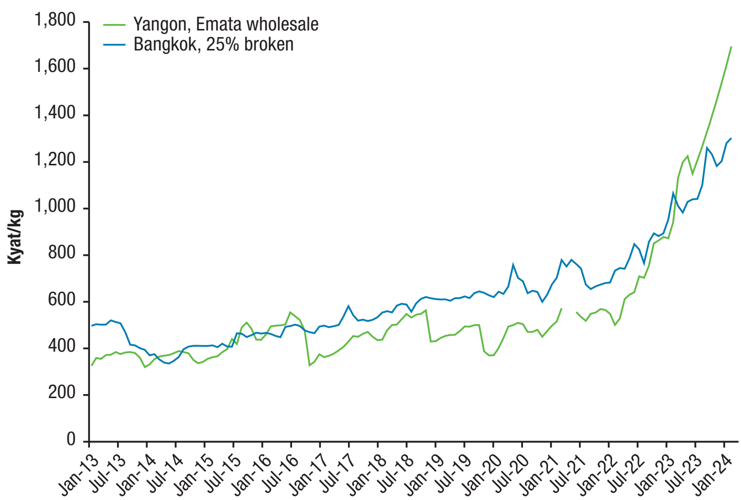
FIGURE 11.5 Myanmar and Thai rice export prices (US$/ton), 2008/09 to 2022/23



Source: IMF (2023), MRF (2023), World Bank (2023), and authors' calculations.

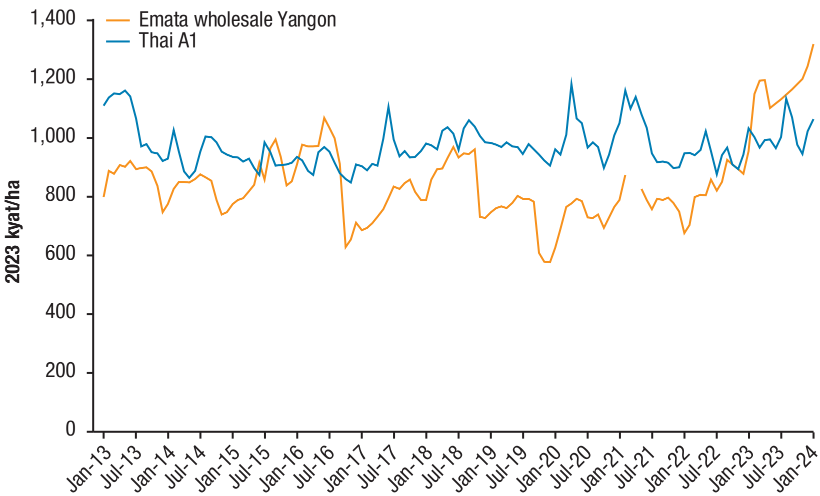
Note: Data for 2008/09 to 2017/18 are for the period from April to March; for 2018, from April to September; and for 2018/19 to 2022/23, from October to September. Avg = average for all exports.

FIGURE 11.6 Rice prices in Myanmar and Thailand (kyat/kg), 2013–2023



Source: IMF (2023), MRF (2023), World Bank (2023), and authors' calculations.

FIGURE 11.7 Real rice prices in Myanmar and Thailand (2023 kyat/kg), 2013–2023



Source: IMF (2023), MRF (2023), World Bank (2023), and authors' calculations.

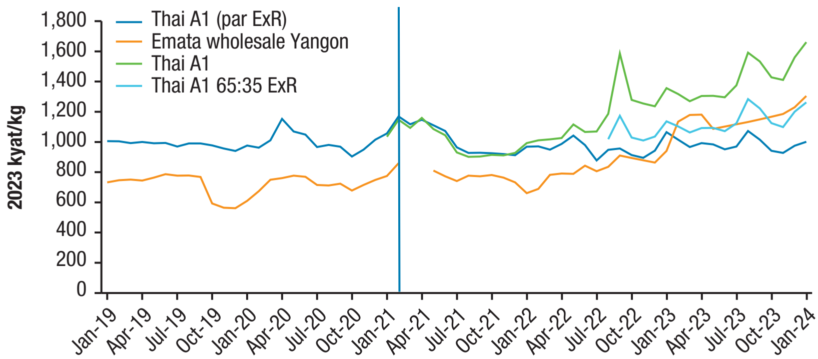
The links between domestic and international rice prices have been obscured since the military takeover in early 2021 by the emergence of a large parallel market for foreign exchange and the introduction of a dual official exchange rate system in August 2022. As shown in Figure 11.8, domestic rice prices (Emata, wholesale Yangon) tracked Thai export prices measured at official (kyat/US$) exchange rates (Thai A1 in Figure 11.8) from June 2020 to October 2021. Subsequently, from the end of 2022 onward, domestic prices more closely tracked Thai prices measured using weighted average exchange rates (65 percent for official exchange rates and 35 percent for parallel market exchange rates—Thai A1 65:35 ExR).[6,7]

The large increase in domestic prices beginning in February 2023 reflects lower domestic production, high macro-inflation, and a loss of competitiveness relative to Thai rice at official exchange rates. Nonetheless, rice exports appeared to remain profitable at world prices converted to kyat at the parallel exchange rate (Thai A1 [par ExR] in Figure 11.8), though not at the 65:35 percent weighted average exchange rate (Thai A1 65:35 ExR).

6 This average reflects the share of foreign exchange earnings (35 percent) that exporters were allowed to keep; the remainder had to be exchanged with the bank at the official exchange rate.

7 Note that the exchange rate policies changed again in the later parts of 2023, beyond the period of analysis (for more details, see Chapter 14).

FIGURE 11.8 Real rice prices (2023 kyat/kg), 2019–2023



Source: IMF (2023), MRF (2023), World Bank (2023), and authors' calculations.

Note: Thai A1 (par ExR) = kyat/kg at the parallel exchange rate; Emata wholesale Yangon = kyat/kg at the domestic rice price; Thai A1 = kyat/kg at official exchange rate; 65:35 ExR = kyat /kg with 65% percent at official exchange rate and 35% at parallel market exchange rate.

Rice consumption

Relatively little recent empirical data on rice consumption in Myanmar exist. Moreover, estimates of consumption derived from household surveys vary widely from estimates calculated as the difference between supply (production plus imports less losses, adjusted for changes in stocks) and other demand (for seed, feed, and industrial uses).[8]

One of the last nationally representative household surveys done in person was the Myanmar Poverty and Living Conditions Survey (MPLCS) 2014–2015 (World Bank 2021). Using data from this survey, per capita quantities of rice consumed are estimated to be much higher in rural areas (160.4 and 160.6 kg/capita/year for the rural poor and nonpoor, respectively) than in urban areas (118.6 and 109.4 kg/capita/year for the urban poor and nonpoor, respectively) (Table 11.3). The average price paid for rice in urban areas is 30 percent higher (5,800 kyat/kg) than the average price in rural areas (4,464 kyat/kg), in part due to marketing margins between rural and urban areas. There are important quality differences, as well, as the average price paid by the urban nonpoor is 19 percent higher than the average price paid by the urban poor.

8 For example, using the 2015/16 USDA estimate of paddy production of 18.77 million tons and the consumption estimate derived from the Integrated Household Living Conditions Assessment II (IHLCA) 2009–2010 data on per capita consumption, total rice consumption would be 7.31 million tons and rice exports (calculated as a residual) would be 4.10 million tons (MNPED, UNDP, and Sida 2011). Using the export trade data showing 1.50 million tons exported in that year, however, household consumption would be 9.92 million tons, a difference of 2.61 million tons.

TABLE 11.3 Household rice demand, 2014/15

Household	Population (millions)	Quantity (tons/yr)	Quantity (kg/cap/yr)	Total expenditure (bil. kyat/ yr)	Expenditure per capita (kyat/cap)	Rice expenditure (bil. kyat/ yr)	Rice budget share (%)
Urban poor	2.4	28.5	118.6	1,334.0	554.8	143.9	10.8
Urban nonpoor	10.9	119.3	109.4	16,971.2	1,556.4	713.6	4.2
Rural poor	16.2	259.5	160.4	7,386.5	456.5	1,107.1	15.0
Rural nonpoor	17.0	272.6	160.6	13,518.2	796.6	1,268.3	9.4
Total	46.5	680.0	146.4	39,209.9	843.9	3,232.8	8.2

Source: Authors' calculations based on MPLCS 2014–2015 data.
Note: yr = year. cap = capita. bil. = billion.

Rice is the main staple, accounting for 59 percent of calories consumed on average—51 and 62 percent of urban and rural calories consumed, respectively—making it crucial for food security in the country (Table 11.4).[9] Rural residents consume almost 50 percent more than urban ones. Rice is especially important for the poor, for whom it makes up 69 percent of all calories, compared with 55 percent for the nonpoor. Rice is a relatively cheap source of calories as it makes up only 18 percent of all food expenditures, significantly less than its share in the contribution to calories consumed. Markets are important for the acquisition of rice: 71 percent of all rice consumed is obtained from the market, compared with 27 percent originating from own production. In rural areas, this is one-third. The share of own production is especially high in the Hills and Mountains agroecological zone, where it reaches 43 percent.

Seasonality

Rice production and trade in Myanmar are characterized by substantial seasonal variation. Most paddy is produced during the rain-fed season, the monsoon. A second or third production period is possible in some areas during the dry season—the winter or summer season—but often only if irrigation is available. However, the monsoon is the most important production season by far. In the 2020/21 season, it was estimated that monsoon and dry season rice made up 83 (87) and 17 (13) percent, respectively, of all paddy rice production (and area cultivated).[10] The share of crop farmers harvesting paddy during different months of the year is shown in Figure 11.9.[11] The peak production month is November, when a quarter of paddy rice growers harvest. The month with the

9 Estimated in 2015, based on MPLCS 2014–2015.
10 Estimates by the Ministry of Agriculture, Livestock, and Irrigation.
11 Estimated during the monsoon of 2022 and the dry season of 2023.

TABLE 11.4 Importance of rice for calorie consumption, in food expenditures, and for markets

		Residence		Poverty		Agroecological zone			
	National	Urban	Rural	Poor	Non-poor	Delta	Coastal Zone	Dry Zone	Hills and Mountains
Daily energy consumption per adult equivalent (calories)									
Rice	1,633	1,218	1,796	1,593	1,651	1,843	1,872	1,548	1,625
Share of rice in total (%)	59.0	52.0	61.2	69.5	55.2	60.8	67.7	54.0	64.4
Daily expenditure per adult equivalent (kyat)									
Rice	216.3	197.2	223.8	190.6	228.1	219.1	207.3	211.5	235.8
Share of rice in food budget (%)	17.9	14.2	19.7	28.2	15.7	17.5	18.9	18.3	21.4
Use of markets									
Share purchased (%)	71.2	95.2	64.8	72.2	70.7	67.8	75.1	74.9	54.7
Share from own production (%)	27.0	3.5	33.3	25.7	27.6	31.2	21.6	23.2	42.6
Share in-kind gifts (%)	1.8	1.3	1.9	2.0	1.7	1.0	3.4	1.9	2.7

Source: Authors' calculations based on MPLCS 2014–2015.

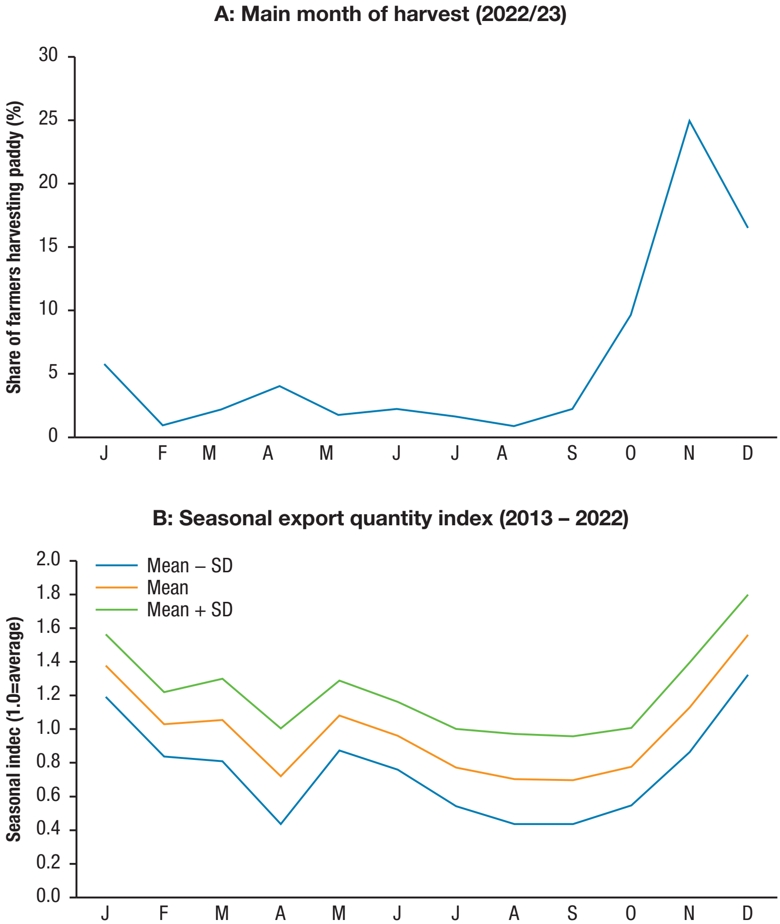
lowest number of farmers reporting paddy harvest is August, considered the peak of the lean period. While shares of farmers growing rice and areas cultivated are much lower during the dry season, yields during this season are often higher than during the monsoon, as farmers are typically willing to use substantially more inputs given the more controlled growing environment.

Strong seasonality is also seen in exports. A seasonality index of quantities of rice exported—calculated based on the 12-month moving average method over the period 2013 to 2022—shows substantial seasonal patterns. The quantity exported in December, a month after the peak in harvest, is 56 percent higher than the annual average. A small second peak is also noted after the harvest of summer rice in May. Exports are lowest in August and September when the monsoon paddy rice is typically still in the field.

Marketing and processing

Seasonality in rice production and trade has important implications. First, to ensure that rice is available for consumption throughout the year, storage of sufficient quantities over the year is required. Such storage is traditionally done at the farm level but is increasingly done by other agents midstream, often by mills. Drying paddy rice is important to reduce grain moisture levels, which are high immediately after harvest, to levels that are suitable for either storage or milling. This is traditionally done through sun drying, but modern dryers are increasingly being used, especially in more humid areas.

FIGURE 11.9 Seasonality in rice production and exports



Source: MAPS Rounds 3 and 4, calculated based on harvesting of largest plot and share of crop farmers growing rice; export quantities as published by Central Statistical Organization (CSO).

Note: SD = standard deviation.

Paddy also needs to be processed, converting it into rice in rice mills. The rice milling sector has shown rapid transformation over the years, with significant advances in the use of improved milling machines, color sorters, polishers, and mist polishers, dramatically improving milling efficiency and the quality of rice produced (Goeb et al. 2022) (see Chapter 13). While the number of modern mills is still relatively small compared to traditional ones, they have become increasingly important in terms of total rice produced. Using a survey of rice mills in Myanmar, Goeb et al. (2022) illustrate that the increasing modernization of the milling sector in Myanmar is resulting in the production of higher quality rice, which is reflected in higher rice prices being obtained by these rice mills as well as better paddy prices offered to farmers who supply these mills. They also find that milling byproducts—such as broken rice and bran—are frequently sold (often to be used for feed) and are important for overall profit margins of rice mills.

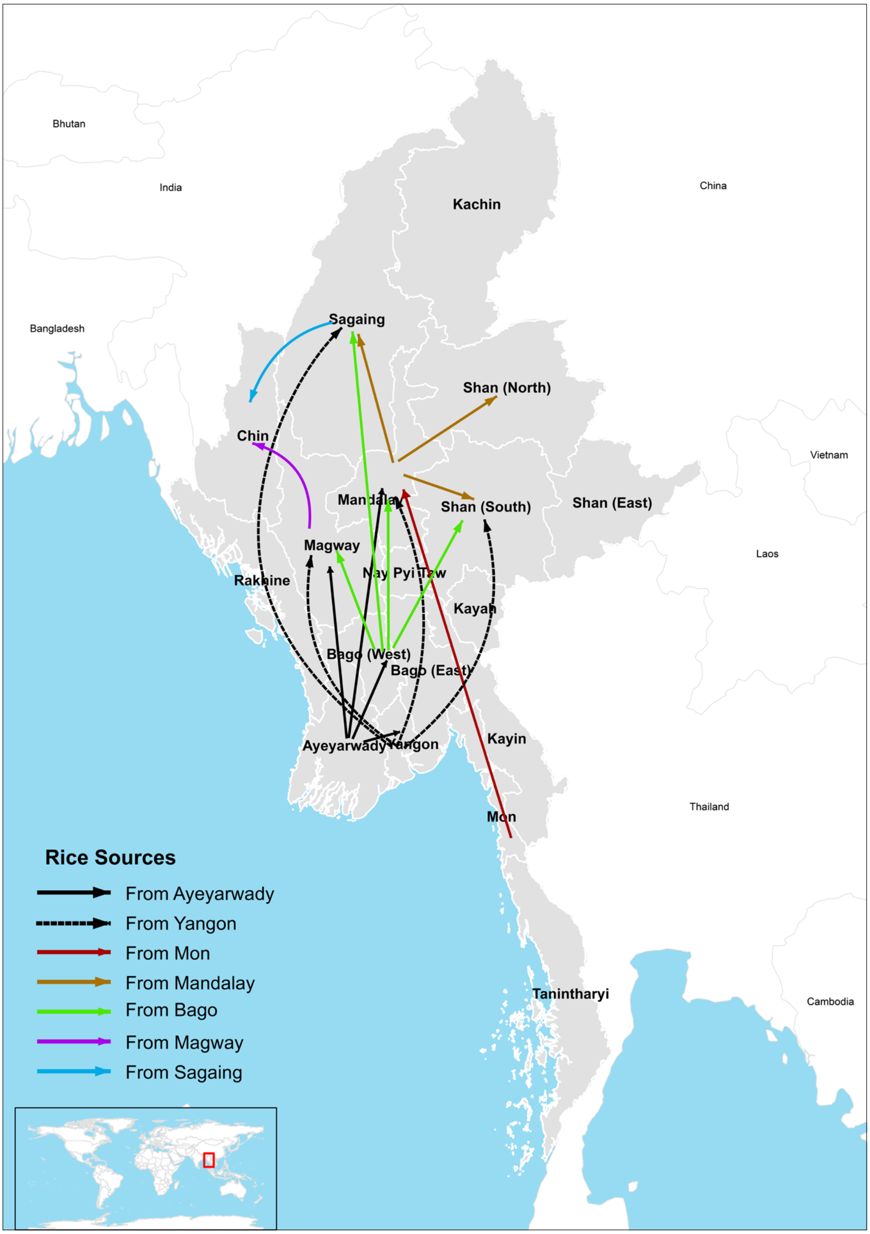
Some regions are particularly important for national rice production, most notably the Ayeyarwady, Bago, and Yangon Regions in the Delta and the Sagaing Region in the Dry Zone. Combined, they typically make up two-thirds of the total rice production in the country—their shares of national rice production in the 2020/21 season, based on official MOALI data, were 31, 18, 8, and 10 percent, respectively. The regional concentration of rice production means that trading and transporting over long distances is important to ensure that rice is available countrywide at desired levels, as well as for export (Figure 11.10). Rice is transported by trucks and boats. Transportation costs are reflected in differential rice prices, which are typically much higher in areas close to the border and the Hills and Mountains (Goeb et al. 2022). Moreover, the conflicts in recent years led to higher rice prices in those areas of the country most affected by conflict, such as Sagaing, Kayah, and Chin.

Figure 11.11 illustrates how rice and paddy prices changed during the crisis years between 2021 and 2023, as measured by average national prices collected in large farm and food vendor surveys. We note, on average, few changes over the years 2021 and 2022, but paddy and rice prices then increased steeply, seemingly driven by increasing international prices and exchange rate depreciations. Distribution costs also increased substantially. We calculate average distribution costs as the difference between retail and paddy rice equivalent[12] farm prices, presented by bars in Figure 11.11. We note a substantial increase over time in these costs by 31 and 146 percent during the monsoon and dry season, respectively. This increase seems linked to higher transportation costs, mobility constraints, and conflict. Minten et al. (2023) estimated that the increased distribution margin at the end of 2021 led to 11 percent higher average retail prices compared with a year earlier, implying welfare losses of almost $0.5 billion for the country. Given increased insecurity, higher fuel costs, and, thus, higher distribution costs, these welfare losses since have further increased.

12 Using a milling ratio of 68 percent.

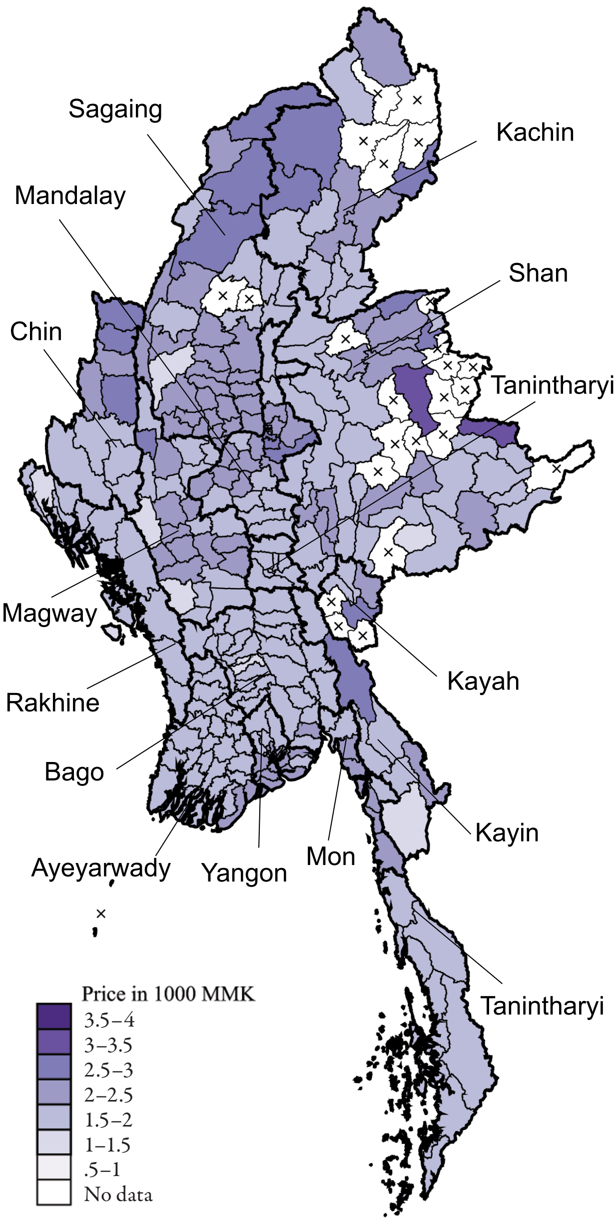
FIGURE 11.10 Spatial patterns in rice markets

A: Rice flows



Source: Vivero and Oo (2019).

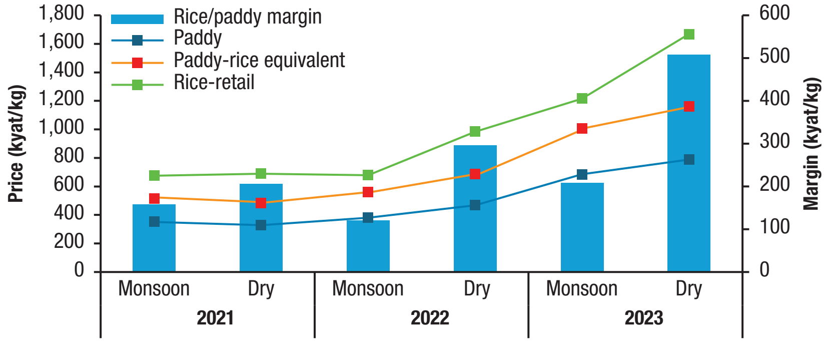
B: Median rice prices ('000 kyat per pyi), end 2023



Source: Authors' calculations from Round 6 of Myanmar Household Welfare Survey (MAPSA 2024).

Note: 1 pyi (Myanmar measurement unit of volume) of rice is approximately 2.13 kilograms.

FIGURE 11.11 Rice and paddy prices, 2021–2023



Source: Authors' calculations based on MAPS and the food vendor surveys.

A partial equilibrium model of Myanmar's rice sector

Model structure

Following Dorosh, Win, and van Asselt (2019), we model production, consumption, and prices of a single commodity: rice (Table 11.5).[13] The current model differs from the earlier version in two ways, however. First, household incomes are split into an endogenous agricultural income and an exogenous nonagricultural income. Second, two alternative specifications of the model are used for international trade and prices. In the first version, used for most of the simulations, exports are endogenous, and domestic prices are set equal to international prices adjusted for marketing margins (converted to kyat at a fixed exchange rate). In the second version, the quantity of exports is exogenous, and domestic prices adjust to balance total supply and demand.

As in the earlier version of the model, production is modeled as the base level of production (X0i) multiplied by an exogenous production shock (xshocki) and the ratio of the simulated market price to the base (previous year's) market price (Pi/P0i) raised to the power esi (the own-price elasticity of supply) (equation 1). Domestic supply Si is equal to production (Xi), net of a constant percentage deduction (lossi) for seed, feed, and wastage (equation

13 The one commodity model used in this analysis is similar to the model of the Bangladesh rice economy in Dorosh (2001). Further analysis involving interactions with other agriculture sectors would require a multimarket model that explicitly models other crops. See Braverman and Hammer (1986), Sadoulet and de Janvry (1995), and Croppenstedt et al. (2007).

TABLE 11.5 **Myanmar rice model equations, variables, and parameters**

Production	(1) $X_i = X0_i * xshock(i) * (P_i/P0_i)^{es(i)}$
Domestic supply	(2) $S_i = X_i * (1 - loss(i))$
Household income	(3) $Y_h = YNA0_h * (1 + ynashk(h) + (P_i * va(i,h) * X_{i,h}) - (P0_i * va0(i,h) * X0_{i,h})$
Demand (consumption)	(4) $D_{ih} = D0_{ih} * (P_i/P0_i)^{ed(i.h)} * (Y_h/Y0_h)^{eY(I,h)}$
Equilibrium	(5) $S_i = \sum_h D_{ih} + E_i$
Variable name (0 denotes base level)	
Di	Demand (consumption) of commodity i (rice)
Ei	Exports
Pi	Domestic price of rice
Si	Total supply of rice
Xi	Total national production of rice
Yh	Household income
YNA0h	Nonagricultural household income
Parameter	
ed(i,h)	Own-price elasticity of demand
eY(h)	Income elasticity of demand
es(i)	Own-price elasticity of supply
loss(i)	Percent losses and nonfood use
xshock(i)	Exogenous production shock
va(i,h)	Value-added share of production
ynashk(h)	Nonagricultural income shock

Source: Authors' calculations.

2). Household income (Yh) is calculated as the base level of nonagricultural income (YNA0h), multiplied by an exogenous income shock (ynashk[h]) plus value added from the household's rice production (equation 3). Household demand of each of the four household groups is modeled as a log-linear function of household per capita income and market prices (equation 4). The base year for the model is 2022. Total supply (Si) equals total demand (the sum of household demands [Dih] and net exports [Ei]) (equation 5).

Model parameters

Household demand parameters are derived from econometric estimates by Ecker and Comstock (2021a; 2021b). As shown in Table 11.6, the estimated expenditure elasticities of nonpoor households are generally lower than those of poor households, as small percentage changes in incomes for these households do not result in large changes in rice consumption. Patterns for absolute

TABLE 11.6 Myanmar household rice demand parameters

Household	Own-price elasticity	Expenditure elasticity
Urban poor	–0.460	0.357
Urban nonpoor	–0.348	0.246
Rural poor	–0.674	0.504
Rural nonpoor	–0.653	0.494
Myanmar average	–0.599	0.449

Source: Econometric estimates using MPLCS 2014–2015 data. See Ecker and Comstock (2021b).

values of own-price elasticities are similar—estimated own-price elasticities of nonpoor households are generally lower in absolute magnitudes than those of poor households. Likewise, the absolute magnitudes of the estimated expenditure elasticities are lower in urban areas (0.246 to 0.357) than in rural areas (0.494 to 0.504). The elasticity of supply of rice is set to 0.30 in the main simulations.

Model data

The base data for quantities of supply and demand aggregates are taken from USDA (2023c). Production of milled rice in the base year of the model (2022) is equal to 12.50 million tons. Exports are 2.40 million tons, and net offtake from public stock is 0.20 million tons. Total supply is equal to production plus exports minus net offtake: 10.30 million tons. Seed use is estimated to be 2.9 percent of paddy production, and feed use to be 7.1 percent, so total seed and feed use is 10.0 percent of production. Consumption is, thus, 9.05 million tons. Consumption per household was calculated using the shares of the national total quantity of rice consumed by each household group in the MPLCS (2014/15) survey. The base rice price is 655 kyat/kg, and the world rice price (f.o.b. Bangkok) is 1,225 kyat/kg.

Model simulation results

Myanmar's rice economy and both urban and rural households have suffered severe shocks in the past several years, as domestic conflict has prevented cultivation of rice in some areas and disrupted input supplies. At the same time, negative shocks to household incomes have reduced domestic rice demand. Export demand has also declined. As a result, incentives for rice producers and consumers, along with levels of production, consumption, and exports, have all been affected.

This section presents model simulations designed to highlight the major effects of these shocks, as well as the potential shock of a hypothetical sharp reduction in rice exports to China. We first simulate the effects of the major shocks to Myanmar's rice sector in 2023: reductions in household incomes in Simulation 1, lower rice production due to lower input supply and other factors in Simulation 2, and in Simulation 3, the combined effects of Simulations 1 and 2. In these simulations, we assume that domestic prices are equal to import parity levels, consistent with the relatively constant percentage margin between domestic and international rice prices in recent years. In Simulation 4, we model the effects of a 365,000-ton reduction in rice exports, allowing domestic prices to vary from import parity due to the drop in demand for rice. Simulation 5 combines Simulations 3 and 4 to show the overall effects of the major shocks to the rice sector in 2023. Finally, Simulation 6 highlights the role of rice exports to China by modeling the effects of a hypothetical cessation of rice exports to China.

Impacts on Myanmar's rice economy of economic decline and productivity shocks

In Simulation 1, urban and rural household incomes are reduced by 13 percent and 27 percent, respectively, reflecting the actual estimated decline in household incomes in 2023 by MAPSA (Table 11.7 and Figure 11.12). We assume no change in rice production or prices in this simulation. As a result of these negative income shocks, household rice consumption falls by 8.1 percent: by 4.9 and 3.4 percent for urban poor and nonpoor households, respectively, and by 11.3 and 7.4 percent for rural poor and nonpoor households, respectively (Figure 11.13). Total rice consumption falls by 730,000 tons, freeing up this amount for additional rice exports (which increase by 30.5 percent).

In Simulation 2, we model a 20 percent decrease in rice productivity and production. With prices fixed and incomes unchanged, there is no change in consumption by urban households. Income declines occur in rural households because of lower rice production, so consumption falls by 2.2 percent for the rural poor and 4.7 percent for the rural nonpoor. Nonetheless, the decline in production (2.5 million tons) is larger in magnitude than the decline in consumption (0.25 million tons) and other uses (seed and feed), so exports fall by 2.0 million tons.

Combining Simulations 1 and 2 for Simulation 3, lower incomes and lower rice production result in an 11.1 percent decline in consumption and a 52 percent drop in exports. Rural households have the largest declines in rice consumption: 13.8 and 12.5 percent for the rural poor and rural

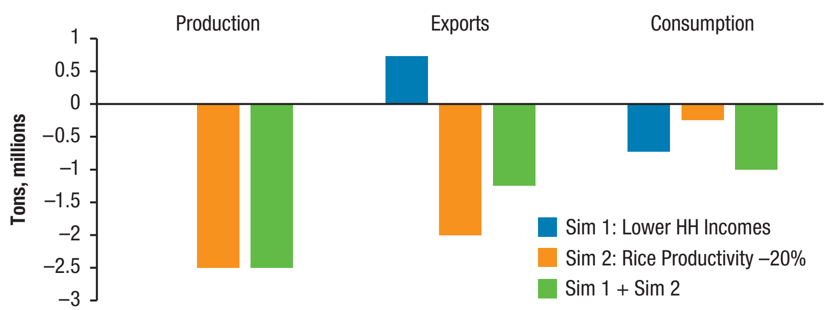
TABLE 11.7 Model simulation results, percentage change from baseline

	Base (2022/23)	Sim 1	Sim 2	Sim 3	Sim 4	Sim 5	Sim 6
	Million tons	Lower household incomes	20% drop rice pro-ductivity	Sim 1 + Sim 2	Lower rice exports	Sim 3 + Sim 4	No rice exports to China
Production	12.50	0.0	−20.0	−20.0	−1.2	−17.2	−3.1
Exports	2.40	30.5	−83.5	−52.0	−15.2	−15.2	−33.3
Consumption	9.05	−8.1	−2.7	−11.1	2.6	−17.3	5.0
Households							
Urban poor	0.38	−4.9	0.0	−4.9	2.7	−12.2	7.5
Urban nonpoor	1.59	−3.4	0.0	−3.4	2.0	−9.0	5.6
Rural poor	3.45	−11.3	−2.2	−13.8	3.2	−21.3	7.3
Rural nonpoor	3.63	−7.4	−4.7	−12.5	2.2	−17.6	2.2
Rice price (kyat/kg)	655.00	0.0	0.0	0.0	−14.6	-5.6	19.0

Source: Model simulations.

Note: Sim 1: lower household incomes: 13 percent drop for urban households; 27 percent drop for rural households. Sim 2: 20 percent decrease in rice productivity and production. Sim 3: combining the effects of lower household incomes and reduced rice productivity (Sims 1 and 2). Sim 4: rice exports reduced by 365,000 tons (15.2 percent lower relative to the base level). Sim 5: combining the effects of lower household incomes, reduced rice productivity, and lower exports (Sims 1, 2, and 4). Sim 6: ban on all rice exports from Myanmar to China. Sim = Simulation.

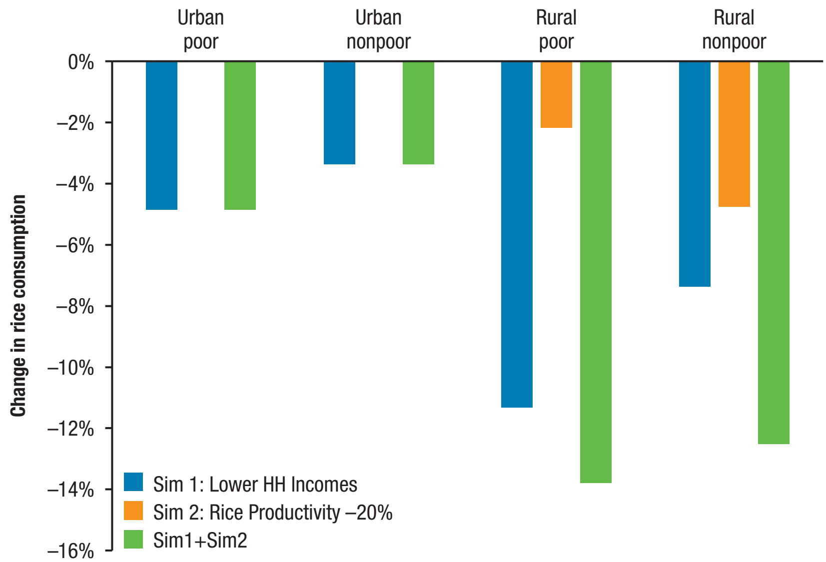
FIGURE 11.12 Impacts of lower incomes and lower rice productivity on amounts produced, exported, and consumed



Source: Model simulations.

Note: HH = household. Sim = Simulation.

FIGURE 11.13 Impacts of lower incomes and lower productivity on rice consumption by household type, percentage change in consumption



Source: Model simulations.
Note: HH = household. Sim = Simulation.

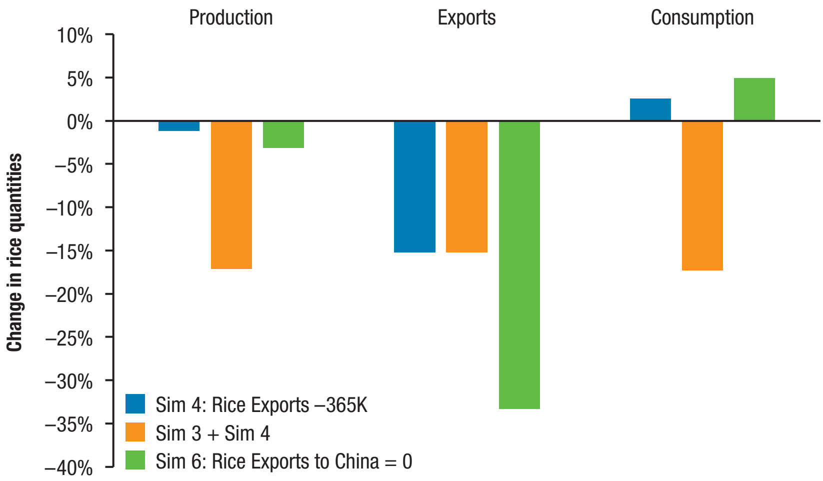
nonpoor, respectively. In contrast, urban consumption declines are only 3.4 to 4.9 percent, as in Simulation 1.

Impacts of reduced rice exports

In Simulation 4, with rice exports reduced by 365,000 tons (15.2 percent relative to the base level), domestic prices of rice fall by 5.6 percent (Figure 11.14).[14] Production falls by 1.2 percent, but lower prices help induce an increase in total consumption of 2.6 percent. Consumption of rice increases for all households, though increases are highest for the poor (who are more sensitive to price changes than the nonpoor), at 2.7 and 3.2 percent for the urban and rural poor, respectively (Figure 11.15). Consumption by the urban and rural nonpoor increases by only 2.0 and 2.2 percent, respectively, in

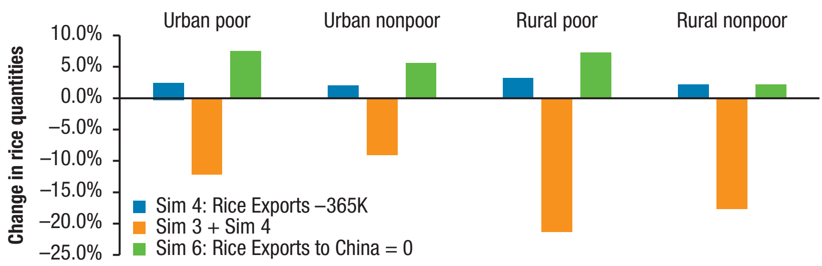
14 In Simulations 4, 5, and 6, we assume that exports are exogenous (set at a predetermined level) and that domestic prices adjust to equate to total supply and demand. Thus, unlike the other simulations, the margin between domestic prices and world prices changes in these two simulations. In part, this change (increase) in margins could represent an increase in the overall quality of total rice exports, as exports of lower quality rice to China are reduced.

FIGURE 11.14 Impacts of lower rice export demand on amounts produced, exported, and consumed



Source: Model simulations.
Note: Sim = Simulation. PRC = People's Republic of China.

FIGURE 11.15 Impacts of lower household incomes, reduced rice productivity, and lower exports on rice consumption by household type



Source: Model simulations.
Note: Sim = Simulation.

part due to the nonpoor experiencing a loss in their rice incomes that offsets some of the increase in their demand resulting from the price decline.

Combining the effects of lower household incomes, reduced rice productivity, and lower exports in Simulation 5, rice production and consumption both fall steeply (by 17.2 and 17.3 percent, respectively). Rice prices rise by 19.0 percent as the drop in production of 2.15 million tons far exceeds the decline in exports (−0.37 million tons). The declines in rice consumption are especially steep for rural households (21.2 and 17.6 percent for poor and nonpoor households, respectively). Rice consumption also falls sharply for urban poor (12.2 percent) and urban nonpoor households (9.0 percent), however.

Impacts of a hypothetical cessation of rice exports to China

Finally, in Simulation 6, a hypothetical ban is imposed on all rice exports from Myanmar to China. In the absence of any other income shocks, this 33.3 percent reduction in total exports results in a 14.6 percent drop in domestic prices due to lower demand for (lower quality) rice. Lower rice prices reduce incentives for production, which falls by 3.1 percent, compared with 1.2 percent in Simulation 4. However, rice consumption increases by 5.0 percent, with large increases by the urban poor (7.5 percent) and rural poor (7.3 percent).

Note, however, that these results do not imply that the net effects of rice exports to China are negative for Myanmar. Although Myanmar's rice consumption would be higher in the absence of these exports, incomes from rice—including incomes from other parts of the rice value chain and the broader food system—would be lower.

Summary and conclusions

The impact of economic growth during the 2010s and economic contraction during the crisis period (2020–2023) on the functioning of the rice sector is not well understood. In the decade before the crisis, it was shown that Myanmar's rice sector was lagging behind its peers, with lower and less efficient modern input use and, therefore, much lower productivity (World Bank 2014). Myanmar's value chain further suffered from inadequate infrastructure—access to electricity, roads, and ports—limiting improved performance (Basu and Sharma 2019). Moreover, it faced unpredictable trade policies, most often because of ad hoc changes by China.[15] Most of the exported rice from Myanmar is still often low quality, used for industrial purposes—for noodles, animal feed, and alcohol (processed in distilleries) in China—making exported quality in terms of broken rice often not an important consideration (Dorosh, Win, and van Asselt 2019).

15 Dorosh, Win, and van Asselt (2019) show how policies instituted by China starting around 2010 enabled rice exports to China from Myanmar to surge. However, sudden policy changes in China in mid-2016 then significantly reversed this new export demand.

However, important changes occurred during the crisis years, and they are discussed in detail in this chapter. Myanmar's rice economy has been battered by severe shocks, including increased insecurity in rural areas, higher world rice and fertilizer prices, and sharp declines in cross-border exports to China between 2019/20 and 2021/22. Rice production has stagnated in recent years, as well. Since 2010, area harvested has remained nearly constant, decreasing by 0.7 percent. Although yields rose steadily between 2010 and 2020, increasing by a total of 16.3 percent in this period, they declined by 4.9 percent between 2020 and 2022. Thus, rice production has declined in recent years.

Nonetheless, rice exports have continued. Total rice exports averaged 2.3 million tons per year from 2019 to 2022, which is equal to about 18 percent of domestic production and 740,000 tons (50 percent) more than the average from 2012/13 to 2016/17. Trade across land borders (mainly to China and Thailand), which accounted for more than half of exports each year from 2012/13 through 2017/18, has declined in recent years, however, falling to an average of only 470,000 tons per year (21 percent of total trade) from 2019/20 to 2022/23. Given this substantial trade, it is not surprising that domestic rice prices (Emata, wholesale Yangon) tracked Thai export prices when measured at prevailing market (kyat/US$) exchange rates.

Model simulations indicate that rice exports are highly sensitive to changes in household incomes and world prices. The income shocks of 2022, which led to 13 and 27 percent reductions in urban and rural household incomes, respectively, when simulated in the model, reduce domestic rice demand and result in a 30 percent increase in rice exports (Simulation 1). A 20 percent reduction in rice production also decreases consumption (by 3 percent) as well as exports (by 83 percent). Together, a decrease in household incomes combined with lower production results in a 52 percent decrease in rice exports, while rice consumption of the urban and rural poor falls by 5 and 14 percent, respectively. In contrast, if rice exports to China fall to zero, but exports of high-quality rice continue, domestic rice prices could fall by 15 percent, leading to a 1 percent drop in production and a 3 percent increase in consumption.

Further analysis is needed to show the sensitivity of these results to changes in key parameters, particularly the own-price and expenditure elasticities that determine the responsiveness of rice demand to changes in rice prices and household incomes. A disaggregation of agricultural households and production by agroecology would enable an analysis of the regional implications of shocks and policy changes. Finally, a broader analysis that includes the supply of and demand for other commodities using a multi-market model or a computable general equilibrium model could provide additional insights on the spillover effects of rice policy on other sectors.

Nonetheless, the model simulations and other analyses presented here provide evidence that shocks to Myanmar's rice economy have resulted in significant declines in rice consumption for both rural and urban households in recent years. Higher world prices have spurred exports to some extent, but negative production shocks and lower incomes have resulted in lower rice consumption. Reversing these adverse economic outcomes will require renewed economic growth, particularly in rural areas; wide availability of fertilizer and other inputs into rice production; and the creation of targeted safety nets for those most affected.

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Chapter 12

AGRICULTURAL VALUE CHAINS: EXAMPLES OF QUIET TRANSFORMATION

Ben Belton, Ame Cho, Peixun Fang, Myat Thida Win, and David Mather

Myanmar's agricultural value chains[1] are often perceived to be traditional and inefficient and to suffer from underinvestment, credit constraints, and inadequate technology (Raitzer, Wong, and Samson 2015; World Bank 2016). This perception is partly rooted in the legacy of Myanmar's military socialist government (1962–1988). During this period, most private business was nationalized, agricultural production in the lowlands was brought under a command-and-control system, and the state assumed all responsibility for the provision of agricultural inputs, services such as mechanization, and crop procurement and marketing (Brown 2012; Fujita, Mieno, and Okamoto 2009).

The liberalization of agribusiness began under the period of "market reform military rule" between 1988 and 2010 (Turnell 2009). Greater openness to private enterprise, foreign direct investment, and international trade—albeit much of it tied closely to the military—stimulated growth and diversification of businesses in some supply chains. For example, the partial relaxation of regulations governing crop production and trade stimulated a boom in export-led pulse production and the reemergence of crop traders and other agricultural intermediaries (Okamoto 2008).

Change accelerated between 2010 and 2020 under the quasi-civilian Union Solidarity and Development Party and National League for Democracy governments. These governments extended the liberalization of agricultural trade and investment and expanded the public and private provision of agricultural credit (Vicol and Pritchard 2021). Rapid development in some agrifood value chains after 2010 reflected growing domestic consumer demand brought on by rising real incomes and facilitated deepening agricultural commercialization.

1 In this chapter, following Porter (1985), we conceptualize value chains as a form of industrial organization among firms that enables the procurement of production inputs, their transformation into outputs, and the distribution to and utilization of these outputs at other sites of production or consumption.

The dynamic performance of certain agrifood value chains, such as maize, poultry, and aquaculture, immediately prior to 2020 is at odds with the popular image of inefficiency and stasis. However, some longer-established chains display fewer signs of transformation—for example, pulses—and, in some cases, appear to be in decline—for example, edible oils.

The triple crises of COVID-19, the military coup, and the global fuel and food price spike—beginning in 2020, 2021, and 2022, respectively—have posed new challenges for actors in Myanmar's agrifood value chains. Value chains for staples, such as maize and rice, appear to have proven surprisingly resilient to successive challenges. In contrast, value chains for some higher value or more perishable crops, such as poultry and watermelon, have been more negatively impacted (Fang et al. 2021; Kubo, Pritchard, and Phyo 2021; MAPSA 2023; Minten et al. 2023).

This chapter analyzes two important clusters of agricultural value chains with distinct characteristics: the rapidly transforming maize–poultry–fish complex, and the less dynamic pulse and oilseed value chains. We analyze how these value chain clusters have evolved in the context of changing policy environments and economic circumstances, in particular the number, geographical location, and size of businesses in different supply chain segments (structure), the assets and technologies deployed (conduct), and the implications of changes in structure and conduct for productivity, income, employment, and product quality (performance). We also review the impacts of recent crises on the functioning of agricultural value chains.

Surveys and data

There have been few large representative, structured surveys of agrifood value chains in Myanmar. For this reason, this chapter relies primarily on data collected by the authors under the Food Security Policy Project from 2016 to 2019. This project collected data on different sets of commodities, value chain segments, and geographic zones in each of the four survey years. Commodities and zones covered included aquaculture (fish) in the Ayeyarwady Delta, pulses and oilseeds in the Dry Zone, maize in southern Shan State, and poultry on the Yangon urban periphery.

We surveyed the farm segment of the value chain for all commodities, as well as crop traders and oil mills in the pulse and oilseed value chains and agricultural input suppliers and crop traders in the maize value chain, totaling 3,736 respondents. Of these, 2,918 were farms, and 818 were enterprises upstream or downstream of the farm (Table 12.1). Prior to the

TABLE 12.1 Summary of surveys by commodity, geographical zone, value chain segment, number of respondents, and year

Characteristic	Fish and rice	Pulses and oilseeds	Maize	Poultry and pigs
Survey year	2016	2017	2018	2019
AEZ or region/state	Delta	Dry Zone	Shan State	Yangon
Input suppliers (number)	NA	NA	109	NA
Farms (number)	571	950	884	513
Crop traders (number)	NA	347	218	NA
Oil mills (number)	NA	144	NA	NA

Source: Authors' surveys.
Note: AEZ = agroecological zone. NA = not applicable.

implementation of all four sets of surveys, we conducted extensive qualitative scoping interviews with actors from most value chain segments to provide additional contextual insights. Our analysis in this chapter draws on this information as well.

We synthesize findings on the structure, conduct, performance, and transformation over time of two clusters of value chains: the maize–poultry–fish complex and the pulse and oilseed value chains. We also draw insights from recent phone surveys with rice mills, agricultural traders, and maize farmers implemented under the Myanmar Agriculture Policy Support Activity (MAPSA) from 2020 onward. This chapter does not cover the value chain of Myanmar's major staple crop, rice, as this is addressed in detail in Chapter 11.

The maize–poultry–fish complex

The maize–poultry–fish complex is a cluster of partially overlapping value chains. Maize is the main ingredient used in manufacturing poultry feed and is also an ingredient in feed for pigs and aquaculture. Intensive feedlot poultry production and associated feed mills were first established in Myanmar by Thai multinational CP in the mid-1990s. CP introduced Myanmar's first hybrid maize variety shortly after that to provide feedstock for its mills. Fish farms were established in the Ayeyarwady Delta in the late 1970s and grew rapidly from the 1990s onward, following the allocation of large land concessions for aquaculture by the military government (Belton et al. 2015). Smaller "integrated" poultry–fish farms, where feedlots are built above ponds to facilitate use of waste nutrients as low-cost inputs for fish farming, have grown briskly in the past decade in several peri-urban areas. Seventy-five percent of the feedlot chicken farms located within 100 km of central Yangon—the country's biggest broiler chicken production zone—are integrated with fish (Belton et al. 2020). Production and distribution of fish feed by companies manufacturing poultry feed have also increased in recent years. The maize, poultry, and fish value chains are thus closely linked.

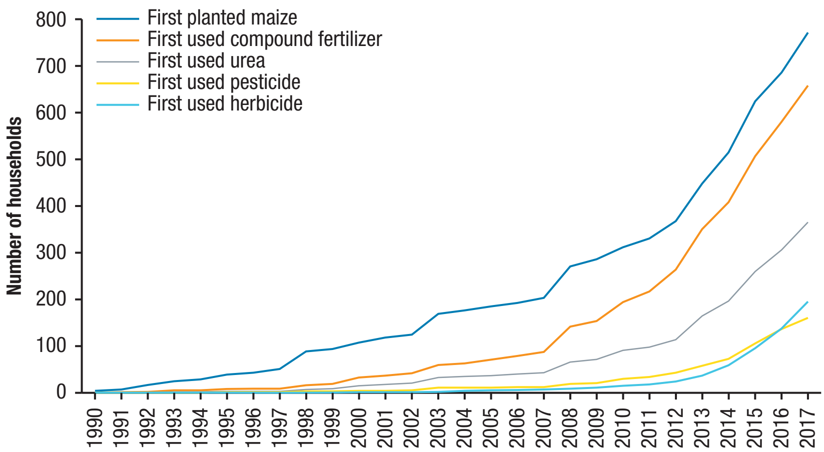
Changes in the upstream and midstream of the maize value chain

The cultivation of maize for sale as animal feed has boomed since CP introduced hybrid seed in 1998, with production growing by around 720 percent to reach 2.45 million tons in 2021 (FAO 2023; USDA 2022). Maize production is concentrated in Shan State, where it accounts for 60 percent of total planted area nationally (USDA 2022). Figure 12.1 illustrates this growth trajectory, showing the trend from the first year that maize growers in southern Shan began planting maize and using fertilizer and other chemical inputs until 2017.

The number of households growing maize climbed steadily following the introduction of hybrid seed in 1998 and accelerated from 2012 following a peak in global maize prices. The adoption of compound fertilizer (nitrogen–phosphorus–potassium), the main fertilizer applied in maize cultivation, tracks closely with the adoption of hybrid maize. The first use of urea follows a similar but less pronounced pattern. Use of pesticides and herbicides was very limited until around 2014 but began to tick upward after that. By 2018, 53 percent of farm households in surveyed areas of southern Shan grew maize, with 95 percent of harvested maize sold, and 87 percent of maize-farming households used inorganic fertilizer on their maize crop. The "maize boom," therefore, has meant a sharp increase in the share of farmers growing maize and has increased vibrancy in agricultural input and output markets (Belton and Fang 2022a).

This trajectory has been facilitated by the proliferation of input supply businesses and maize traders, about half of which also supply agricultural inputs. Figure 12.2 shows the share of agricultural input suppliers and maize traders in southern Shan selling fertilizers, maize seed, pesticides, and herbicides by year of first sale of these inputs. These actors have substantially increased in number since 1988. The growing number of businesses supplying inputs and the volume of inputs supplied per business have been accompanied by an increase in the number of varieties of seed sold, from 3.8 in 2013 to 5.7 in 2018 for traders. The increase in the range of seeds sold reflects new seed companies entering the market, with each seeking to

FIGURE 12.1 Cumulative number of surveyed households that adopted maize and agrochemicals, by year of adoption, 1990–2017, southern Shan State



Source: Authors' survey.

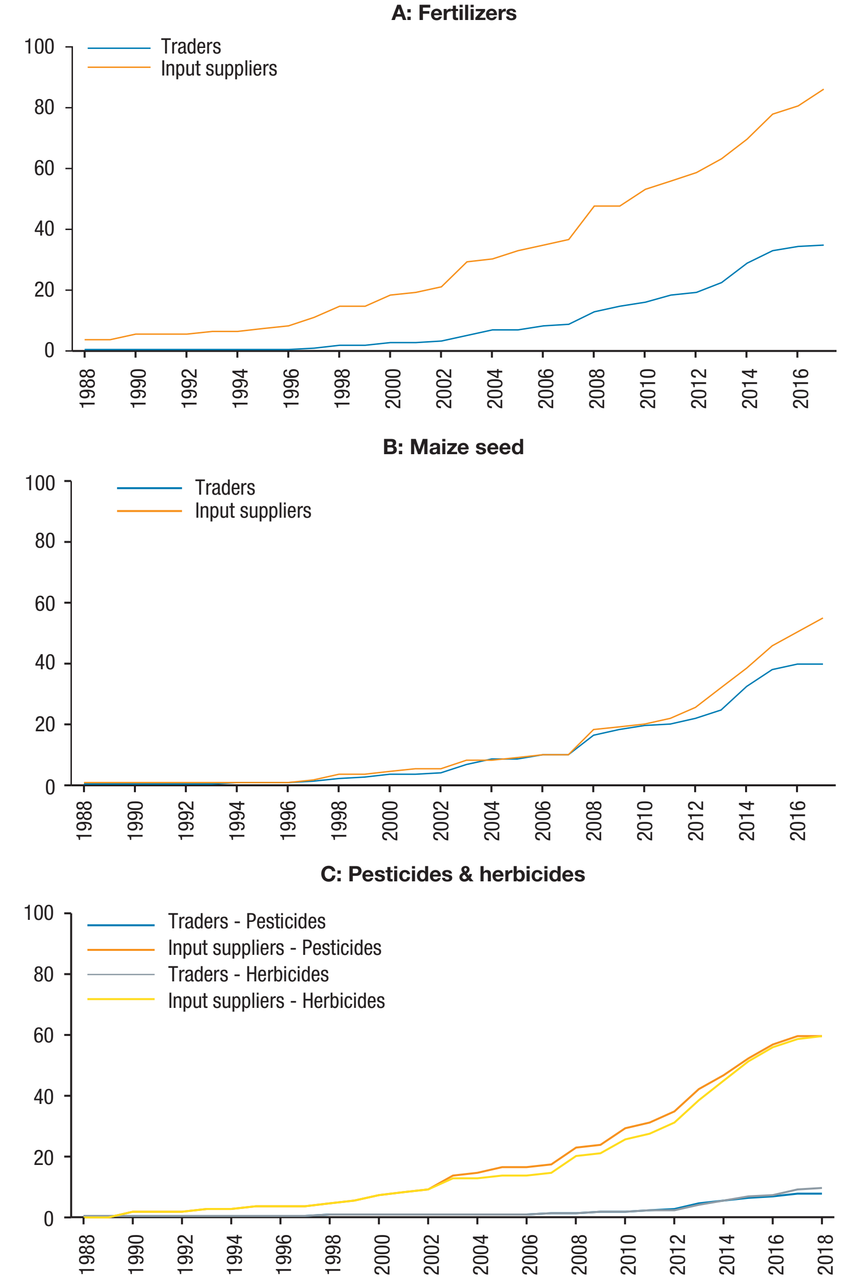
differentiate themselves from their competition through the seed varieties they offer (Table 12.2).

Hybrid varieties of maize seed accounted for 85 percent of the market by 2018, around half of which was produced by CP, with the remainder coming from a plethora of competing brands. The share of businesses selling compound fertilizer and quantities sold per business also increased during this period (Cho and Belton 2019). These trends indicate intensifying farm commercialization and increasingly competitive and diversified input supply.

The shift from traditional maize varieties to hybrids, coupled with increasing fertilizer use, has driven a rise in maize productivity. Average maize yields grew 23 percent between 2007 and 2017, from 1,054 kg to 1,293 kg per acre. The yield increase reported by farmers who cultivated in both years was 36 percent, rising from 1,059 kg to 1,436 kg per acre.

When other household characteristics are controlled for in the analysis, farm households growing maize are estimated to earn $59 more crop income per capita annually than those not growing maize (significant at $p < .05$), suggesting that maize performs favorably compared with alternative crops. However, for the one-third of maize-growing households with the smallest landholdings, maize cultivation was negatively—albeit insignificantly—correlated with crop income, suggesting that farm households with greater resource endowments are more likely to benefit from producing the crop.

FIGURE 12.2 Southern Shan maize traders and input suppliers selling inputs, by first year of sale, from 1988, percentage share



Source: Authors' survey.

Note: Series for fertilizer and maize seed are through 2017. That for pesticides and herbicides is through 2018.

TABLE 12.2 Maize seed sales by input suppliers and traders, 2013 and 2018

	Input suppliers		Traders	
Characteristic	2013	2018	2013	2018
Businesses selling maize seed (%)[a]	65	89	68	96
Maize seed sold, total (tons)	676	1,765	662	1,599
Maize seed sold, average (tons)	4.0	3.0	5.5	8.3
Maize seed varieties sold, average (number)	4.2	5.4	3.8	5.7

Source: Authors' survey.
Note: [a] Conditional on the business selling seed of any kind.

This result is partly explained by the tendency for maize growers with greater resources to harvest and sell the crop later than the smallest farms at times when prices tend to be more favorable (Belton and Fang 2022a).

The proliferation of traders and improvements in transport and communications have made it easy for maize farmers to access buyers. The large numbers of traders operating in rural Shan enable farmers to side-sell if offered a submarket price, even when inputs have been advanced as credit in kind. As a result, prices received by farmers who have taken advances from traders are almost identical to prices received by farmers selling maize in spot transactions (Table 12.3). This finding is strongly at odds with earlier studies arguing that maize traders are highly exploitative and that maize prices are fixed by cartels of traders to the detriment of farmers (Woods 2015).

From 2013 to 2018, the total volume of maize traded by surveyed traders jumped 94 percent, up from 486,364 tons to 943,530 tons, corresponding with the sharp increase in the number of farms growing the crop. However, concentration among traders, measured as the Gini coefficient of the total

TABLE 12.3 Selected maize farmer characteristics, by landholding tercile

Characteristic	Tercile 1 (smallest)	Tercile 2	Tercile 3 (largest)
Share of farms growing maize (%)	28	55	79
Received output-tied credit (%)	15	21	34
Price received with credit (kyat/kg)	220	231	249
Price received without credit (kyat/kg)	215	232	238
Gross margin ($/hectare)	256	293	314

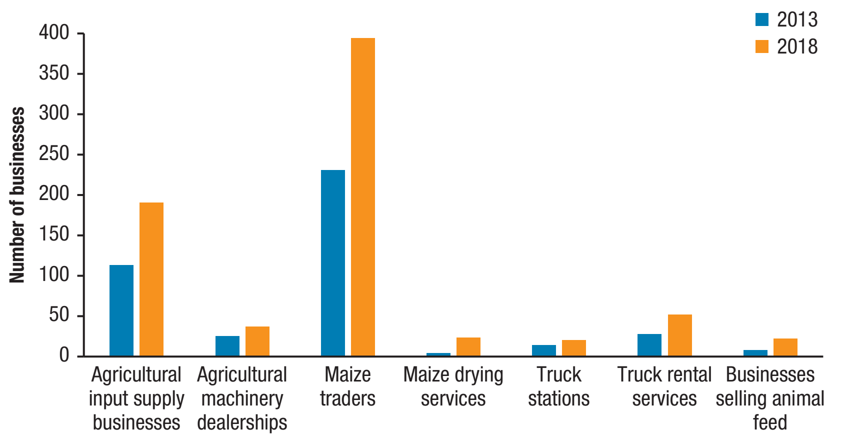
Source: Authors' survey.
Note: Landholding terciles are obtained by ranking maize-farming households by the area of agricultural land that they operate and dividing the households into three equal groups. Output-tied credit is credit that obliges the borrower to sell production outputs (in this case maize) to the lender.

quantity of maize procured, fell over the same period, from 0.72 to 0.62, suggesting that the sector's growth was relatively inclusive of new entrants.

Traders' ownership of business assets increased sharply after 2013. In 2018, more than 85 percent of traders owned mobile phones, motorbikes, bagging machines, and manual scales, and around half owned generators, electronic scales, or four- to six-wheel trucks. Asset accumulation appears to have facilitated efforts to improve the quality of maize traded. Between 2013 and 2018, the share of traders using a machine to dry maize increased from 5 to 11 percent, while the shares of traders using digital moisture meters and maize cleaning machines rose from 28 to 47 percent and 9 to 19 percent, respectively. The maize value chain performs well in terms of loss and waste, with losses of maize during trading amounting to just 0.18 percent of the total volume procured.

The growing scale of maize production and trade has been accompanied by simultaneous growth in the number of related enterprises, including agricultural machinery retailers, maize drying services, businesses selling animal feed, and truck hire companies. These businesses grew by between 85 percent and 475 percent from 2013 to 2018 in the townships surveyed (Figure 12.3). The average size of vehicles used for transporting maize also increased substantially between 2013 and 2018, reflecting both the growing quantities traded and the proliferation of third-party logistics services, and facilitated by the relaxation of restrictions on vehicle imports and fuel rationing from 2012 onward.

FIGURE 12.3 Businesses in the maize value chain in surveyed townships, 2013 and 2018



Source: Authors' survey.

The poultry and aquaculture value chains

Myanmar's aquaculture and intensive feedlot poultry sectors originated and developed independently. However, they share a similar set of drivers, as well as some similarities in the structure of their value chains and the transformations that these have undergone. The two sectors have increasingly converged over the past decade in terms of co-location and use of feeds originating from the same manufacturers.

In the mid-1990s, CP established poultry farming with high-yielding broiler and layer chicken breeds raised in intensive feedlots using commercially milled formulated feeds. CP initially established vertically integrated feed milling and farming operations but later diversified into contract farming and selling day-old chicks and poultry feed to independently operated farms. Domestically owned feed mills and some vertically integrated farming operations also emerged during the 1990s.

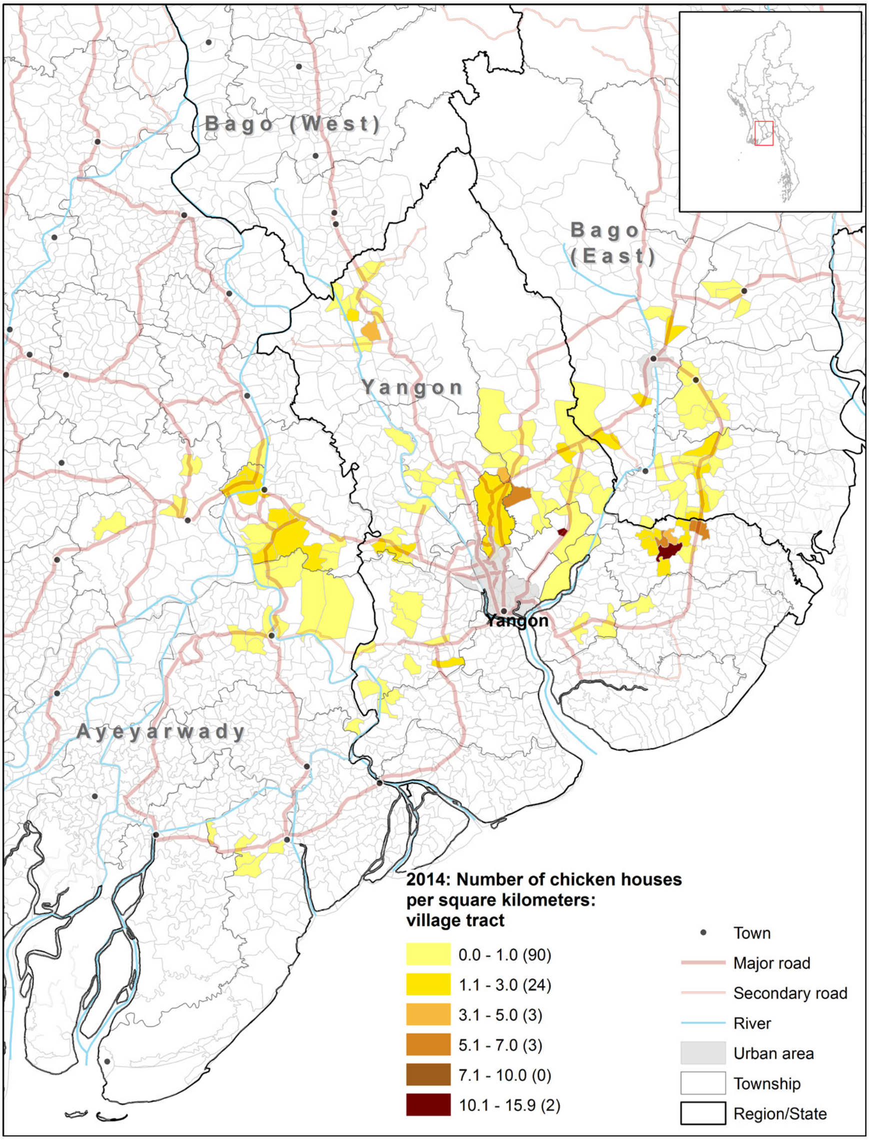
Greater economic liberalization and relative stability between 2010 and 2020 led to new investments in feed milling by an array of transnational companies and the extremely rapid growth of medium-scale independent poultry farms. Fifty-three percent of Myanmar's broiler farms are concentrated in Yangon Region and the regions bordering it (LBVD 2019). About three-quarters of these produce broilers, with the remainder producing layers. Construction costs for such farms are substantial, averaging \$5,000 and \$16,000, respectively, in 2019. Average flock sizes are also significant, at around 6,000 and 14,000 birds, respectively (Belton et al. 2020).

Analysis of satellite images indicates that the total number of chicken houses on integrated chicken–fish farms within 100 km of Yangon doubled in the five years from 2014 to 2018, up from about 1,900 to about 3,900. The number of village tracts with integrated chicken–fish farms in this zone also rose, from 121 to 230 (Figure 12.4). Average flock sizes per farm remained constant, implying that increases in chicken and egg production were driven mainly by the proliferation of new farms. Two-thirds of chicken farms in this zone are integrated with fishponds. The rapid growth of poultry production has thus also been associated with the expansion of peri-urban aquaculture.

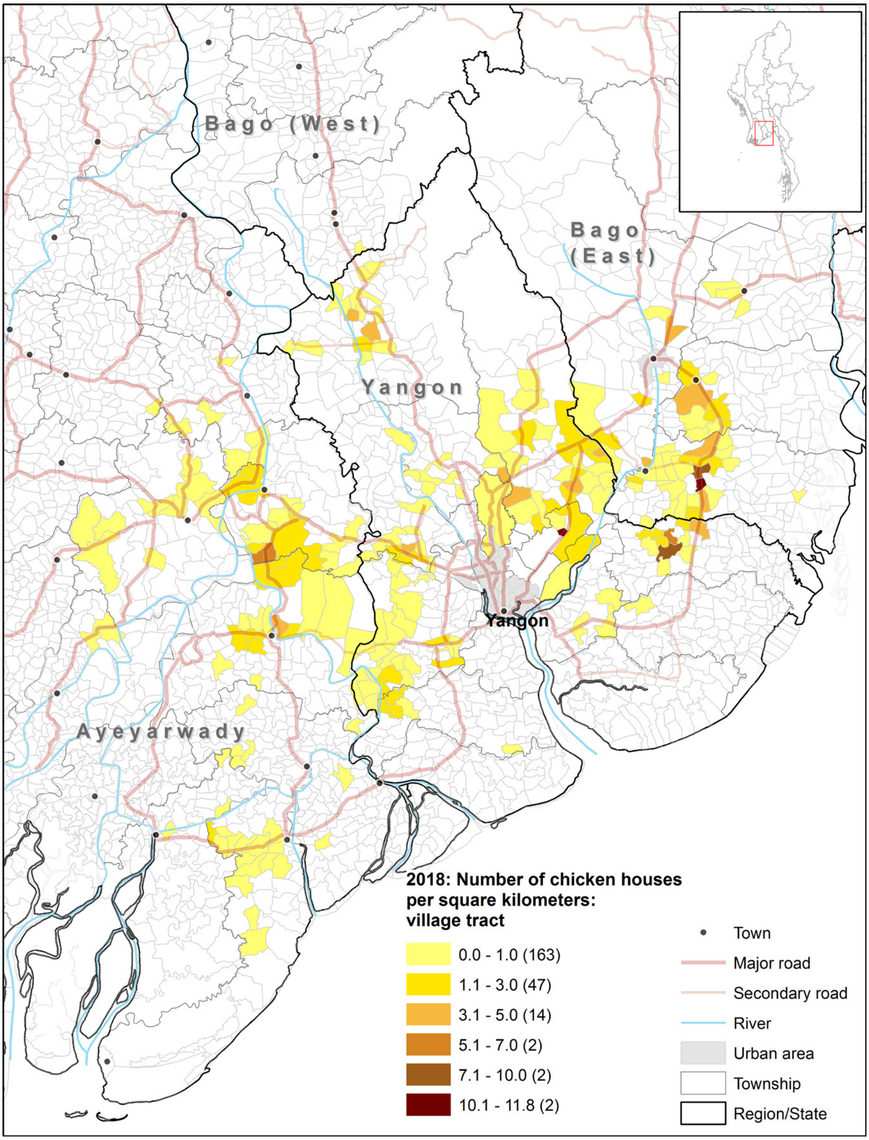
In parallel, the poultry feed market has diversified and become increasingly competitive over time. The four companies whose feed is most widely used are foreign owned, accounting for well over two-thirds of the poultry feed market. CP feed is used most widely, followed by feed from the Dutch company De Heus, Maykha (a Myanmar company partnered with Indonesian firm Japfa), and China's New Hope. A mix of Myanmar and foreign-owned companies account for the remainder of the poultry feed market (Figure 12.5).

FIGURE 12.4 Density of poultry houses per village tract from integrated chicken–fish farms within a 100 km radius of Central Yangon, 2014 and 2018

A: 2014

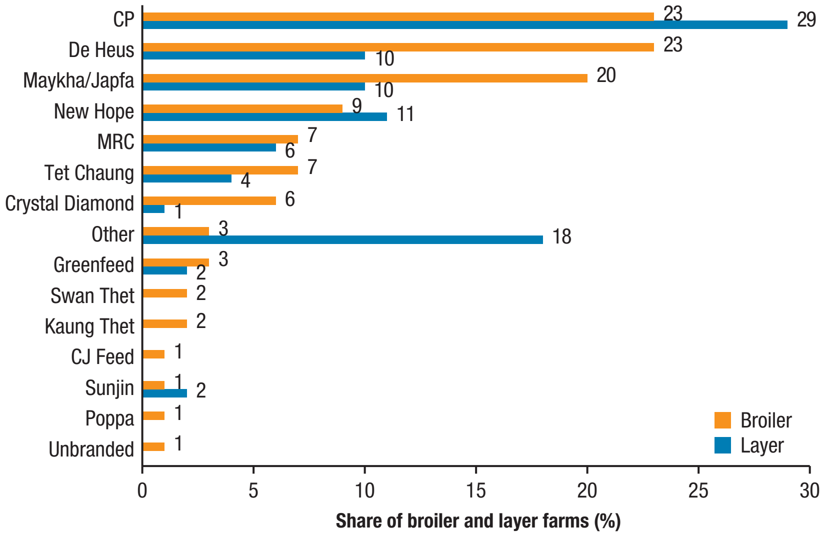


B: 2018



Source: Belton et al. (2020).

FIGURE 12.5 Share of broiler and layer farms using formulated feed, by brand



Source: Authors' survey.

Growth and competition in the poultry feed market have created spillovers for aquaculture. Mills have added aquafeed lines to grow their businesses, giving rise to changes in the structure and conduct of the input supply segment of the value chain and technological change for aquaculture farms. In 2016, there were no foreign-owned fish feed producers, and a single Myanmar company accounted for 65 percent of sinking fish feed sales and 51 percent of floating fish feed sales (Belton, Filipski, and Hu 2017). By 2019, five feed companies supplied pelleted fish feed, of which Myanmar companies (Htoo Htit and MRC) accounted for 46 percent, while three foreign-owned companies (New Hope, De Heus, and Greenfeed) supplied 54 percent (Belton et al. 2020).

Moreover, 40 percent of formulated fish feed used by farms in 2016 was sourced directly from feed factories (Belton, Filipski, and Hu 2017). In contrast, in 2019, only 3 percent of integrated chicken–fish farms interviewed bought fish feed directly from a feed factory, and more than half (58 percent) obtained feed from distributors, indicating that substantial developments in fish feed marketing networks had occurred during the intervening period to make feed more easily accessible to farmers. The use of floating feeds, which are more efficient than sinking feeds, increased substantially during this period.

TABLE 12.4 Change in the number of enterprises in aquaculture value chain in the Ayeyarwady–Yangon aquaculture cluster, 2006 and 2016

Enterprise	2006	2016	% change
Hatchery	30	60	100
Nursery	501	1,538	207
Seed trader	166	265	60
Pelleted feed trader	5	11	112
Rice bran/oil cake trader	112	175	56
Small boats for hire	115	216	88
Fish trader	46	68	47
Ice factory	9	16	82
Mechanical excavator hire	2	24	961
Trucks for hire	1	20	1,900

Source: Belton et al. (2017).

The spatial structure of the fish and poultry value chains is quite similar. Travel times, transport costs, proximity to urban markets, access to production inputs such as feeds, ice, and medicines that are manufactured in or imported into Yangon, and complementarities with other peri-urban activities like agro-processing, feed milling, and construction all contribute to the clustering and co-location of aquaculture and poultry production on the Yangon periphery.

The growth of aquaculture farms in the early 1990s predated that of independently operated feedlot poultry farms, which began to expand rapidly only after 2010. Fishponds are concentrated in an arc around the western and northern outer perimeter of Yangon city, where transport and water control infrastructure is better developed than in the rest of the Ayeyarwady Delta. Yangon can be reached easily via a major shipping canal and by road. Most poultry farms are also found close to Yangon, along major arterial roads, near the main poultry feed mills and the urban market for broilers and eggs. The two-tiered design of integrated chicken–fish farms maximizes returns to land in peri-urban locations where land values are very high.

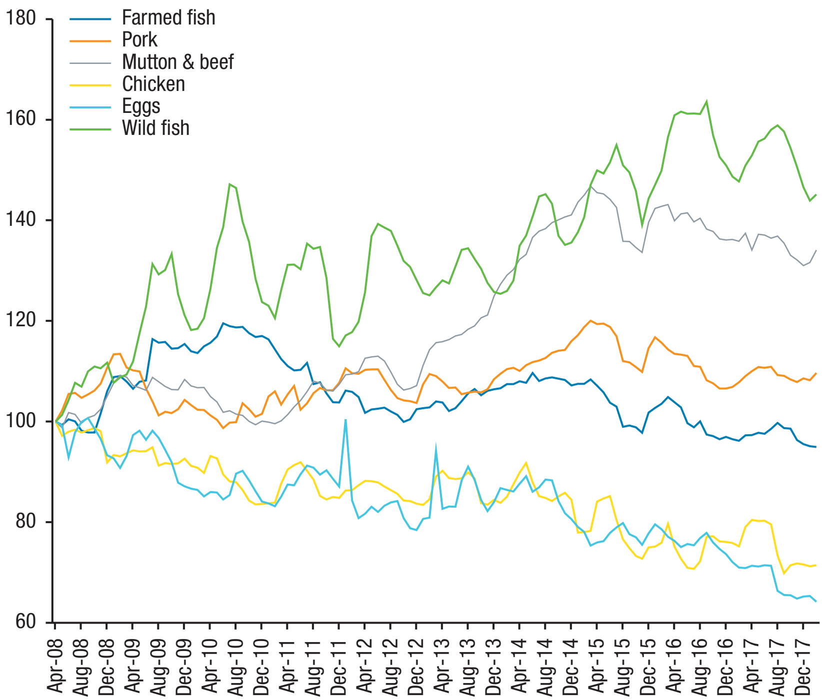
The highly clustered nature of fish farm development has given rise to dense agglomerations of other supporting businesses providing specialized goods and services (for example, feed and seed supply businesses and third-party logistics providers). Table 12.4 presents changes in the numbers of these businesses in surveyed areas from 2006 to 2016. Enterprises in the aquaculture value chain grew rapidly during this period, in line with the expansion of pond area. This transformation has facilitated farm growth and the adoption of productivity-enhancing innovations, such as the use of commercially manufactured feeds and the stocking of large fish seed to reduce the duration of production cycles.

Labor-intensive small and medium enterprises have created substantial employment spillovers within these aquaculture clusters. Production, consumption, and employment linkages within aquaculture clusters have been estimated to generate an increase in total real income in the local economy of $384 per acre for small-scale fish farms (of less than 10 acres) and $322 per acre for large-scale fish farms. A total of 44 percent and 49 percent of this income, respectively, would accrue to the farm owner as profit, with the remainder accruing as a spillover earned by workers and businesses supplying locally traded goods and services.

In contrast, devoting an additional acre of land to crop farming (mainly rice cultivation) would generate a lower total income of $119, of which 58 percent would accrue directly to farmers. The main recipients of these income spillovers are landless households, which gain via on-farm employment and work in associated value chains (Filipski and Belton 2018). This finding suggests that aquaculture value chains are relatively inclusive in terms of the employment generated. Similar economic spillovers may occur in locations with clusters of small- and medium-scale feedlot poultry farms, though this hypothesis has yet to be tested empirically.

As well as sharing similar supply-side drivers, Myanmar's aquaculture and poultry value chains both transformed in response to the growth of real incomes during the 2010–2019 period, particularly in urban areas. Average per capita incomes rose quickly during this time, creating greater demand for poultry and fish that induced large supply responses. The rapidly increasing supply of these products drove down their real prices, both in absolute terms and relative to other animal-source foods such as beef, mutton, and wild fish, generating further demand (Figure 12.6). Thus, the dramatic transformation in the structure and conduct of Myanmar's poultry and farmed fish value chains in the decade preceding the triple crises contributed substantially to national food and nutrition security by making nutritious animal-source foods more widely available and accessible. For instance, the share of dietary energy obtained from poultry rose from 0.8 percent to 1.3 percent between 2010 and 2013 (Chapter 4), reflecting an increase in average annual per capita poultry consumption of 4.2 kg to 6.9 kg over the same period (Scott et al. 2023).

FIGURE 12.6 Price index of real prices (deflated by national consumer price index) of selected animal-source foods, 2008–2018 (100 = April 2018)



Source: Scott et al. (2023).

The pulse and oilseed value chain cluster

Pulses are among Myanmar's most important agricultural exports, valued at around $1 billion annually. Oilseeds are also exported in large quantities and are among the most important domestically consumed grain crops after rice. We consider both sets of value chains together because pulses and oilseeds are often grown by the same farmers, particularly in the Dry Zone, and are traded by the same traders.

The two value chains diverge downstream of regional wholesale markets. Most pulses are exported to India via the port of Yangon, with a smaller portion traded overland to China through northern Shan State. Oilseeds are processed in Dry Zone oil mills that produce edible oil for sale on the domestic market, enter domestic retail value chains for sale as snacks, or are exported unprocessed to China and other East Asian countries. Despite the importance of pulse and oilseed production and value chains in Myanmar's agrifood system, only a handful of studies have comprehensively addressed them (Boughton, Haggblade, and Dorosh 2018; Favre and Myint 2009; Okamoto 2008).

An export-led boom in the production of pulses—most importantly, green gram, pigeon pea, and black gram—followed the liberalization of marketing and export of non-paddy crops during the early 1990s, with India as the main export market. In the Dry Zone, this policy shift resulted in a reallocation of land from traditional crops such as sorghum to pulses (Okamoto 2008). Pulses are exported with minimal processing or value addition. Trade with India is vulnerable to disruptions from import restrictions imposed to support its domestic pulse producers, as occurred in 2018.

Oilseeds, most importantly sesame and groundnut, are traditional Dry Zone crops, long since grown for subsistence and sale (Nash 1965). During the period of partial liberalization after 1988, private oil mills emerged throughout the Dry Zone to produce edible oil for the domestic market (Favre and Myint 2009). Oilseeds that are surplus to domestic needs are exported unprocessed, particularly to China. The liberalization of palm oil imports in 2011 proved challenging for Myanmar's oil millers, many of which have since closed.

Changes in the structure, conduct, and performance of the pulse and oilseed value chains

Pulse and oilseed cultivation in the Dry Zone is highly commercially oriented. Between 82 percent and 97 percent of households producing sesame, groundnut, pigeon pea, chickpea, or green gram reported having sold part of their most recent crop, with the marketed share of the quantity harvested ranging from 65 percent (chickpea) to 96 percent (green gram). Most unmarketed grain is held over as seed for the following crop season rather than being consumed as food (Table 12.5). Pulse and oilseed farmers are highly integrated into some input value chains. Most farms use inorganic fertilizers, with shares ranging from 72 percent of farms growing green gram to 86 percent of those growing groundnut in the post-monsoon season, and between 50 and 60 percent use pesticides (Mather et al. 2018).

Despite the high level of commercialization, use of improved seeds is limited (ranging from 8 percent for green gram to 24 percent for sesame) (Table 12.6). Most seed described by farmers as "improved" is retained from their own production or purchased from nearby farmers, and most improved varieties originate from lines that are many years old (Boughton et al. 2020).

TABLE 12.5 Share of Dry Zone farm households producing and selling major pulse and oilseed crops, and share of production sold

	Sesame	Groundnut	Pigeon pea	Chickpea	Green gram
Farm households producing (%)	68	33	33	22	21
Households selling crop (%)	88	83	87	82	91
Marketed surplus (%)	83	79	67	65	96

Source: Authors' survey.

TABLE 12.6 Rates of fertilizer and improved seed use and yields for Dry Zone groundnut, sesame, and green gram producers, 2007–2017

	Groundnut			Sesame			Green gram		
Year	Fertilizer use (kg/ha)	Farms using improved seed (%)	Yield (kg/ha)	Fertilizer use (kg/ha)	Farms using improved seed (%)	Yield (kg/ha)	Fertilizer use (kg/ha)	Farms using improved seed (%)	Yield (kg/ha)
2007	264	8	1,752	227	14	526	116	0	985
2012	282	10	1,697	235	15	496	131	0	775
2017	304	12	1,655	254	23	466	170	8	678

Source: Authors' survey.

This situation reflects low plant breeding and seed multiplication capacity in the public sector, as well as limited incentives for agribusiness to develop improved lines of open-pollinated varieties.

Fertilizer application rates and use of improved seed both increased moderately between 2007 and 2017 among Dry Zone farmers growing groundnut, sesame, and green gram. However, average reported yields fell over the same period by between 6 percent (groundnut) and 31 percent (green gram) (Table 12.6). Declining yields may reflect increasing climate variability and higher incidence of extreme weather, which were both reported by surveyed households, with weather conditions a key determinant of crop yields in the Dry Zone's rainfed farms (Herridge et al. 2019). Crop sensitivity to climate variability under rainfed conditions results in highly variable, but on average low, incomes and yields for crop farmers (Mather et al. 2018).

Most pulses and oilseeds grown in the Dry Zone are traded through wholesale markets referred to as commodity exchange centers (CEC). There are five CECs in major urban centers in the zone. Unlike maize traders in Shan, whose numbers have grown steeply over the past decade, most Dry Zone pulse and oilseed trading businesses have been established for at least 10 years, with 63 percent established between 1993 and 2007. This growth corresponds with the boom in pulse cultivation for export that followed the relaxation of socialist-era planning rules for crop production.

Most CEC traders (71 percent) are brokers who earn their commission by coordinating transactions among buyers and sellers. Around one-quarter are wholesalers who take possession of grain purchased from sellers for resale to other buyers. In addition, most CEC traders (73 percent) source crops directly from farmers; one-third (primarily the larger ones) source crops from other CEC traders. Only a small fraction of the pulses and oilseeds traded enter the supply chain via small village-level collectors. Just 4 percent of traders reported sourcing from rural aggregators, and 7 percent procured crops from traders working as agents on their behalf.

This finding indicates that a high degree of disintermediation has taken place in the pulse and oilseed value chain, with most farmers bypassing local traders to sell directly to larger traders in urban CECs. This scenario represents a significant change from the 1990s, when pulse farmers were often reliant on small rural collectors to aggregate and transport crops to market (Okamoto 2008). This pattern of disintermediation is common throughout Asia, where the diffusion of wholesale markets and improved roads linking rural areas to urban areas has facilitated direct purchases from farmers by urban wholesale market traders and spurred the decline of village traders (Reardon and Timmer 2014).

Disintermediation has also been facilitated by the growth of private transport rental services since 2010, following the liberalization of vehicle imports and fuel sales. Small motor vehicles are now available for hire in most Dry Zone villages (Belton et al. 2017). Four- and six-wheel trucks are by far the most common modes of transport used for delivering pulses and oilseeds to market. Larger vehicles are usually used to make outbound deliveries to traders at other CECs. Traders use their own vehicles for 4 percent and 9 percent of inbound and outbound deliveries, respectively, with third-party logistics supplying 16 percent and 20 percent of inbound and outbound transport. Buyers and sellers provide 83 percent and 76 percent of transport, respectively, most of which is likely also obtained from third-party logistics providers.

The degree of market concentration in pulse and oilseed trading is high. The smallest 40 percent of traders accounted for just 4 percent of the total volume of grain traded in 2017, whereas the largest 20 percent accounted for 73 percent. However, the Gini coefficient of traded quantity changed little between 2012 and 2017 (from 0.72 to 0.70), suggesting that the structure of this value chain segment is stable. This likely reflects the well-established nature of most businesses, high barriers to entry, and high operating costs.

Survey respondents traded 20 crops in 2017, including six oilseeds, 11 pulses, and two cereals. Among these, the four main pulses (pigeon pea, chickpea, green gram, and black gram) accounted for 54 percent of the total quantity traded, while the two main oilseeds (groundnut and sesame) accounted for 34 percent. Most traders (80 percent) dealt in both pulses and oilseeds. The average quantity of crops traded annually per trader fell 13 percent between 2012 and 2017, from 1,589 tons to 1,371 tons, but the total volume traded changed little. Total traded volumes of pigeon pea, sesame, groundnut, and black gram remained constant, while the total quantity of chickpea and green gram traded fell by 20 percent and 17 percent, respectively. Traded volumes of maize rose 51 percent during this period but from a low base, reflecting the expansion of maize production, including in a few parts of the Dry Zone. Anecdotal evidence suggests that volumes of maize traded by Dry Zone CEC traders increased sharply from 2019, as Chinese clampdowns on illegal cross-border trade forced a shift in market orientation, with Thailand and other Asian countries subsequently targeted as new markets (Belton and Fang 2022a).

As most traders are brokers who charge a standard rate of commission, their main business objective is to ensure a high turnover to maximize income earned. Moreover, most crops traded are sold as undifferentiated bulk commodities. Only 3 percent of traders use branded packaging. Moreover, nearly all traders specialize in crop trading and do not integrate vertically through the incorporation of upstream or downstream functions. As a result of these factors, most traders have little incentive to attempt to increase product quality. Sixty percent of traders reported doing nothing to improve the quality or value of crops traded. The most common form of grading is sorting crops by quality (practiced by 24 percent of traders); 17 percent of traders reported cleaning grains, and 8 percent reported grading by color. The share of traders practicing these forms of grading did not vary greatly with trader size and changed little between 2012 and 2017.

Pulse and oilseed traders are not a major source of rural finance. Only 30 percent of all traders reported extending credit to any supplier. Among suppliers, only 14 percent of farmers supplying traders were reported to have received trader credit, and this credit was extended mainly by smaller CEC traders; 6 percent of small rural traders supplying CEC traders were reported to have received credit, mainly from medium-size traders. The terms under which this credit is extended (for example, output-tied or untied) are not known. Very little credit is extended between CEC traders. This finding supports the broad observation from across Asia that the role of traders in rural finance provision has generally declined with improvements in transport and communications, the rise of off-farm employment, and the emergence of alternative sources of formal finance (Reardon et al. 2012).

In sum, these findings point to pulse and oilseed value chains that are more mature and less dynamic than the maize value chain, having already undergone a period of rapid growth and transformation at least two decades ago. This equates to a relatively stable structure in upstream farm and input provision and in midstream trading segments and little change in producer and trader behavior. Limited change in these segments also reflects the scarcity of options for upgrading—for example, limited access to improved seed varieties and mechanized harvesting technologies on farm, and little scope for value addition by traders, given a reliance on export markets demanding undifferentiated, unprocessed bulk commodities.

Changes in the edible oil value chain

Oil mills process oilseeds into edible oil. In the Dry Zone, rural oil mills are typically small and mainly provide custom milling services for farmers, enabling them to process small amounts of oil crops sufficient for their home consumption or for sale as groceries in the village (Favre and Myint 2009). Urban mills are larger than rural mills on average and do little custom milling. Their business model is to buy and process oilseeds and sell edible oil and oilcake. The following analysis deals exclusively with urban mills, drawing on a survey of 144 mills that represent 83 percent of the known operational oil mills in the Dry Zone's major urban centers in 2017 (Belton and Win 2019).

Urban mills can also be categorized into two groups based on the type of milling equipment used. First are expeller mills, which crush oilseeds using an encased rotating screw powered by an engine or motor. Expeller presses come in a wide range of sizes and designs. Second are artisanal mills, which extract oil through friction caused by a revolving pestle in a large mortar (Favre and Myint 2009).

Groundnut is the main crop processed by urban mills in the Dry Zone and is milled by 94 percent of mills. Sesame is of lesser importance, milled by 31 percent of mills. Nearly all urban millers source oilseeds from traders (94 percent in the case of groundnut), whereas only 9 percent source directly from farmers, and only 11 percent offer custom milling services to farmers.

More than two-thirds (69 percent) of oil produced in the Dry Zone is consumed locally, with local consumers accounting for 57 percent of sales. Local retailers are the second-largest market segment, with 12 percent of sales. Most of the remainder is sold to consumers and retailers in other cities. Mills receive orders from these customers by phone or via social media platforms, and delivery is often made by intercity bus. Only 15 percent of mills sell oil to wholesale traders. The predominance of consumers and retailers among mill customers suggests that most of their business is in the form of relatively low-volume transactions.

The number of urban expeller mills has declined sharply in recent years. Between 2007 and 2017, 80 mills closed, reducing the total number of operational mills from 266 to 186, a drop of 30 percent. The quantity of both groundnut and sesame procured by operational mills also fell by more than half between 2012 and 2017, with the largest average reduction in volumes procured by mid-size mills, down 79 percent. As a result, the urban oil mill sector became more concentrated over this period. The Gini coefficient of oilseed procurement rose from 0.63 in 2012 to 0.76 between 2012 and 2017, with large mills procuring around 90 percent of all oilseeds milled in 2017.

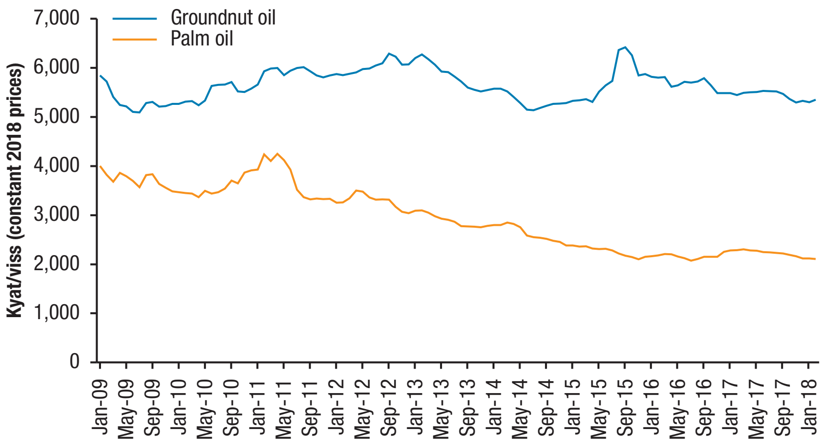
The shrinking number of operational mills and the falling volume of oilseeds processed by remaining mills are largely the result of imports of cheaper palm oil, which has partially displaced consumer demand for groundnut and sesame oil. A long-run decline in the price of palm oil corresponded with the liberalization of imports in April 2011. Prior to this time, only a handful of state-owned enterprises were granted palm oil import licenses. The real retail price of groundnut oil remained stable between 2011 and 2018, within the range of 5,000 to 6,000 kyat per viss,[2] while palm oil declined from around 4,000 kyat to 2,000 kyat per viss, meaning that groundnut oil retailed at close to three times the price of palm oil by the end of this period (Figure 12.7).

Domestically milled oil is therefore unable to compete on price with imported palm oil, which is cheaper to source than unmilled groundnut. According to oil millers interviewed, the quality of palm oil has also improved since 2011, further enhancing its appeal to consumers.

As a result, Myanmar's market for edible oil has become segmented. Retail prices for domestic groundnut oil and imported palm oil have diverged to such an extent that they now cater largely to different pools of consumers: a better-off group that can afford domestically produced oil and a larger lower-income group that cannot. High-income consumers consume much more groundnut oil than those with lower incomes (Figure 12.8). Individuals in the wealthiest 20 percent of the population (expenditure quintile 5) consume 354 percent more groundnut oil on average than those in quintile 1 (the poorest), at 8.87 kg per capita versus 1.95 kg per capita. Groundnut oil accounts for

2 1 viss (Myanmar measurement unit of mass) = 1.63 kg.

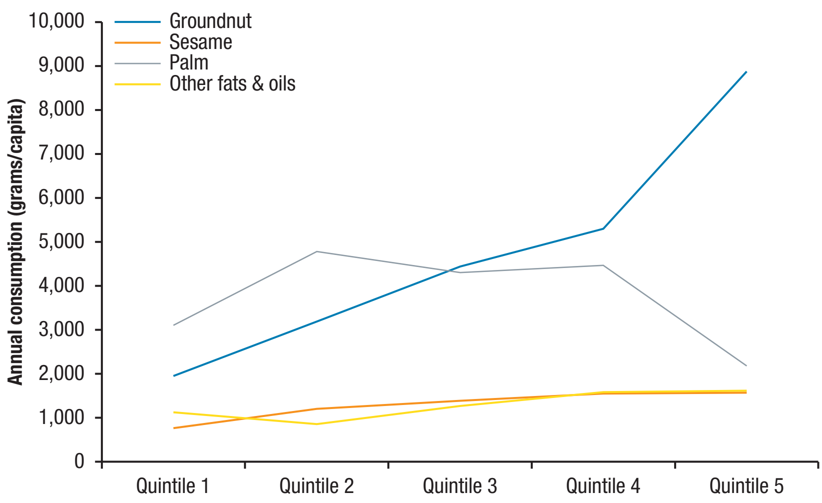
FIGURE 12.7 Real monthly retail prices of groundnut and palm oil, January 2009–February 2018



Source: Authors' calculations using CSO data (multiple years).

Note: 1 viss (Myanmar measurement unit of mass) = 1.63 kg.

FIGURE 12.8 Edible oil consumption 2015, by expenditure quintile



Source: Belton and Win (2019).

Note: Expenditure quintiles are obtained by ranking households by per capita consumption expenditure and dividing them into five equal groups, where expenditure quintile 1 is the 20 percent of households with the lowest expenditure per capita.

62 percent of the oil consumed by individuals in quintile 5, as opposed to only 27 percent of the oil consumed by those in quintile 1.

Edible oil consumption increased sharply between 2010 and 2015. A comparison of data from nationally representative household surveys indicates that annual per capita consumption of edible oils grew by 29 percent over this period, from 8.7 kg to 11.3 kg. However, the composition of edible oils consumed changed significantly. The share of sesame oil in total oil consumption dropped from 27 percent to 12 percent, and the share of groundnut oil from 47 percent to 42 percent. The share of palm oil jumped from 23 percent to 33 percent. "Other fats and oils," likely comprising mainly imported vegetable oils (for example, sunflower, soy, and rice bran), grew very rapidly, from 2 percent to 12 percent. These results underline the importance of palm oil for lower-income consumers and the broadly positive effects of import liberalization from a consumer perspective—at least in terms of economic welfare, though not necessarily health outcomes—despite the challenges this poses for the domestic milling industry.

Mills that have survived the challenge posed by palm oil have done so by adopting two broad strategies: (1) buying palm oil and blending it with groundnut oil at ratios determined by customer price preferences to meet demand for cheaper oils or by mislabeling blended oil as pure groundnut oil, and (2) seeking to expand and diversify sales by selling more oil directly to consumers and retailers, seeking out new markets (for example, other cities or supermarkets[3]), selling oil in own-branded packaging, and advertising these brands. We address these points below.

First, one-third of urban mills surveyed reported buying palm oil. Medium and large mills were twice as likely as small mills to report buying palm oil, purchasing an average of 5,800 liters per month. The mean volume of groundnut oil that urban mills sold per month was 34 percent higher in 2017 than in 2012. Large mills reported a 35 percent increase in average monthly sales over this period, whereas medium-sized mills reported a slight drop (12 percent) and small mills a large drop (58 percent). However, as noted above, purchases of groundnut fell by more than half over the same period. This observation strongly suggests that large and medium-sized mills have adapted to the demand for cheaper oil by selling groundnut oil blended with palm oil. Millers reported that blended oil was sometimes produced to meet customer

3 As of 2017, there were 15 domestically owned supermarket chains in Myanmar, operating a total of 102 stores (Htike 2017). A Thai subsidiary of the Dutch-owned Makro supermarket chain opened a single store in 2018. However, supermarkets are confined to larger cities. Most food continues to be purchased from traditional wet markets (Downs et al. 2018).

specifications and priced according to the ratio of groundnut to palm oil requested. However, it seems likely that not all blended oils are marketed as such. In contrast, sesame oil is rarely sold in blended form, perhaps because its distinctive color and aroma make it difficult to do so. Average monthly sales of sesame oil declined sharply for mills of all sizes between 2012 and 2017, falling by between 52 percent and 72 percent. These figures are close to percentage declines in the quantity of sesame procured by urban mills over the same period.

Second, two-thirds of urban mills are partially vertically integrated, allowing them to spread some risk across multiple complementary businesses. Around one-third of urban milling businesses operate oil retailing businesses (36 percent) or trade oil seeds (32 percent), and one-quarter (24 percent) work as edible oil wholesalers. Oil retailing businesses operated by millers tend to have been established later than mills, perhaps as part of attempts to diversify income streams in the face of falling returns from milling after 2011. More than half of urban mills, particularly larger ones, brand the oil that they sell. Most mills that brand their oil began to do so between 1999 and 2009, suggesting that branding may have been an early adaptive response to competition that began in the early 1990s from palm oil imports by state-owned enterprises. One-third of urban mills advertise their products. The number of mills that advertise grew rapidly after 2011, as did the variety of advertising media deployed, with Facebook being the fastest-growing medium. This development likely reflects both the availability of new advertising opportunities and media and a heightened need for urban mills to attract customers amid falling demand for domestically produced edible oil.

Value chains during the triple crisis

Research on maize, poultry, aquaculture, and pulse and oilseed value chains since the beginning of the crisis has been limited. Here, we therefore draw primarily on longitudinal phone surveys on rice value chains (Goeb et al. 2022; Minten et al. 2023), crop traders (MAPSA 2022b), and maize farmers (MAPSA 2021) conducted by MAPSA between 2021 and March 2022.

Lockdowns imposed to control the spread of COVID-19 in March and April 2020 and August and September 2020 resulted in transport restrictions that significantly curtailed mobility, increased transport costs, reduced business operations, contributed to employee layoffs, and led to a severe economic downturn and rising poverty levels (MAPSA 2022a). This outlook depressed domestic consumer demand for and production of nonstaple foods, such as chicken and fish (Belton and Fang 2022b). In contrast, prices and milling margins for staple rice remained mostly stable at this time (Goeb et al. 2022; MAPSA 2022b).

The economic and human welfare situation deteriorated further following the coup in February 2021. In addition to the use of violence against the general population by the military and security forces, the coup precipitated further restrictions on movement, the establishment of checkpoints, and disruptions to the banking sector and communications. For example, 11 percent of maize farmers surveyed in southern Shan and Kayah during the 2021 monsoon season were displaced by violence in July, and most farmers faced transportation restrictions in their village tracts (58 percent) and townships (84 percent) (MAPSA 2021). This situation was compounded by the COVID-19 Delta variant in June to August 2021, which resulted in much higher levels of mortality than in earlier waves.

Myanmar's rice milling sector was severely disrupted during the summer paddy season of 2021, with almost 90 percent of millers reporting that the banking sector was the most severe constraint to business at that time. Millers responded by shifting toward cash transactions, leading to cash flow problems for some, and using informal *hundi* systems to transfer payments. Transportation became less secure and more difficult after the coup, contributing to rice price inflation driven by increased marketing costs between mills and vendors, with price hikes also correlated with local incidents of violence. However, despite the depth of challenges faced, rice processing and trade continued, ensuring the availability of rice in most retail markets and illustrating the resilience of the value chain to a major shock (Minten et al. 2023).

Prices of fuel and key agricultural inputs such as fertilizer have increased sharply since the coup. This reflects a mix of factors, including the global peak in international oil and fertilizer prices since the onset of the Russia–Ukraine war, high international freight costs, domestic inflation and the depreciation of the Myanmar kyat, and issues with the local distribution of fuel. These factors have resulted in further increases in transport, fuel, and fertilizer costs.

Diesel prices more than doubled between March 2021 and 2022, and the price of urea jumped 56 percent between the monsoon seasons of 2021 and 2022 (IFPRI 2022; Minten et al. 2023). More than 90 percent of crop traders reported increased transport costs in March 2022, driven by fuel price increases of 168 percent (MAPSA 2022b). More than 80 percent of rice millers cited electricity and fuel supply disruptions as the greatest constraint faced in March 2022, overtaking banking disruptions, which had been the largest challenge reported since early 2021 (Minten et al. 2023).

Farmgate prices received by grain farmers increased sharply from 2021 to 2022, rising 78 percent for maize, 41 percent to 55 percent for pulses, and 27 percent to 32 percent for oilseeds. These increases resulted from high international prices, export demand, and the depreciating Myanmar kyat. As of late March 2022, paddy prices had increased less (23 percent) than those of other grains, and the price increase was inadequate to offset higher costs of fertilizer and mechanization services. High fertilizer prices led to a reported decline in fertilizer application rates by 63 percent of farmers in 2021, negatively affecting yields. Smaller-scale farmers planted less land to maize in 2021 than in 2020, likely to minimize costs and reduce risk (MAPSA 2021). Similar outcomes are probable for other major crops (IFPRI 2022). Higher procurement prices and transport costs translate into higher consumer prices. The price of vegetable oils remains extremely high, owing to a combination of the effects of the Russia–Ukraine conflict and the brief Indonesian palm oil export ban in April 2022 (MAPSA 2022b).

Conclusion

This chapter synthesizes findings from several representative surveys of agrifood value chains. It descriptively analyzes the linked processes of transformation in the structure and conduct of multiple value chains and value chain segments prior to the triple crisis beginning in 2020, as well as the behavior of farms and firms during the crisis. This analysis reveals the following points:

- The proliferation of businesses upstream and downstream of farms has played an essential role in facilitating farm commercialization and growth.
- Value chain development has been highly geographically clustered, reflecting the spatially uneven nature of environmental conditions, infrastructure, urbanization, and market access. The highest value commodities studied (fish and poultry) are the most densely clustered and found the closest to cities. In contrast, the upstream segments of grain and cereal clusters are less geographically concentrated and more rural.
- Highly geographically clustered demand for specialized goods and services and farm and nonfarm labor can create significant employment and economic multipliers, though their size may vary widely with value chain structure.
- There are multiple linkages between different agrifood value chains. Input suppliers provide agrochemicals to producers of multiple crops, maize and

byproducts from rice and oilseed processing are major inputs into animal feed, feed milling serves multiple animal husbandry value chains, and livestock waste is used as a source of nutrients for fish culture.

- More recently established value chains tend to be highly dynamic in their structure and conduct. Longer-established chains tend to be more stable but retain the potential to adapt to changing circumstances.
- Many of the changes observed in Myanmar's agrifood value chains can be linked to liberalization policies, including the deregulation of pulse farming and trade, motor vehicle imports, phone and internet communications, and foreign direct investment. Rapid transformation in agrifood value chains has also been enabled by investments in infrastructure that have cumulatively enhanced mobility and minimized transport costs. The liberalization of palm oil imports has proven highly challenging for domestic millers, while being beneficial to the economic welfare of lower-income consumers (but perhaps not their health).
- The performance of Myanmar's agrifood value chains has been mixed, still lagging behind those of many neighboring countries in productivity and value-added activity. However, the chains display capacity for rapid adaptation in response to new opportunities and shocks. Moreover, the chains generally are inclusive, generating large employment spillovers through the small and medium-sized enterprises that dominate them.
- Myanmar's agrifood value chains and the actors that comprise them have experienced multiple cascading shocks during the triple crisis. Certain value chains (most notably maize and rice) have proven surprisingly resilient despite the scale of the challenges faced. Traders, in particular, have adopted a diverse range of coping strategies and workarounds to persist in the face of extreme adversity (MAPSA 2023). However, chains supplying higher value and more perishable foods, such as poultry and watermelons, have proven much more vulnerable to demand shocks and trade disruptions (Fang et al. 2021; Kubo, Pritchard, and Phyo 2021).
- Numerous policies instituted following the coup complicate the activities of agrifood value chain actors. Since 2022, the military has ceased issuing new import and export licenses, manipulated foreign currency exchange rates by mandating "official" rates well below markets, and implemented foreign currency rules whereby 30 percent to 50 percent of foreign exchange earnings must be converted to Myanmar kyat at the official rate.

These changes have been introduced without warning (MAPSA 2023). These policies have directly impacted export-oriented value chains, such as maize and pulses, and have indirectly affected domestic value chains by reducing the availability and raising the price of imported inputs (see Chapter 10).

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Chapter 13

FOOD PROCESSING: A STALLED TRANSFORMATION

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Processed foods account for 80 percent of global food sales. Such foods are becoming increasingly important in low- and middle-income countries, driven by growing demand for convenient and ready-to-eat products (World Bank 2007).[1,2] The aim of this chapter is to analyze the state and evolution of food processing in Myanmar and to assess the effect of the crises (COVID-19 and the military coup) on the different segments—production, trade, and consumption—of the sector. This assessment is important given the possible implications of changes in food processing for agriculture, employment opportunities in the food processing industry and food service sector, and nutritional outcomes.

We look at data from food processing enterprises and analyze the importance of different levels of processing in international food trade and consumption. We then quantify the importance of prices and income in demand for foods categorized by their degree of processing. We further analyze the

1 For example, Reardon and colleagues (2014) show that in Bangladesh, Nepal, Indonesia, and Viet Nam, the average share of processed foods in the value of food consumption was 59 percent in rural areas and 73 percent in urban areas. They also found that the processing share in food consumption rises with income levels, indicating increased importance with possible future income growth. A case study in Tanzania finds that processed food has penetrated the diets of rural areas and those of the rural and urban poor, driven mostly by the effort to save home processing and cooking time but also because of food environment factors (Sauer et al. 2021). On the other hand, de Brauw and Herskowitz (2021) illustrate in the case of Nigeria that consumption of highly processed foods at home has declined, while consumption of food away from home (FAFH), often assumed to be highly processed, has risen substantially.

2 The growth in the consumption of processed foods in low- and middle-income countries has two important associated trends. First, the off-farm segment in agricultural value chains becomes increasingly important—and that segment then evolves into an important source of employment in these countries (for example, Mueller and Thurlow 2019). Second, the increasing consumption of processed, but especially ultra-processed, foods has been linked to rapid increases in overweight and obesity, often referred to as the double burden of malnutrition, given the combination of under- and overnutrition in these countries (Demmler, Ecker, and Qaim 2018; Popkin, Corvalan, and Grummer-Strawn 2020; Reardon et al. 2021). These trends have sparked public health concerns and a policy debate about ways to reverse these outcomes (Boysen et al. 2019).

effects of the recent crisis period on food processors, on international food trade, and on the consumption of foods in the different processing categories.

Throughout this chapter, we use the food classification system focused on processing proposed by Monteiro et al. (2019), the NOVA classification system, to categorize foods by their degree of processing into four groups: (1) unprocessed; (2) minimally processed, which are unprocessed foods altered by industrial processes but without salt, sugar, oils or fats, or other food substances added to the original food; (3) culinary processed, which mostly involves the addition of oils and sugars; and (4) processed foods. See MAPSA (2023) for a detailed description and the annex to this chapter, for the allocation of foods recorded in the national household survey to the four processing categories.

In this chapter, we first analyze the functioning of the food processing sector, then assess food trade disaggregated by food processing category and consider the consumption of processed food products overall and for different socioeconomic groups. Next, we present the results of demand assessments, using a quadratic almost ideal demand system (QUAIDS) model (MAPSA 2023). We use these results to assess the effect of the recent crises in Myanmar on food consumption.

Production in the food processing sector

Characteristics

The role of food processing in the local economy is not well understood. However, several characteristics are worth highlighting. First, food processing is very important in the overall industrial and manufacturing sector, as a number of indicators illustrate. Table 13.1 presents the number of registered industrial enterprises by commodity group, indicating the high share of food processing enterprises: 56 percent of industrial enterprises are involved in the food and beverages commodity group. Table 13.1 further shows that an estimated almost two-thirds (65 percent) of industrial food processing enterprises are small, defined as those enterprises with fewer than 50 employees, whereas an estimated 16 percent are in the large category. This size distribution broadly follows the distribution of other commodity groups.

Second, exact employment numbers in the food processing sector are lacking. As discussed in Chapter 16, Paudel, Filipski, and Minten (2022) estimate, based on the Myanmar Living Conditions Survey of 2017, that about 5 percent of the rural population is employed in manufacturing. They indicate

TABLE 13.1 Registered private industrial enterprises, 2019

Commodity group	Large	Medium	Small	Total	Share (%)
Food and beverages	4,173	6,038	18,987	29,198	56.5
Clothing apparel	926	914	1,314	3,154	6.1
Construction materials	1,246	1,596	1,875	4,717	9.1
Personal goods	709	680	451	1,840	3.6
Household goods	147	87	89	323	0.6
Printing and publishing	109	213	138	460	0.9
Industrial raw material	236	193	175	604	1.2
Mineral and petroleum products	421	735	2,400	3,556	6.9
Agricultural equipment	12	28	37	77	0.1
Machinery and equipment	30	32	31	93	0.2
Transport vehicles	72	28	13	113	0.2
Electrical goods	70	18	17	105	0.2
Miscellaneous	252	1,205	5,970	7,427	14.4
Total	8,403	11,767	31,497	51,667	100.0
Share (%)	16.3	22.8	61.0	100.0	NA

Source: Data from SME Development Agency.

Note: The size of small and medium enterprises is defined based on number of employees, type of activity, and capital invested or level of turnover. Small manufacturing enterprises have fewer than 50 employees and less than kyat 500 million of capital, medium more than 50 and fewer than 300 employees (301–600 employees in labor-intensive manufacturing) and up to kyat 1 billion of capital, and large more than 300 employees and more than kyat 1 billion of capital. NA = not applicable.

that this sector covers mostly food processing activities. In the national Myanmar Household Welfare Survey fielded at the beginning of 2022, 3.2 percent of households reported that they were involved in food processing (MAPSA 2022b). The shares were slightly higher in rural areas (3.4 percent) compared with urban areas (2.9 percent).

Third, rice mills are the most important food processing enterprises, as well as the most important enterprises in the manufacturing sector, as measured by their share in revenue and in value added of the manufacturing sector as a whole (Table 13.2). Table 13.2 also shows—based on a large survey of manufacturing firms (MOPF and UNU-WIDER 2020)—that rice mills make up 59 and 57 percent of total revenue and value added, respectively, in the industrial sector. Rice mills combined with all other enterprises in food, beverages, and tobacco make up 84 and 83 percent. Table 13.2 further shows that the average size of rice mills is significantly larger than the average for other manufacturing enterprises (at more than double the size), measured in revenue as well as value added.

TABLE 13.2 Revenue and value added by industry, 2019

Industry	Revenue		Value added	
	Sum Million kyat	Mean kyat	Sum Million kyat	Mean kyat
Rice mills	15.74	951	4.26	257.7
Food, beverages, and tobacco	6.68	335	1.92	96.5
Textiles, apparel, and leather	1.43	266	0.41	75.4
Wood, paper, and printing	0.78	156	0.21	41.9
Coke, chemicals, rubber, and minerals	0.83	177	0.28	59.0
Metal	0.41	96	0.10	24.1
Electrical equipment, machinery, and motor vehicles	0.42	148	0.11	41.2
Furniture and other manufacturing	0.31	99	0.12	40.3
Total	26.60	430	7.43	120.0

Source: MOPF and UNU-WIDER (2020).

Fourth, innovations in the food processing sector have seemingly been limited in the past decade, but they are increasingly being adopted for some commodities. For example, Belton and Win (2019) show that most oil mills use very old equipment. In the case of pulses, most are exported as unprocessed grains after cleaning and sorting for size and (in some cases) color (Boughton, Haggblade, and Dorosh 2018). It has further been shown that poor tapping and processing practices in the rubber sector have led to low quality and low prices for Myanmar rubber exports (van Asselt, Htoo, and Dorosh 2017).

On the other hand, the rice milling sector has undergone important changes since the industry was liberalized in 2003 (Okamoto 2005), particularly in the decade under the civilian government from 2010 onward. Some upscaling has happened, but medium- and large-scale mills—classified as having a daily throughput capacity greater than 15 tons—accounted for just 12 percent of all rice mills in 2018 (USDA 2020). Yet, in terms of total rice produced, these medium- and large-scale mills are becoming increasingly important as the number of small-scale mills is declining. Goeb et al. (2022) find that such modern mills pay higher prices to their suppliers and, because of extra processing, sell rice at higher prices than their competitors.

Fifth, the inflow of foreign direct investment in low- and middle-income countries has been associated with innovations and improved efficiencies in food processing. For example, the liberalization in China of foreign investment in food processing in the 1990s and 2000s unleashed large foreign direct investment inflows, contributing to an increase in food processing investments (Reardon 2015). However, foreign direct investment in food processing in Myanmar has been limited. While there has been increasing interest by foreign companies in investing in processing—for example, Wilmar International, a large Singapore-headquartered agrifood sector investment holding company, invested in the rice sector in 2019 after partial liberalization in that sector—the number of firms that have done so is still very small.

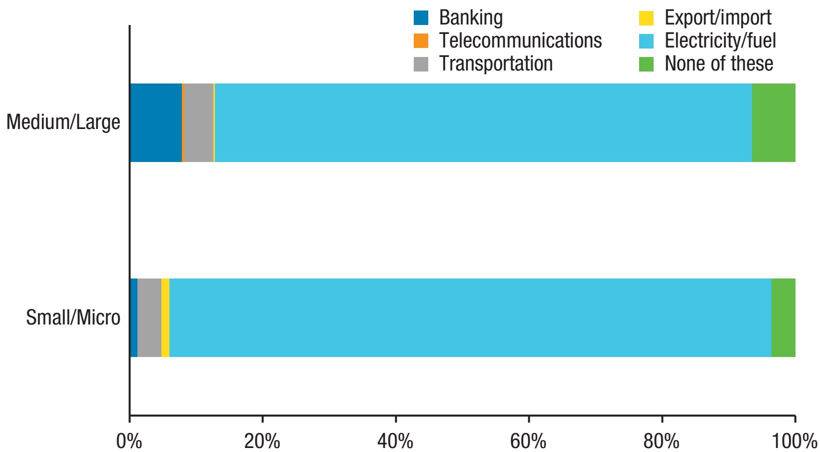
Sixth, food processors typically achieve higher revenues through branding and product differentiation. Reardon and colleagues (2012) show in several Asian countries that rice mills have changed their functions over time from only custom milling, where customers bring paddy to the mill and pay only for the milling services, to procuring paddy, milling it, and then packaging and branding the milled rice for sale. Similar processes are happening in Myanmar, where branded local products are increasingly appearing in local retail markets (Euromonitor 2020). Belton and Win (2019) show in the case of oil mills that rural mills focus mostly on custom milling, whereas urban mills, in addition to milling the oil, also are involved in value-addition and branding. Increasing urbanization in the country—and demands for choice and quality by richer urban residents—likely is contributing to this change in practices of millers.

Seventh, the increase in consumption of processed products has been linked to the rapid emergence of modern retail in a number of other countries (Demmler, Ecker, and Qaim 2018; Reardon et al. 2021). It is estimated that modern retail grew by double digits in the decade before the 2020s, albeit from a low base (Euromonitor 2020). The growth of modern retail has been concentrated mainly in urban areas and mostly in Yangon, the largest city, as is the pattern typically seen in the early stages of modern retail rollout (Reardon et al. 2012). In any case, that growth might have been associated with an increase in the sales of processed foods, whether imported or obtained from local firms.

The effect of the crises—the case of rice millers

To illustrate the effect of the crises on food processing, we focus on the rice milling industry, given its pivotal importance for farmers, consumers, and export earnings. In March 2022, millers were asked a series of questions on different forms of disruptions faced in the 30 days prior to the interview. Overall, fuel and electricity were the most common disruptions. About 80 percent of modern larger mills reported high fuel prices and difficulties accessing electricity. Many traditional smaller mills run on diesel generators; nearly 90 percent reported disruptions as a result of high fuel prices. Fuel access was thus a large disruption for both mill size categories.

FIGURE 13.1 **Most significant reported business disruption reported by rice millers, by mill size, March 2022**



Source: Authors' analysis based on miller survey, March 2022 round.

Modern millers require transportation for both paddy input and milled rice output. Thus, they were severely affected by rising transportation costs (65 percent) and transport restrictions and curfews (35 percent). Among those millers reporting transport disruptions, the most common restrictions were checkpoints (35 percent), the need for special permissions (27 percent), and increased fees (23 percent).

To further evaluate these challenges, millers were asked to identify which group of disruptions they considered the most significant (Figure 13.1). With frequent power outages and rising fuel prices from the start of 2022, electricity and fuel were overwhelmingly the largest disruptions for both mill types, overtaking banking, which dominated throughout 2021. Disruptions related to banking were also still a challenge, particularly for medium and large mills, which conduct more purchases and sales.

The surveys also asked a series of questions on milling operations to understand how rice mills had responded to these challenges. For the 2021/22 monsoon harvest season, millers reported an average total throughput decline of about 15 percent relative to the 2020/21 season (Table 13.3). Throughput in the 30-day periods prior to interviews showed larger declines, perhaps reflecting the acute power challenges mills were facing. Paddy storage had also declined, and these results together suggest a decline in monsoon paddy production. While this is likely the main factor in reduced milling throughput,

TABLE 13.3 Rice mill operations, employment, and credit in March 2022 compared with March 2021

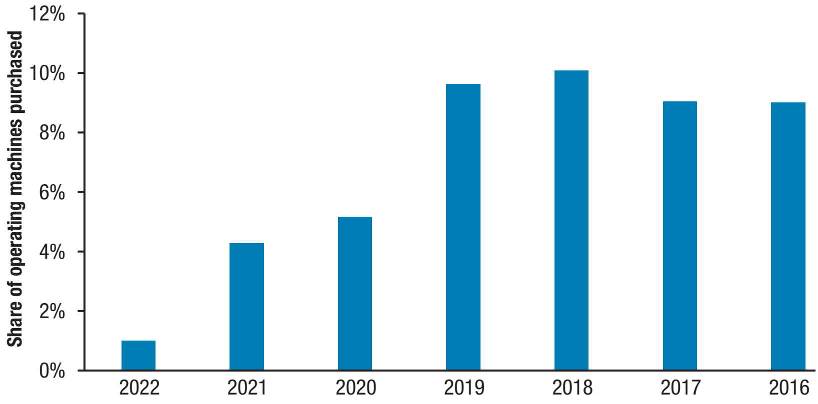
	Small/micro mills			Medium/large mills		
	March 2021	March 2022	% change	March 2021	March 2022	% change
Throughput (average)						
Last 30 days (tons)	39	26	–35%	366	272	–26%
Monsoon harvest season (September–March, tons)	199	166	–16%	1,504	1,275	–15%
Storage (average)						
Paddy (number of bags)	1,246	901	–28%	24,676	20,343	–18%
Rice (number of bags)	58	63	8%	724	717	–1%
Transport (average)						
Cost of diesel (kyat/l)	976	2,186	124%	911	1,843	102%
Employees (average)						
Permanent employees (number)	2.8	2.4	–13%	6	6	0%
Daily workers (number)	2.1	2.1	–2%	20.5	20.5	0%
Daily wage (kyat /day)	6,936	7,021	1%	7,691	7,701	0%
Working capital (average)						
Weekly capital to buy paddy (kyat '00,000)	29	29	–1%	612	556	–9%
Milling commission fees (average)						
Fees for milling 108 lb. bag (kyat)	1,131	1,218	8%	1,207	1,290	7%
Credit lent out						
Share lending out	4%	5%	33%	18%	18%	2%
Conditional average amount (kyat '00,000)	158	120	–25%	834	781	–6%
Credit borrowed in						
Share borrowing	4%	5%	33%	13%	14%	9%
Conditional average amount (kyat '00,000)	235	209	–11%	1,559	1,530	–2%

Source: Miller survey, March 2022 round.

electricity and fuel disruptions likely also contributed to lower operating hours. Average diesel costs more than doubled in 2022. This increased operating costs and widened the price gap between consumers and producers (Chapter 11) (Minten et al. 2023).

The rising fuel costs and declines in throughput contributed to lower mill profits and an average decline in working capital of 9 percent for larger mills. However, employment and credit were mostly stable, particularly for larger

FIGURE 13.2 Purchase year of operating machines owned by modern rice mills



Source: Miller survey, March 2022 round.

mills. Last, banking restrictions meant that millers continued to be heavily reliant on cash. On average, cash transactions accounted for 99 percent of paddy purchases and 69 percent of rice sales. However, in-person bank transfers had risen relative to previous months to 19 percent of rice sale transactions in March 2022, suggesting improvements to bank operations.

The turbulence and uncertainty resulting from the COVID-19 pandemic since 2020, along with the political unrest since early 2021, has led to a clear decline in machinery investments for modern larger mills (Figure 13.2). Data from the mills survey indicate significant problems in the sector during the crises. Changes in the once rapidly expanding and modernizing rice milling sector have stalled, machines are depreciating without replacement, and output is declining. These changes suggest broader changes in the manufacturing sector (World Bank 2022).

To summarize, the milling sector has seen important disruptions but has helped ensure both market access for paddy producers, as paddy rice is the most important crop for farmers in quantity and value terms, and reliable access for consumers to milled rice at competitive prices, even as higher energy and transport costs have widened the price wedge between paddy and milled rice. However, continued declines in new investment in mills will undermine Myanmar's competitiveness in rice markets, with impacts on the welfare of farmers and consumers alike.

International trade

Figure 13.3 shows the value of international trade over the period from 2009 to 2022 for three food categories based on processing: unprocessed and minimally processed, culinary processed, and processed. Panel A illustrates that the value of food imports increased rapidly in nominal US dollars—by 18 percent annually over the decade—leading to a fivefold increase from $732 million in 2009 to $3,419 million in 2019.[3] In 2022, however, it had declined by 16 percent compared with three years earlier and by 29 percent compared with the peak in 2016. On the exports side (panel B), we also note a substantial increase, continuing during the crisis years. The value of overall food exports increased in nominal terms by 10 percent annually, from $1,520 million in 2009 to $3,993 million in 2019, almost a tripling over that period. It has increased further since—the value of exports in 2022 was 22 percent higher than in 2019.

Myanmar participated substantially more in international trade over the period from 2009 to 2019, but food imports increased much more rapidly than exports. In value terms, Myanmar was a net agricultural exporter in 2009 (of $788 million) as well as before the crisis years ($574 million in 2019).[4] However, that situation improved during the crisis years. A substantially larger trade surplus is noted in 2022 than in 2019, at $2,326 million or a tripling of that surplus in only three years. This growth in the agricultural trade surplus was driven by new stringent import restrictions, especially on palm oil, as well as increasing prices in international agricultural commodity markets.

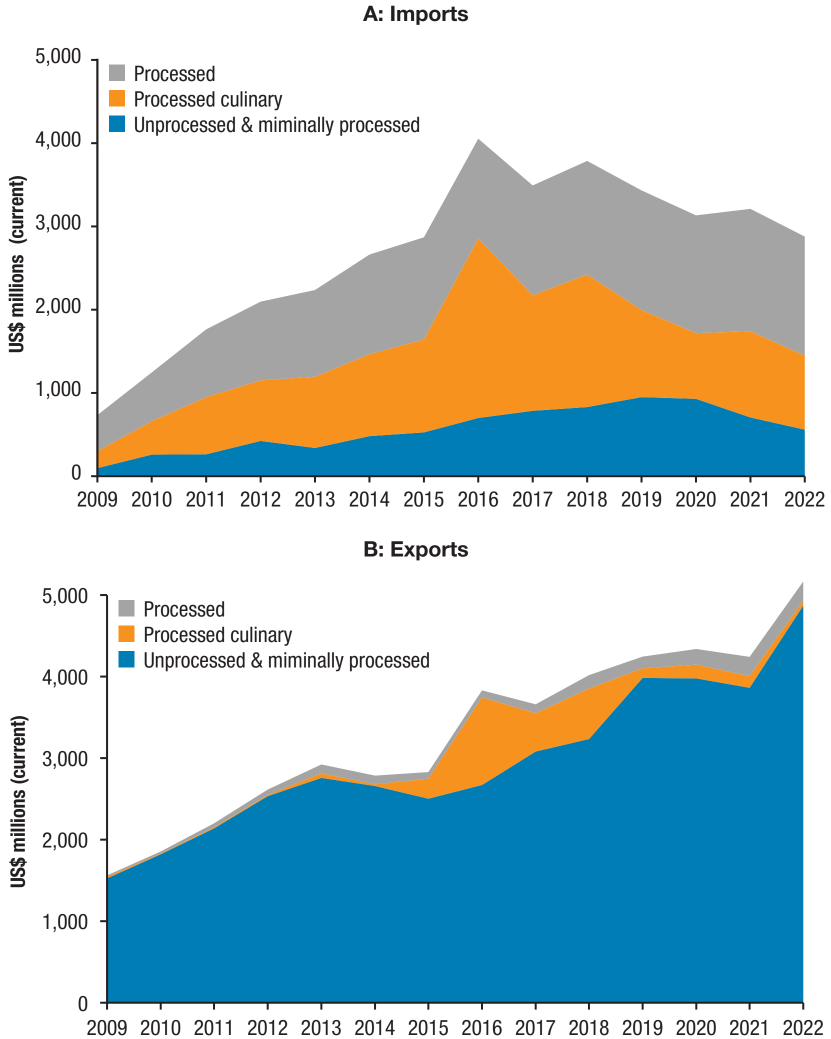
We further see a large difference in the composition of food imports and exports. Within food imports, culinary processed foods (31 percent of value imported in 2022) and processed foods (50 percent in 2022) are the two main categories of food imported. For culinary processed ingredients, palm oil and sugar are the two major imported commodities.[5] The category of unprocessed and minimally processed food imports, making up 19 percent of total food imports, is diverse, with wheat, apples, frozen bovine meat, nuts, and citrus fruit together accounting for half of the food imports in this category. In contrast, unprocessed and minimally processed food products were the major

3 The peak in imports in 2016 in Figure 13.3 is explained by substantially higher imports of sugar in that year.

4 A caveat for the current assessment is that we rely only on official statistics. There is substantial informal trade as well, which does not appear in the official statistics.

5 Together, they accounted for two-thirds of culinary processed food imports in 2019.

FIGURE 13.3 Food trade in Myanmar, by processing level, 2009–2022



Source: Authors' analysis using BACI database (Gaulier and Zignago 2010).

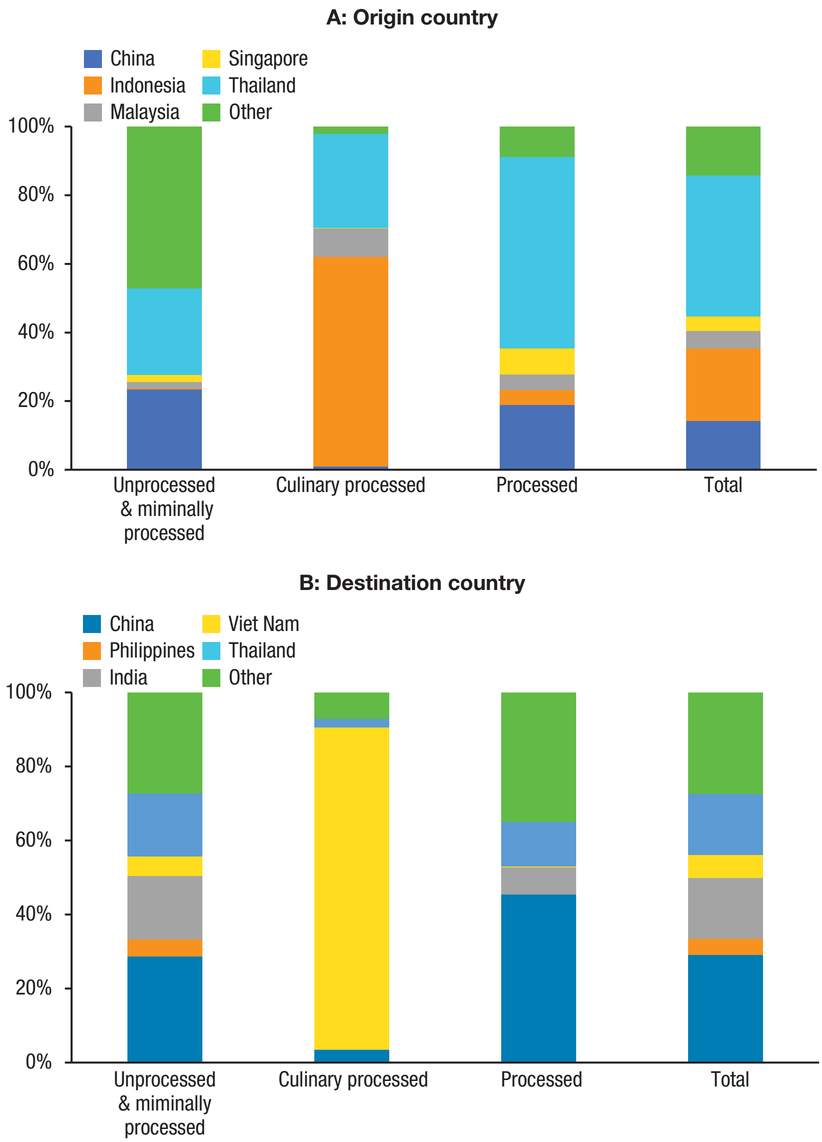
food groups exported between 2009 and 2022, accounting for 94 percent of the value of total food exports in 2022.

Figure 13.4 further presents an assessment of the origin (panel A) and destination (panel B) countries of differently processed items in 2022. The relative shares for the five most important countries that import (panel A) or export (panel B) are shown. On the imports side, Thailand is an important source of processed products. For culinary processed products (palm oil and sugar), Indonesia and Thailand are the two most important countries. The top five countries represent 86 percent of all products imported in Myanmar. On the export side, China is the most important destination country, importing 29 percent of all agricultural exports from Myanmar, in value terms, in 2022. China imports a significant share of unprocessed and minimally processed products, as well as almost all culinary processed products. Thailand comes second, closely followed by India. The top five countries represent 73 percent of the total value of food exports, indicating a slightly lower concentration than for imports.

Finally, we look at the prices—averaged for the period 2009–2022—for different types of processed foods in imports as well as exports (Figure 13.5). Prices are calculated by simply dividing the value of a specific processing category by traded quantities. Within processing categories, we see small differences between prices for imports into and exports from Myanmar. If there are differences, these are driven mostly by different portfolios between exports and imports. However, we note significant price differences between processing categories, with processed products being two to three times more expensive than unprocessed and minimally processed products. This suggests that Myanmar exports mostly cheap unprocessed or minimally processed primary products and imports significantly more expensive processed products.

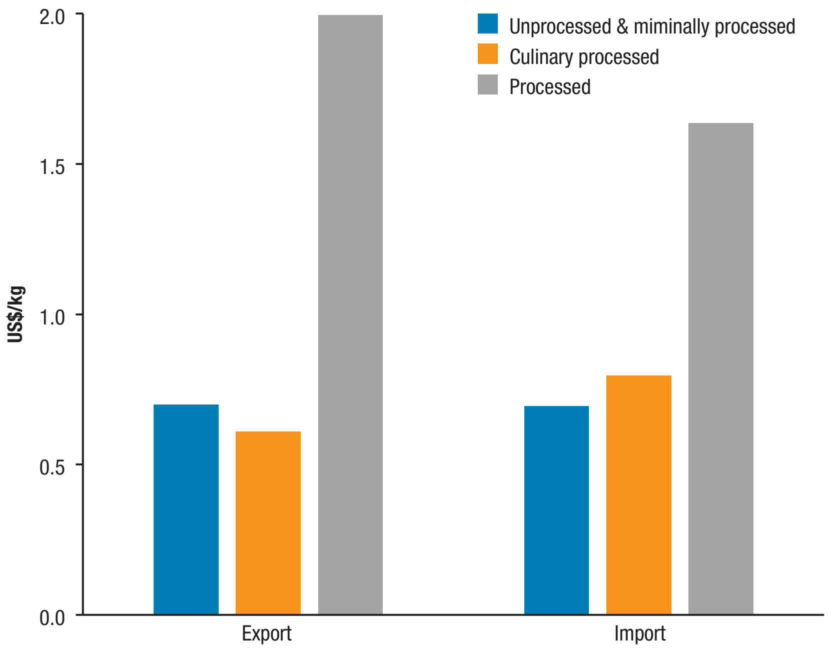
Since the military coup, international trade has altered in important ways. First, the military government abandoned the managed floating exchange rate regime and fixed the exchange rate at an overvalued rate, leading to a growing spread between the parallel and official market rates. Second, international trade is now restricted through a system of requirements on import and export licensing, import bans and quotas, and restrictive currency policies. In 2021, only 35 percent of imported items required trade licenses; this had increased to 81 percent by mid-2022 (World Bank 2022). The capacity to manage these licenses is limited, leading to long delays in obtaining licenses for imports, increasing uncertainty, and price rises for imported products such as processed foods. On the export side, 13 percent of export items were subject to license

FIGURE 13.4 Origins and destinations of food trade in Myanmar, by processing level, 2022



Source: Authors' analysis using BACI database (Gaulier and Zignago 2010).

FIGURE 13.5 Import and export prices, by processing level, average for 2009–2022



Source: Authors' analysis using BACI database (Gaulier and Zignago 2010).
Note: For export levels, 2016 is not included.

requirements in mid-2022, including agricultural products such as beans and pulses, oilseeds, and edible oils.

The vegetable oil market is a good example of the effects of these policies. Over time, the government has attempted through different policy measures to reduce imports of palm oil, the most important imported (culinary processed) food product. The intention is to promote increased consumption of locally produced edible oils, such as groundnut, sunflower, and sesame oils. Prior to 2010, quotas limited palm oil imports to 20,000 tons per month; this restriction was lifted from May 2011 onward. The military government reestablished import restrictions at 50,000 tons per month at the end of 2021, permitting 81 companies to import edible oils.

If there were no trade and market restrictions, the price of palm oil in the local market should be determined by the full cost of imports.[6] To compare

6 This includes insurance, freight charges, prices of imports at the port, tariffs, taxes, transport, handling and marketing, and exchange rate costs.

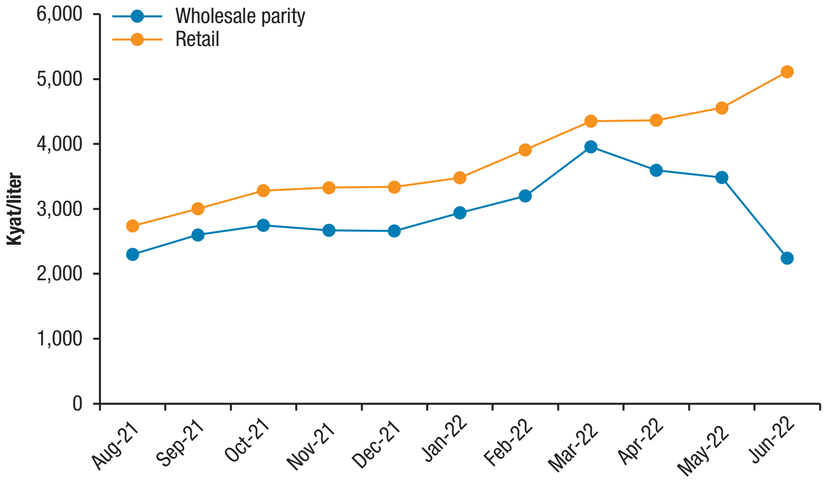
prices of imported palm oil with prices of local palm oil in retail markets, we calculate import parity prices, reflecting the free on board (f.o.b.) price, at the major port in Yangon. We plot monthly these import parity prices against a price series of average national retail prices collected by the World Food Programme (WFP) in a large number of retail markets in the country (Figure 13.6). Using the market exchange rate, we note that margins between palm oil retail prices tracked import parity prices at the wholesale level rather well over most of the period examined. Average markup margins were, on average, 20 percent over the period between August 2021 and April 2022. However, we see an increasing wedge after this period, with retail prices in July 2022 more than double the wholesale parity price, which suggests an increasing "starvation" of palm oil in local markets (Frontier 2022).

On top of higher prices, these trade policy changes have led to an increase in the issues related to the availability of vegetable oils in retail markets. In a survey of local food vendors, almost half of food vendors indicated that vegetable oils were less available in March 2022 compared with the same period a year earlier (MAPSA 2022a). Availability was especially an issue in conflict-affected areas. The situation has further worsened since (Frontier 2022).[7] The situation of palm oil illustrates how the new trade regulations are reshaping agricultural pricing and incentives, with important implications for local food processing, as seen in renewed investments in previously uncompetitive oil mills.

In sum, structural constraints and adverse foreign exchange policies have hampered international trade in processed food products. Myanmar has not been able to diversify away from unprocessed and minimally processed exports as imports of more highly processed food products have increased, steadily narrowing the agrifood trade surplus over time. More recently, foreign exchange policies under the military regime have led to large and unpredictable increases in imported cooking oil prices for consumers. The next section examines the effects of price and income shocks on food consumption patterns in detail.

7 In the middle of August 2022, the Myanmar Edible Oil Dealers' Association distributed palm oil to the public at a price of 5,000 kyat per viss (3,125 kyat/l) across the country. However, quantities sold at this price were limited to 0.5 or 1 viss. The distribution took place through a token system, and it is estimated that people sometimes had to queue for three to four hours to acquire this quantity (BBC 2022).

FIGURE 13.6 Palm oil prices, import wholesale parity and retail, August 2021–July 2022



Source: Authors' analysis using MEODA 2022 (parity prices) and WFP retail prices (HDX 2022).

Food consumption

Descriptive statistics

We obtain a number of stylized facts on food consumption and processing from analysis of the consumption data of the Myanmar Population and Living Conditions Survey (MPLCS) 2015. Table 13.4 presents an overview of the share of the consumption of five categories of foods in consumers' expenditures and calories: unprocessed foods, minimally processed foods, culinary processed foods, processed foods, and alcohol and stimulants. We present alcohols and stimulants separately, given the difficulty involved in assigning them to other categories. In addition, we present the share of food away from home (FAFH) consumption, given the rapid growth of this method of consumption in Asia in recent years (Reardon et al. 2014).

The highest shares of the caloric and monetary values of food consumption are in the category of unprocessed (10 percent of calories; 43 percent of food expenditures) and minimally processed (64 percent; 23 percent) food products (Table 13.4). The importance of the latter category reflects the importance of rice in Myanmar's food economy. Four percent of the food budget goes toward alcohol and stimulants, representing 1.5 percent of calories. Processed foods make up 3 percent of calories consumed but 9 percent of expenditure—3 times

TABLE 13.4 Food consumption, by processing level

	Unprocessed	Minimally processed	Culinary	Processed	Alcohol and stimulants	FAFH	Total
National							
Calories (per adult equivalent)	273	1,724	339	85	41	236	2,698
Share in calories (%)	10.1	63.9	12.6	3.2	1.5	8.7	100.0
Expenditures (kyat per adult equivalent)	494	270	69	105	49	169	1,156
Share in total food expenditures (%)	42.7	23.3	6.0	9.1	4.2	14.6	100.0
Rural versus urban share in total food expenditures (%)							
Rural	42.0	25.7	6.5	9.1	4.3	12.3	100.0
Urban	44.2	18.5	4.9	9.1	4.0	19.4	100.0
By expenditure quintile share in total food expenditures (%)							
Q1 (poorest)	36.5	37.9	7.6	8.0	3.5	6.5	100.0
Q2	40.3	31.2	6.9	8.1	4.2	9.2	100.0
Q3	42.6	25.1	6.4	9.1	4.4	12.3	100.0
Q4	43.8	21.9	6.1	9.3	4.6	14.2	100.0
Q5 (richest)	44.9	15.9	4.8	9.7	4.1	20.7	100.0
By agroecological zone share in total food expenditures (%)							
Delta	45.5	23.2	5.5	10.3	4.0	11.6	100.0
Coastal Zone	43.4	22.9	4.4	10.7	4.4	14.2	100.0
Dry Zone	38.3	24.6	8.5	8.6	3.9	16.0	100.0
Hills and Mountains	43.1	27.3	5.6	7.9	5.6	10.5	100.0
Yangon	44.6	18.3	3.9	8.4	3.7	21.1	100.0

Source: Authors' calculations using MPLCS 2015.
Note: FAFH = food away from home.

as much. The average daily expenditure on any processed foods—combining all types of processing—in 2015 was kyat 444 per day.

As in a number of low- and middle-income countries, Myanmar is beginning to suffer from a double burden of malnutrition, whereby incidences of obesity and overweight exist together with a large prevalence of undernutrition. Obesity and overweight are increasingly becoming a problem in urban areas: an estimated 40 percent of women of reproductive age in urban areas are overweight or obese (WFP 2019). This has been linked partly to the rapid increase in the consumption of unhealthy ultra-processed foods. While the share in consumption of highly processed foods is still relatively low, the consumption data reflect the situation only in 2015; the noted rapid increase in imports of processed foods generates worries of negative nutritional and health impacts (Baker and Friel 2016; Monteiro et al. 2012; WFP 2019).

Significant differences in the composition of consumption baskets are also seen over consumption expenditure quintiles, as documented in other countries (Bouis 1994; Bouis and Haddad 1992; Pingali 2007; Subramanian and Deaton 1996).[8] When people become richer, they also spend relatively more money on FAFH. This process is happening in Myanmar. The rich spend 21 percent of their food budget on FAFH, while the poorest quintile spend 6 percent.[9] There also is a large difference in the share of consumption baskets made up of FAFH between urban areas (19 percent) and rural areas (12 percent).

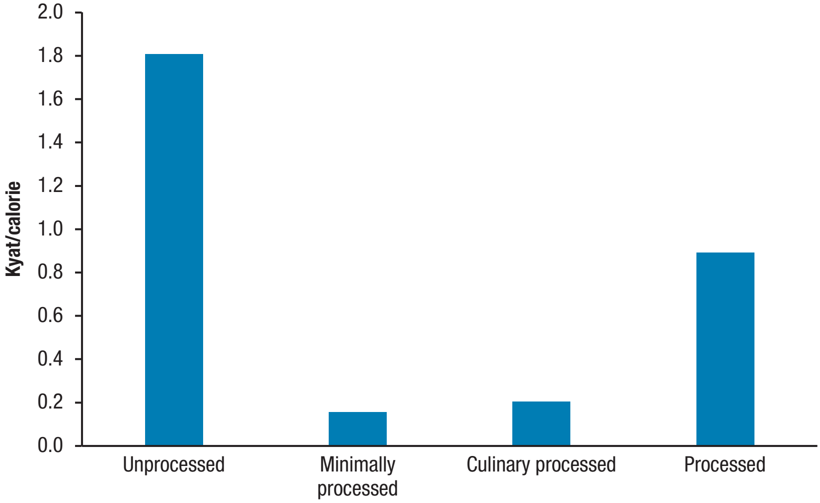
Comparing expenditures and calories allows for the calculation of average calorie prices by processing category. As already illustrated for products that are traded internationally, Figure 13.7 shows large differences between these categories. Unprocessed products are the most expensive. That category reflects the relatively high prices of nutrient-dense (but low-calorie content) foods such as some animal-source foods, fruits, and vegetables. Relatively high prices for these foods have been noted in other countries as well (Headey and Alderman 2019). Prices per calorie for processed foods are found to be about 4 times higher than prices of minimally processed foods (the cheapest of all the categories), which is partly an indication of the economic value added by processing.

Driven by the relatively high prices per calorie in the unprocessed categories (animal-source foods, fruits, and vegetables), the poor consume less of these unprocessed foods compared with the rich. The share of unprocessed products increases from 36 percent to 45 percent between the poorest and the richest quintile (Table 13.4), indicating a 4.4-times increase in absolute expenditure between the poor and the rich. We further find that the rich spend more than the poor on processed foods in absolute terms but the share of total expenditure is similar. The poorest quintile spent 8 percent of their total food

8 Several changes associated with national income growth affect food consumption patterns. These include changes in lifestyle, with more women working outside the home and access to technology, such as refrigerators and microwave ovens, reducing food preparation cost; the development of better packaging technologies; and the entrance of modern marketing channels, including in retail, processing, and food service industries (Reardon et al. 2021).

9 For example, Smith, Dupriez, and Troubat (2014) noted that food eaten away from home had increased from 10 percent to 49 percent of total food expenditures in the United States between 1900 and 2010. Similar rapid changes in consumption of FAFH were seen in a number of quickly transforming economies, including China, India, and Mauritius.

FIGURE 13.7 Prices per calorie for different processing categories



Source: Authors' analysis using MPLCS 2015.

expenditures on the consumption of processed foods. This contrasts with 10 percent for the richest quintile. As the rich spend (3.5 times) more on food, this implies that the richest quintile spends significantly more on processed foods than the poor do. We further see that the share of minimally processed foods decreases over expenditure quintiles, at 38 percent of the food basket of the poor compared with only 16 percent for the rich.

Extrapolating consumption of processed foods based on expenditures reported by households enables us to estimate the size of the processed food sector, incorporating all foods that are categorized as minimally, culinary, or highly processed. Using this definition, processed food consumption was $6.1 billion out of a total of $15.9 billion spent on food in 2015. Of all the agroecological zones, the value is highest for the Dry Zone and the Delta (each counting for $1.8 billion). The urban population consumed 28 percent of the value of all processed products, and the rural population consumed 72 percent. Comparing consumption numbers with imports in 2015 indicates that local food processing accounted for around 82 percent of the consumption of processed foods in the country.[10]

10 Assuming half of the unprocessed and minimally processed food category falls in the minimally processed food category and there is a margin of 20 percent on imported foods.

Food demand assessments

Tables 13.5 and 13.6 show the results of the demand model estimation for Myanmar (MAPSA 2023). In the results presented, income and poverty are proxied by total household consumption expenditure, as is typically done given the problems of correctly measuring income and that expenditures may better reflect the "permanent income" of a household. The QUAIDS model specification further controls for a rural/urban dummy and for household economies of scale. Elasticities are reported at the per capita population mean and are derived for each household individually. They have further been cleaned for extreme outliers.[11]

Table 13.5 shows that expenditure elasticities vary relatively little between different processing categories—that is, at between 0.69 and 0.82 (except for culinary processed foods), indicating that a 10 percent increase in expenditures leads to an approximated increase in consumption for these categories of between 6.9 and 8.2 percent. These estimated elasticities are consistent with the elasticities estimated from a 15-food-group demand system (Chapter 4) and with the results of de Brauw and Herskowitz (2021), who found point elasticity estimates on processed foods in Nigeria that were relatively close to other food categories. In contrast with other food groups, for culinary processed foods, the expenditure elasticity is relatively low (0.19). This group is dominated by the consumption of oil, sugar, and salt, which generally tend to be less income-responsive than other foods.[12]

Table 13.5 also presents elasticities for urban and rural areas by expenditure quintile. The most striking differences in expenditure elasticities are noted by expenditure quintiles. The gradient is especially large for processed foods, where the expenditure elasticity drops from 0.93 for the poorest quintile to 0.61 for the richest quintile in rural and urban areas, and for FAFH, where we see a similar drop for the same quintiles, from 1.06 (1.08) to 0.61 (0.65) in rural (urban) areas. We see that expenditure elasticities are overall slightly

11 Results based on our estimation approach were compared with the results of the standard QUAIDS command for Stata (which does not address the zero-consumption problem). The latter method produced implausible elasticities for the food groups that have a considerable number of households that did not report food group consumption over the recall period. However, the ranking of the elasticities by magnitude is identical, increasing confidence in the approach followed.

12 Moreover, the food group is diverse (oil, sugar, salt)—oil prices differ substantially from sugar and salt prices—and these items are commonly consumed in most households. Hence, there is considerable bunching of different items within this food group. We note that the elasticities for oils/fats and sugars/condiments separately are each higher but still lower than those for all non-rice food groups derived from our 15-food-group system.

TABLE 13.5 Estimates of expenditure elasticities, QUAIDS model

Food group	Mean	Median	Minimum	Maximum	Standard deviation
			Rural		
Unprocessed & minimally processed foods	0.724	0.742	0.460	0.833	0.070
Culinary processed foods	0.150	0.119	–0.086	0.517	0.110
Processed foods	0.805	0.805	0.342	1.180	0.125
Alcohol and stimulants	0.827	0.842	0.469	1.023	0.091
FAFH	0.887	0.881	0.260	1.584	0.194
			Urban		
Unprocessed & minimally processed foods	0.659	0.675	0.455	0.827	0.087
Culinary processed foods	0.139	0.111	–0.127	0.497	0.098
Processed foods	0.741	0.736	0.372	1.144	0.128
Alcohol and stimulants	0.750	0.761	0.480	1.007	0.109
FAFH	0.830	0.822	0.266	1.455	0.194
Consumption expenditure quintiles by rural and urban (mean elasticities)					
			Rural		
	Q1	Q2	Q3	Q4	Q5
Unprocessed & minimally processed foods	0.747	0.728	0.724	0.711	0.659
Culinary processed foods	0.087	0.127	0.195	0.226	0.249
Processed foods	0.927	0.834	0.770	0.699	0.611
Alcohol and stimulants	0.822	0.825	0.839	0.839	0.795
FAFH	1.059	0.936	0.838	0.724	0.609
			Urban		
	Q1	Q2	Q3	Q4	Q5
Unprocessed & minimally processed foods	0.703	0.695	0.676	0.653	0.622
Culinary processed foods	0.083	0.101	0.124	0.156	0.188
Processed foods	0.928	0.854	0.788	0.718	0.615
Alcohol and stimulants	0.758	0.771	0.763	0.748	0.730
FAFH	1.085	0.995	0.898	0.802	0.651

Source: Authors' calculations using MPLCS 2015.
Note: QUAIDS = quadratic almost ideal demand system. FAFH = food away from home.

higher for rural areas compared with urban ones, likely because of lower income levels in these areas (MOPF and World Bank 2017).

Table 13.6 shows the estimates of price elasticities. For most food groups, these estimates are close to negative unitary, implying that if prices increased by 1.0 percent, consumption would drop by 1.0 percent. This illustrates the

TABLE 13.6 Estimates of price elasticities, QUAIDS model

Food group	Mean	Median	Minimum	Maximum	Standard deviation
			Rural		
Unprocessed & minimally processed foods	–0.846	–0.854	–0.976	–0.622	0.049
Culinary processed foods	–1.161	–1.159	–1.313	–1.012	0.047
Processed foods	–0.978	–0.982	–1.000	–0.822	0.018
Alcohol and stimulants	–0.974	–0.978	–0.990	–0.813	0.015
FAFH	–1.044	–1.052	–1.101	–0.830	0.031
			Urban		
Unprocessed & minimally processed foods	–0.819	–0.830	–0.973	–0.603	0.065
Culinary processed foods	–1.152	–1.150	–1.300	–1.038	0.046
Processed foods	–0.970	–0.976	–1.000	–0.829	0.025
Alcohol and stimulants	–0.973	–0.977	–0.989	–0.771	0.015
FAFH	–1.026	–1.039	–1.098	–0.754	0.047
Consumption expenditure quintiles by rural and urban (mean elasticities)					
			Rural		
	Q1	Q2	Q3	Q4	Q5
Unprocessed & minimally processed foods	–0.848	–0.846	–0.850	–0.849	–0.822
Culinary processed foods	–1.131	–1.158	–1.180	–1.188	–1.193
Processed foods	–0.980	–0.979	–0.976	–0.976	–0.973
Alcohol and stimulants	–0.978	–0.973	–0.972	–0.971	–0.973
FAFH	–1.048	–1.044	–1.043	–1.041	–1.037
			Urban		
	Q1	Q2	Q3	Q4	Q5
Unprocessed & minimally processed foods	–0.827	–0.828	–0.825	–0.818	–0.810
Culinary processed foods	–1.106	–1.132	–1.149	–1.161	–1.177
Processed foods	–0.972	–0.972	–0.969	–0.970	–0.971
Alcohol and stimulants	–0.974	–0.976	–0.973	–0.973	–0.970
FAFH	–1.041	–1.033	–1.027	–1.022	–1.020

Source: Authors' calculations using MPLCS 2015.
Note: QUAIDS = quadratic almost ideal demand system. FAFH = food away from home.

high importance that consumers in Myanmar attach to prices when making food consumption choices. The highest price elasticities are found in FAFH and culinary processed foods and the lowest for unprocessed foods. Few differences are noted for urban versus rural areas and for the poorest quintile compared with the richest one.

The effect of the crises

We use the expenditure and price elasticities from the previous section to assess the effect of the recent crises on the consumption of different food processing categories.[13] To model the impact of the crises, we need information on income and price changes over the past two years. The crisis generated by the COVID-19 pandemic and the military takeover led to a contraction of the economy and, consequently, household incomes in 2020 and 2021. A World Bank (2021) analysis estimated that the economy in fiscal year 2021 had contracted by 18 percent and that the economy, therefore, would be 30 percent smaller than it would have been in a scenario with no pandemic or military takeover.[14] For 2022, the World Bank estimated that the economy may show 3 percent growth (World Bank 2022).[15]

We have seen large food price changes over the crisis years, especially in 2022 compared with 2021. Table 13.7 presents price changes for a selected number of food products for rural as well as urban areas, based on a food vendor survey fielded regularly between 2020 and 2022. We see that price changes were, on average, higher in urban areas than in rural ones. The cost of an average consumption basket had increased by 1.3 percent in rural areas and 7.2 percent in urban areas in mid-2021 compared with mid-2020. In 2022, these price increases were 54.8 percent and 58.6 percent, respectively. Over the two years, urban prices increased by 70 percent, compared with 57 percent in rural areas. Part of the food inflation was caused by very large increases in the prices of vegetable oils, which rose by more than 200 percent in rural areas. However, rice prices also increased substantially by 43 and 41 percent in urban and rural areas, respectively, between mid-2021 and mid-2022. We use these price changes at the food processing category level based on average changes for the prices of the limited products covered in the survey for each food processing category.[16]

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13 Elasticities were estimated for different product categories using the same methodology as described in Chapter 4. However, in this chapter, they are subsequently used to predict changes in the consumption of different food groups after the crisis. Such predictions were not made in Chapter 4.

14 The World Bank (2022) also showed significant declines in imports and exports in the country in 2021, likely associated with reduced availability of processed products overall.

15 However, given the lack of data, significant uncertainties surround these estimates. Diao and colleagues (2022), for example, estimate a 3.5 percent lower GDP in Myanmar as a result of the impacts of the international crisis linked to the Russia–Ukraine war, which started in February 2022.

16 We use relative food price changes for these food categories (compared with the cost of a food basket) and assume that food price inflation was in line with overall inflation in the country.

TABLE 13.7 **Price changes of major food products in 2021 compared with 2020 and 2022 compared with 2021, selected food items, rural and urban**

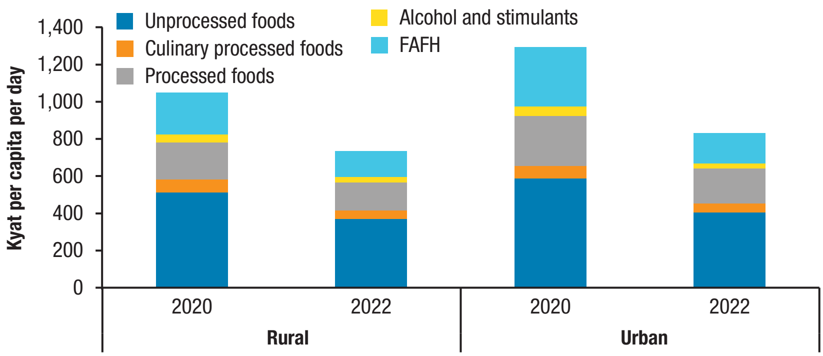
	July 2021 vs. July 2020		August 2022 vs. July 2021	
Food item	Rural	Urban	Rural	Urban
Rice	12.9	14.2	41.0	43.0
Chickpea	19.2	–0.4	71.5	72.1
Potato	1.6	0.6	150.5	137.3
Water leaf	–15.9	15.3	15.5	54.1
Banana	–14.8	12.0	44.4	30.4
Chicken	–4.8	–6.5	29.4	37.5
Fresh fish	–15.9	–13.1	32.0	47.2
Dried sea fish	1.3	12.6	66.7	44.5
Palm oil	75.0	74.9	201.6	177.6
Food basket	1.3	7.2	54.8	58.6

Source: Authors' calculations using MAPSA food vendor surveys.

We model the effects of expenditure and price changes under the scenario for 2022, in which there was positive income growth in line with projections by the World Bank in 2022 (+3 percent), after a dramatic contraction in 2021 (–18 percent). We use the price changes presented in Table 13.7 as indicative of price changes for each food processing category. Because the focus of the exercise is on changes in food consumption caused by the crises, we assume similar consumption levels in 2015 as in 2020. Figure 13.8 presents the results of that simulation for rural and urban areas separately. Base consumption levels in rural and urban areas were 1,050 kyat ($0.84) and 1,293 kyat ($1.04) per capita, respectively.

The results show the large effects of the crises: average real food expenditure levels decreased by 30 percent in rural areas and 36 percent in urban areas. For the different food processing categories, the biggest impacts are seen in FAFH consumption—a decline of 37 and 49 percent in rural and urban areas, respectively. Large reductions are also seen in the consumption of alcohol and stimulants—a decline of 42 and 47 percent in rural and urban areas, respectively. The declines for culinary processed foods are substantially larger in rural areas (36 percent) than in urban areas (27 percent)—partly because of higher price increases and higher own price elasticities for the former—while the opposite is the case for processed products (a decline of 22 percent in rural areas compared with 30 percent in urban areas). Despite the relatively larger impacts of the crises in urban areas, consumption levels in rural areas are, on

FIGURE 13.8 Per capita food consumption for urban and rural areas, by processing category, 2020 and 2022



Source: Authors' analysis using MPLCS 2015.
Note: FAFH = food away from home.

average, still 12 percent below urban ones. The gap was 19 percent before the crises.

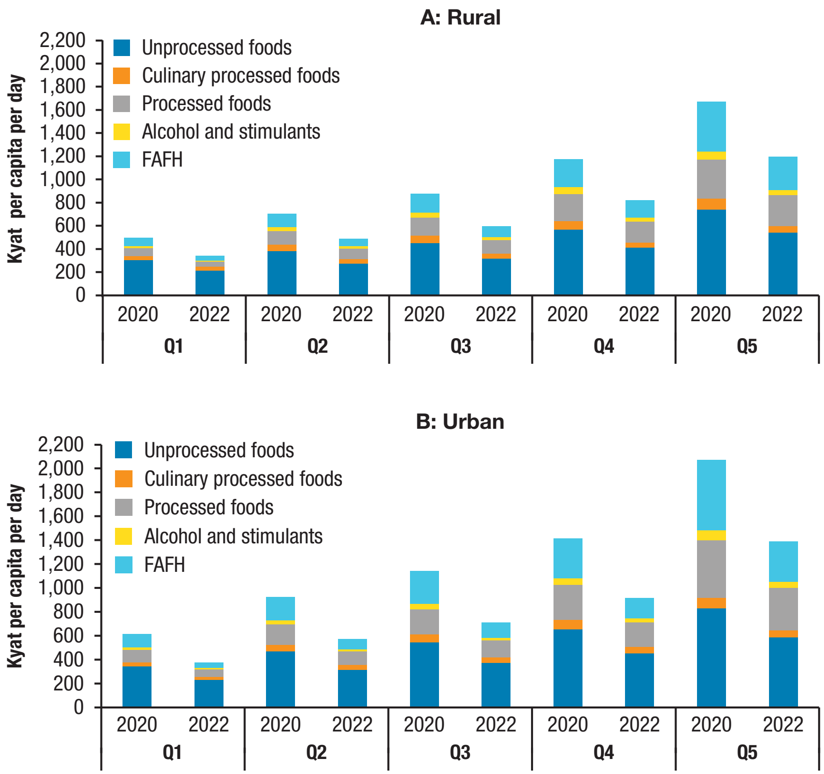
We further assess how urban and rural areas and different poverty quintiles have fared since the triple crisis (Figure 13.9). The poorest quintile saw the biggest declines in consumption, of 31 percent in rural areas and 39 percent in urban areas. This compares with declines for the richest quintile of 29 percent and 33 percent in rural and urban areas, respectively. Despite the bigger decline for the poorest quintile in urban areas, their consumption level after the crises was still 10 percent higher than that of the poorest quintile in rural areas. Within food processing categories, it is noteworthy that FAFH consumption decreased by 60 percent for the poorest urban quintile and is now at almost a similar level to that in rural areas. Processed food consumption also decreased substantially for the poorest urban quintile, but after the crises it was still 36 percent above that of rural areas.

In sum, dramatic increases in food prices over the period from 2020 to 2022, aggravated by lower incomes, forced consumers to reduce food consumption in all categories. The poorest quintiles of consumers have been the most seriously affected.

Conclusions and implications

We assess the status of and changes in the food processing sector by analyzing the production of processed food, international trade in food products, and

FIGURE 13.9 **Value of food consumption, by processing category, for urban and rural areas by poverty quintile, 2020 and 2022**



Source: Authors' analysis using MPLCS 2015.
Note: FAFH = food away from home.

food consumption by food processing category, and the impact of recent crises (COVID-19, the military coup, and spikes in international commodity prices) on these three segments.

We find that food processing—and especially rice milling—is very important in the country, making up more than 80 percent of the revenue and value addition of the local industrial sector. The value of food imports—dominated by culinary processed foods (oils and sugar) and processed foods—rapidly increased from 2009 to 2019 and then declined over the years of crisis. Agricultural exports increased over the whole period. Exports are, however, dominated by lower-value unprocessed and minimally processed food products: prices of these are half to one-third the price of imported agricultural products. On the consumption side, we find that the highest share of the value of food and calorie consumption falls in the categories of unprocessed (10 percent of calories; 43 percent of food expenditures) and minimally processed (64 percent; 23 percent) food products. The importance of the latter category reflects the importance of rice in the food economy. There are substantial differences in food composition by income level, with the rich relying more on unprocessed foods, processed products, and especially FAFH than the poor and consuming fewer minimally processed products.

The military takeover and the COVID-19 crises have led to enormous problems related to food demand and the functioning of the food system overall (Boughton et al. 2021; MAPSA 2021a). The growth seen in the food economy and in international food trade has taken a serious hit. Problems with agricultural and business credit, transport, banking, and communications have resulted in substantially reduced agribusiness activities (Boughton et al. 2021; MAPSA 2021b). The impact of the crises is particularly well documented for rice milling—the most important food processing sector—where a consistent drop in business activities compared with normal years has been seen. Meanwhile, import substitution trade policies and foreign exchange control are leading to substantial price increases and lower availability of imported food products, such as palm oil. Food consumption assessments after the triple crisis show a significant decrease in overall food consumption. Moreover, while consumption has declined significantly for all income groups, the rural poor have suffered the most, with food consumption expenditures decreasing by 31 and 39 percent in rural and urban areas, respectively.

The findings of this research have several important implications. First, by focusing more on value addition through investments in processing industries, Myanmar could significantly improve its trade position in agriculture. Current low levels of value-added processing—for example, in pulses and maize—reduce potential earnings from Myanmar's agricultural exports. Emphasis on diversified pulse export markets and an increased focus on value-added processing (noodles, sprouts, flour, dahl, and prepared foods) would improve Myanmar's trade situation, with the added benefit of generating highly nutritious processing residues to meet the country's growing demand for animal feed. Investing in the processing industry would also allow for improved competition with processed food products that are currently imported. Moreover, unprocessed and minimally processed products are not very diverse and have concentrated buyers. This results in potential price volatility for upstream actors, especially producers, which more value addition might counter.

Second, to further stimulate access to rewarding high-value markets for Myanmar, improved incentives through appropriate international trade policies are needed. As the past decade has shown, outward-looking strategies have helped increase international agricultural trade, contributing to an improved situation for its citizens as a result of better incomes for its farmers and more choices for its consumers (World Bank 2021). A more outward trade orientation would bring in new technologies and insights that would significantly help strengthen the export situation as well as local food systems.[17] Investments in trade would, however, best be guided by the comparative advantages of the country and less by import substitution concerns.

Third, it is crucial to create an enabling business environment that will ensure increased investments in the food processing sector, enable better prices for farmers, support more efficient value chains, and provide more choices for consumers. Such an environment would include, among other improvements, predictable policy frameworks; transparent trade rules; secure property rights; low price inflation; access to reliable and affordable communication, electricity, and transport infrastructure; and a well-functioning banking system. These improvements would also attract desired foreign direct investment. More effective incentives to encourage such foreign investment in agricultural trade and processing will help the processing sector achieve the quality and standards required to compete in growing urban and international markets. Investments in more modern local processing plants would be beneficial for farmers, who would obtain higher prices, and consumers, who would have more choices.

ANNEX

List of foods included in different processing categories

NOVA classification category by food processing	Detailed food groups	Food category expenditure share (%)
Unprocessed	Coconut	0.4
	Potatoes	2.4
	Sweet potatoes	0.4

(continued)

17 International trade after the military takeover has been hampered by an implicit export tax resulting from the implementation of a dual exchange rate system (Chapter 14).

ANNEX (continued)

NOVA classification category by food processing	Detailed food groups	Food category expenditure share (%)
	Roots	0.7
	Poultry	15.2
	Pork	9.5
	Beef	4.2
	Other meat	2.2
	Eggs	7.0
	Aquaculture	4.6
	Freshwater capture	9.7
	Sea capture	4.9
	Other fish	0.3
	Dark-green leafy vegetables	4.3
	Other vegetables	19.1
	Fruit	12.5
	Garlic and other fresh seasonings	2.5
	Total	100.0
Minimally processed	Rice (Ngasein)	8.8
	Rice (Emata)	14.6
	Rice (Medone)	2.4
	Rice (Nga kywe)	5.2
	Kaukhnyin (sticky rice)	0.4
	Other rice (local variety)	40.9
	Rice noodles	1.1
	Other cereals	1.2
	Dried pulses	8.6
	Pulse products (tofu, pastes, bean vermicelli)	0.2
	Groundnut	2.1
	Sesame	0.2
	Milk	1.3
	Dried/powdered chili	6.2
	Other seasoning/condiments	1.9
	All other minimally processed foods	5.0
	Total	100.0
Culinarily processed	Oils	86.0
	Sugar and sweets	10.9
	Other seasonings/condiments	3.2
	Total	100.0

(continued)

ANNEX (continued)

NOVA classification category by food processing	Detailed food groups	Food category expenditure share (%)
Processed	Other cereals	1.9
	Pulse products (tofu, pastes, bean vermicelli)	1.1
	Other meat	0.6
	Sea capture	0.4
	Dried medium/large fish	9.7
	Dried small fish/shrimp	2.8
	Fish products	4.8
	Sugar and sweets	5.8
	Other seasonings/condiments	3.5
	Alcoholic beverages	13.7
	All other processed foods	6.7
	Prepared foods eaten at home	5.7
	FAFH	43.4
	Total	100.0

Source: Authors' calculations using MPLCS 2015.
Note: FAFH = food away from home.

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Chapter 14

AGRIFOOD TRADE

Xinshen Diao, Ian Masias, and Wuit Yi Lwin

Agrifood exports make up about one-third of Myanmar's total exports, and their share of both total exports and as a ratio of total GDP has risen in recent years. Agrifood exports have the potential to generate higher income for farmers, traders, processors, and other stakeholders within agrifood value chains. Additionally, they can contribute to the country's foreign exchange earnings, supporting the importation of manufactured products embedded with modern technology required for the transformation of the agrifood sector. This chapter analyzes the past performance of key agrifood exports and assesses their potential role in the transformation of Myanmar's agrifood system and the overall economy.

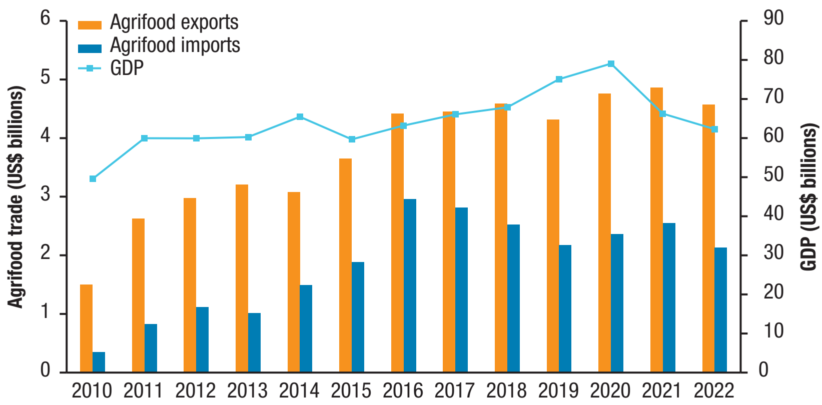
The chapter largely relies on the open access international trade database, Base pour l'analyse du commerce international (BACI) (BACI 2024; Gaulier and Zignago 2010). BACI is built on Comtrade—the UN international trade statistics database—which is based on data that individual countries report directly to the United Nations. The BACI dataset provides balanced bilateral trade flows for more than 5,000 products.

The chapter is organized as follows. First, we provide a broad overview of the performance of Myanmar's agrifood exports, identifying key exports and their markets. Second, we look at specific export crops that may play an important role in the future of Myanmar's agrifood export sector. Third, we discuss the policy environment that is constraining the sector. Last, we summarize our findings and provide policy recommendations for increasing export competitiveness and making agrifood exports an important driver of Myanmar's economic growth.

Overview of Myanmar's agrifood exports

Agrifood exports are Myanmar's second-largest export category behind manufacturing and account for one-third of total exports. In recent years, the value of agrifood exports has been nearly double that of agrifood

FIGURE 14.1 Myanmar's GDP and agrifood export and import levels, 2010–2022



Source: Authors' calculations using World Development Indicators data (World Bank 2024).

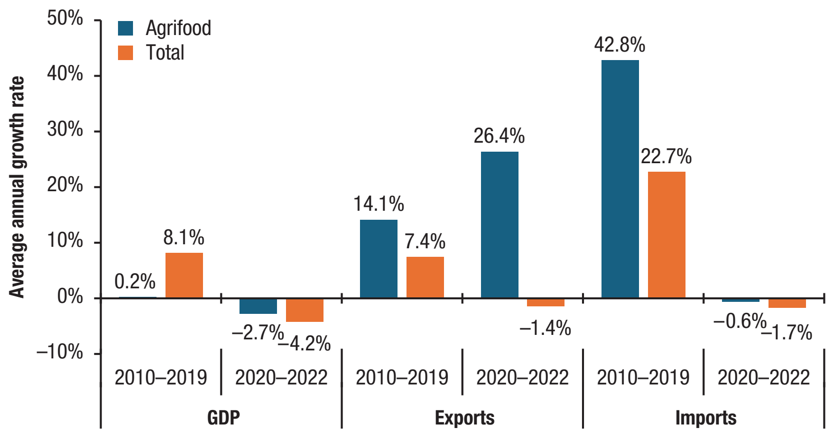
imports—Myanmar is a significant net agrifood exporter. Agrifood exports played a crucial role in Myanmar's economic growth from 2010 to 2019. The value of agrifood exports increased significantly from US$1.7 billion in 2010 to $4.2 billion in 2019 (Figure 14.1). As shown in Chapter 2, while the overall contribution of agriculture to total GDP declined during this period, the share of agrifood exports in total exports and GDP grew. This indicates that agrifood exports expanded at a faster pace than both total exports and the overall economy (Diao and Li 2020).

Through the crisis period from 2020 to 2022, agrifood exports continued to grow as Myanmar's agrifood exports benefited from an increase in global food prices and the depreciation of the Myanmar kyat (World Bank 2022). Meanwhile, the overall economy shrank during this period due to the impacts of the COVID-19 pandemic and the military coup.

As shown in Figure 14.2, agrifood exports grew at an annual average of 14.1 percent between 2010 and 2019, outpacing the growth of total exports (7.4 percent). The annual average growth rate for agrifood exports accelerated to 26.4 percent between 2020 and 2022, while growth in overall exports fell to negative 1.4 percent in the same period. This pattern demonstrates that the agrifood sector has been relatively more resilient to economic downturns compared with other sectors of the economy.

Approximately 94 percent of Myanmar's agrifood exports are unprocessed and minimally processed foods, while more than 80 percent of agrifood imports are culinary processed or processed foods (Chapter 13). Moreover,

FIGURE 14.2 Average annual growth rates for total GDP, agrifood GDP, value of total exports and imports, and value of agrifood exports and imports, 2010–2019 and 2020–2022



Source: Authors' calculations using World Development Indicators data (World Bank 2024).

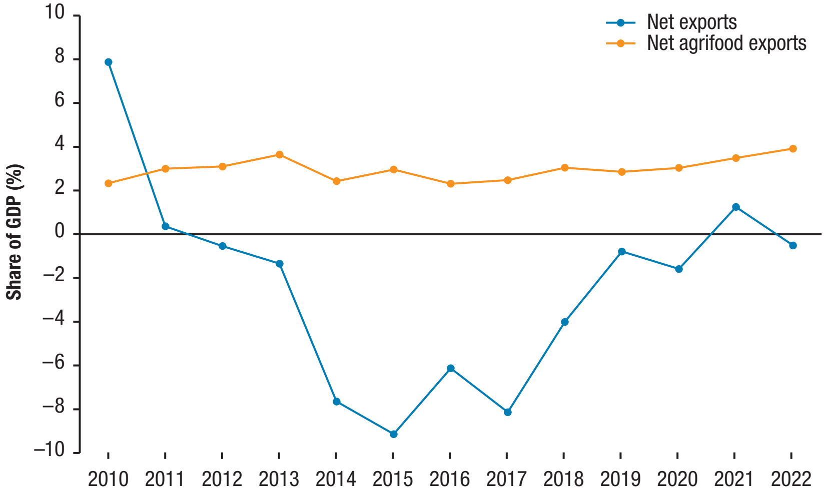
processed foods make up almost two-thirds of household demand for agrifood products (Chapter 2). This suggests there is potential for import substitution through investments in value-added processing, in addition to increasing potential earnings through exports.

Figure 14.3 shows that agrifood exports have contributed positively to Myanmar's trade balance. Agrifood exports averaged 3.1 percent of GDP between 2010 and 2019 and increased slightly to an average of 3.7 percent between 2020 and 2022. Conversely, the share of net total exports as a share of GDP averaged negative 2.9 percent between 2010 and 2019 and negative 0.3 percent between 2020 and 2022. As such, the agrifood sector, through its exports, plays a significant role in generating foreign exchange earnings and in reducing the total trade deficit that commenced in 2011.

The importance of the Asian market to Myanmar's agrifood exports

Asia is the most important agrifood export market for Myanmar, accounting for more than 80 percent of the country's agrifood exports. Table 14.1 provides information for the 12 largest importers of Myanmar's agrifood products between 2015 and 2019. The table shows annual average export values in current US dollars and the share of Myanmar's total agrifood exports that go to each of these 12 countries for the periods 1998 to 2002, 2015 to 2019, and 2020 to 2022. The aggregate share of agrifood exports to these 12 countries

FIGURE 14.3 Net total exports and net agrifood exports, as a share of total GDP, 2010–2022



Source: Authors' calculations using World Development Indicators data (World Bank 2024).

is surprisingly stable between 1998 and 2022, slightly increasing from 79 to 84 percent.

However, shares of individual countries vary significantly between the periods in Table 14.1. In the earliest period between 1998 and 2002, India was the largest importer of agrifood exports, receiving more than one-quarter of Myanmar's total agrifood exports. China became the largest importer between 2015 and 2019, while India became the second-largest market over that period, before falling to third between 2020 and 2022. China not only surpassed India as the most important importer; its agrifood imports alone accounted for nearly half of Myanmar's total exports to its 12 largest trade partner countries in the recent two periods. In the earliest period between 1998 and 2002, Japan and Singapore were important markets for Myanmar's agrifood products, but their share fell in subsequent periods. Instead, Thailand has become an important market. The three countries—China, India, and Thailand—together accounted for nearly two-thirds of Myanmar's total agrifood exports in the recent years.

Even though Myanmar is a member of the Association of Southeast Asian Nations (ASEAN), the Southeast Asian market did not emerge as a significant export destination until recently. ASEAN countries comprised one-third of Myanmar's total agrifood exports between 1998 and 2002, but their share declined to 18.1 percent between 2015 and 2019. However, during the crisis

TABLE 14.1 Top 12 countries importing Myanmar's agrifood exports, 1998–2022

	Average value (US$ million)			Share of total agrifood exports (%)		
Country/totals	1998–2002	2015–2019	2020–2022	1998–2002	2015–2019	2020–2022
China	17	1,656	1,729	3.3	39.8	33.3
India	129	675	725	25.6	16.2	14.0
Thailand	30	343	799	5.9	8.2	15.4
Malaysia	40	130	202	8.0	3.1	3.9
Japan	61	122	113	12.2	2.9	2.2
Singapore	60	75	36	12.0	1.8	0.7
Indonesia	14	70	91	2.9	1.7	1.7
Viet Nam	1	68	270	0.1	1.6	5.2
United Arab Emirates	0	67	53	0.0	1.6	1.0
Republic of Korea	5	61	52	1.1	1.5	1.0
Philippines	2	59	196	0.4	1.4	3.8
Bangladesh	20	57	97	4.0	1.4	1.9
Total of the 12 countries	380	3,383	4,364	79.1	81.4	84.1
ASEAN total	147	753	1,612	31.1	18.1	31.1
China, India, Japan, and Republic of Korea total	212	2,513	2,620	47.0	60.4	50.5

Source: Authors' calculations using BACI (2024).

Note: ASEAN (Association of Southeast Asian Nations) total includes exports to the nine ASEAN member countries. Thailand, Malaysia, Singapore, Indonesia, Viet Nam, and the Philippines are ASEAN member countries among the top 12 largest importers included in the table. The other ASEAN countries are Brunei, Cambodia, and Lao People's Democratic Republic, plus Myanmar. China, India, Japan, and Korea are non-ASEAN countries.

period between 2020 and 2022, ASEAN countries' share increased back to 31.1 percent, with large increases in agrifood exports to Thailand, Viet Nam, and the Philippines. Meanwhile, the share of agrifood exports to Japan and the Republic of Korea declined in the most recent period. This reduction is likely a result of their disinvestment in Myanmar in response to the military coup.

Concentration in agrifood exports

At the HS 4-digit commodity classification level, which is commonly used in product-level international trade databases, including BACI, Myanmar is shown to export approximately 150 agrifood commodity items. This number is notably lower compared to the mix of agrifood products exported by countries such as Indonesia, Malaysia, the Philippines, Thailand, and Viet Nam, all of which export 200 or more agrifood commodity items. Moreover,

TABLE 14.2 Myanmar's top 10 agrifood export commodities or commodity groups, by value, 1998–2022

Commodity	Rank			Average value (US$ million)			Share of total agrifood exports (%)		
	1998–2002	2015–2019	2020–2022	1998–2002	2015–2019	2020–2022	1998–2002	2015–2019	2020–2022
Pulses	1	1	1	165	1,000	1,306	35.5	27.7	26.0
Rice	3	2	2	24	588	964	5.2	16.3	19.2
Fish	2	3	4	159	545	591	34.3	15.1	11.8
Rubber	4	4	5	14	249	364	3.1	6.9	7.2
Maize	8	5	3	6	203	617	1.4	5.6	12.3
Cattle	5	6	7	10	188	60	2.2	5.2	1.2
Sesame	6	7	6	11	99	157	2.5	2.7	3.1
Bananas	—	8	8	0	79	59	0.0	2.2	1.2
Groundnuts	—	9	9	0	71	52	0.0	2.0	1.0
Melons	—	10	—	0	40	18	0.0	1.1	0.4
Top 10 total	NA	NA	NA	391	3,061	4,188	84.1	84.7	83.4

Source: Authors' calculations using BACI (2024).

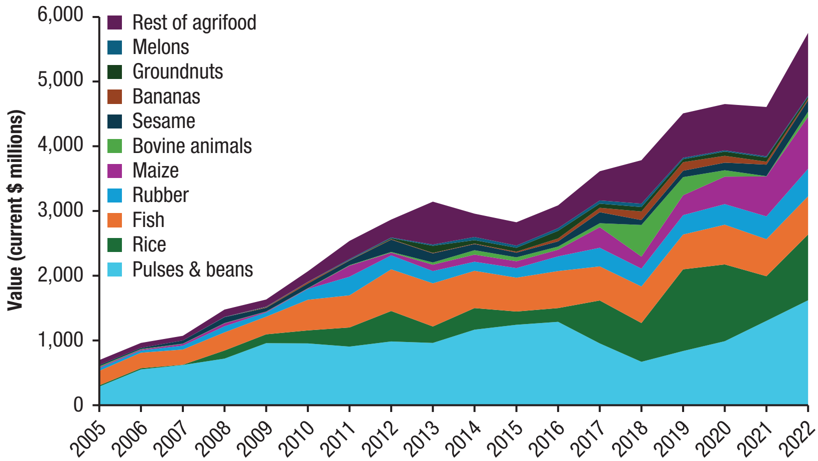
Note: Sugar exports are excluded in the ranking for the table because a large amount of sugar exports to China are reexports of sugar imports from India and Thailand (Pinitwong 2018). In addition, much of the sugar exported to China in recent years comes from sugar plantations in Myanmar that were recently established by Chinese investors to directly supply the Chinese market. A significantly lower share of fish and other seafood in total agrifood exports in the 2014 to 2018 period is a result of sharp declines in shrimp exports relative to other agrifood exports. Shrimp exports accounted for about 30 percent of total agrifood exports between 1998 and 2002 but only about 2 percent more recently. — = commodity not ranked among the top 10 agrifood export commodities during the period. NA = not applicable.

Myanmar's agrifood export trade is highly concentrated in a few specific commodities.

Using the five-year average export value for the period of 2015 to 2019, Table 14.2 lists the 10 most significant agrifood commodities or commodity groups exported by Myanmar in that period. For comparison over time, the average export commodity rank, value, and share of agrifood exports for 1998–2002 and 2020–2022 are also included in Table 14.2. Collectively, the 10 commodities constituted 84.7 percent of total agrifood exports between 2015 and 2019. The dominance of this group of commodities has remained relatively stable since 1998, except for bananas and groundnuts, which joined the top 10 only recently.

The average export value for these 10 commodities increased from an annual average of $391 million between 1998 and 2002 to $4.19 billion between 2020 and 2022. While pulses are Myanmar's most important export commodity in all years, by 2015 rice surpassed fish to become the second most important agrifood export. Rice as a share of the value of all agrifood

FIGURE 14.4 Value of exports of top agrifood commodities from Myanmar, by commodity, 2005–2022



Source: Authors' analysis using BACI (2024).
Note: Total agrifood exports exclude sugar products.

exports grew to 19.2 percent between 2020 and 2022. Maize has been the fastest growing agrifood export commodity in recent years, the share of which increased from 1.4 percent of total agrifood exports between 1998 and 2002 to 5.6 percent between 2015 and 2019 and to 12.3 percent between 2020 and 2022, becoming the third most important export commodity. Figure 14.4 shows the aggregated value of the top agrifood commodities between 2005 and 2022.

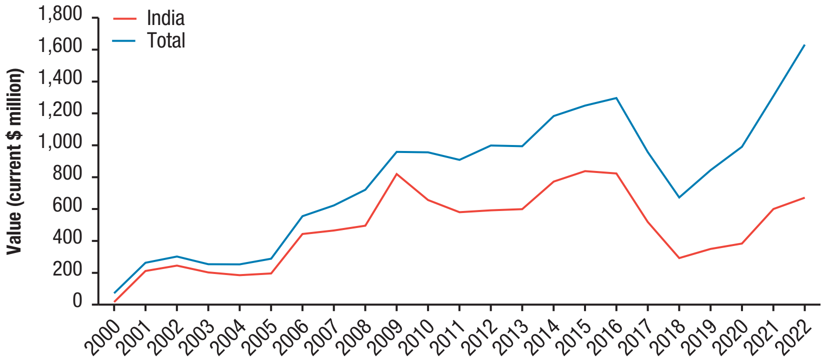
The potential of agrifood exports

This section focuses on the agrifood commodities that could play a more important role in the economic development of Myanmar's agrifood export sector.

Pulses

Pulses, including beans, are the most important agricultural export commodity group in Myanmar. Pulses account for a quarter of total agrifood exports annually, valued at between $1.0 billion and $1.6 billion in recent years (Figure 14.5). Pulses are grown primarily by smallholder farmers across the country, with 30 to 40 percent of production destined for export (MOALI

FIGURE 14.5 Myanmar's pulse exports, by value, total and to India, 2000–2022



Source: Authors' analysis using BACI (2024).

2020). The export of pulses has grown rapidly in recent years. An important exception to this pattern of growth was in 2017 and 2018, when India imposed an import quota on Myanmar's pulse and bean exports (Boughton, Haggblade, and Dorosh 2018).

India has been the largest importer of pulses from Myanmar since the early 1990s (Table 14.3). As the world's most populous country and with roughly 500 million vegetarians, India will likely remain the world's dominant consumer of pulses for the foreseeable future. In consequence, the Indian market is expected to remain the primary destination of Myanmar's pulse exports and serve as a driving force for growth in Myanmar's four major pulses—black gram, green gram, pigeon pea, and chickpea.

The future growth of Myanmar's pulse exports depends on reliable access to the Indian market in the long term and reduced volatility in demand caused by changes in India's import policies. India's import restrictions in 2017 and 2018 led to a complete cessation of black gram and pigeon pea purchases from farmers by Myanmar traders. A collapse in prices resulted. The unpredictability of India's quotas led Myanmar farmers to shift production to other crops for several years. However, in 2021, India signed a memorandum of understanding with Myanmar to import 350,000 tons of pulses annually through 2025/26. This agreement has led to an expansion in the production of black gram and pigeon pea, even as Myanmar farmers have shifted in recent years to produce green gram for the Chinese market. In the long run, Myanmar will benefit from extending this agreement with India. A long-term agreement to stabilize access to the Indian market will give Myanmar's farmers more

TABLE 14.3 Value of Myanmar's pulse exports to selected Asian countries, 1998–2022

	Average value (US$ million)			Share total pulse exports (%)		
Country	1998–2002	2015–2019	2020–2022	1998–2002	2015–2019	2020–2022
India	123.8	574.4	562.2	75.0	57.4	43.1
China	1.1	80.7	266.5	0.7	8.1	20.4
Indonesia	4.6	39.6	76.3	2.8	4.0	5.8
Viet Nam	0.0	39.1	85.2	0.0	3.9	6.5
United Arab Emirates	0.0	37.8	33.0	0.0	3.8	2.5
Pakistan	0.0	32.3	71.5	0.0	3.2	5.5
Malaysia	8.0	30.2	30.5	4.8	3.0	2.3
Japan	5.6	24.2	22.1	3.4	2.4	1.7
Thailand	0.1	19.4	31.1	0.1	1.9	2.3
Nepal	0.0	17.4	21.8	0.0	1.7	1.7
Sri Lanka	0.4	15.1	2.9	0.2	1.5	0.2
Bangladesh	0.3	11.9	20.1	0.2	1.2	1.5
Philippines	0.8	11.3	20.6	0.5	1.1	1.6
Singapore	11.0	10.0	12.9	6.7	1.0	1.0
Republic of Korea	2.4	7.4	5.6	1.4	0.7	0.4

Source: Authors' calculations using BACI (2024).

incentive to engage in pulse production, resulting in more stable domestic supply and price levels.

Since 2020, the market for Myanmar's pulse exports has diversified. Green gram has a more diversified market compared with other pulses, including a growing number of high-value markets—China, ASEAN countries, and Pakistan. While India continues to be the primary market, the Chinese market for pulses has increased substantially. China represented 20 percent of total pulse exports between 2020 and 2002, up from 8 percent between 2015 and 2019. ASEAN countries, particularly Indonesia, Viet Nam, Thailand, and the Philippines, have also increased their imports of pulses from Myanmar. ASEAN counties' share of pulse exports increased from 15 percent between 2015 and 2019 to almost 20 percent between 2020 and 2022. Pakistan has also emerged as a growing market for Myanmar pulses, taking 5.5 percent of total pulse exports between 2020 and 2022.

To continuously grow its pulse exports, Myanmar must expand to other markets and reduce its reliance on India. This includes expanding exports to existing markets, such as Japan, which imports the same pulses from Myanmar as India. However, Japan now imports more pulses from other countries—less than 10 percent of its pulse imports come from Myanmar. Improving its competitiveness in the Japanese market will enable Myanmar to increase its pulse exports to Japan. Another approach will be for pulse producers in Myanmar to expand the production of other pulse varieties that have large markets outside of India. For instance, Bangladesh has a sizeable market for chickpeas, and while Myanmar produces chickpeas, the commodity accounts for only a small share of Bangladesh's imports.

Potential for growth is also seen in high-value and value-added pulse markets. Myanmar exporters currently clean and sort by size only 35 percent of green gram and 10 percent of pigeon pea exports (Myint 2014). In recent years, large Myanmar traders have made forays into high-value niche markets, with success in exporting large-sized green gram, which many wealthy Asian countries prefer for making bean sprouts. Europe could be an important additional market for this high-value product, with potentially high returns if Myanmar is able to meet its quality and traceability requirements.

Expanding the supply of quality value-added pulses will require investment in storage to achieve sufficient inventory, as well as processing facilities to ensure a year-round supply to foreign customers. To achieve this goal and to make investments in such processing facilities profitable, foreign companies will need to be allowed to trade in the domestic market and to purchase and locally store adequate amounts of raw materials. In addition to ensuring that local traders have access to equivalent financial services, opening up the domestic pulse market to foreign investors will enhance the level of investment and liquidity in the market and provide more stable and consistent price and quality incentives to Myanmar farmers (Boughton, Haggblade, and Dorosh 2018).

Rice

Myanmar's rice sector is covered extensively in Chapter 11. This section focuses on the markets for Myanmar's rice exports and how Myanmar can expand them.

Rice regained its status as an important export crop after Myanmar liberalized its rice export policy in the late 2000s and early 2010s, removing many restrictions on rice exports (World Bank 2014). According to the Ministry of Agriculture, Livestock, and Irrigation (MOALI), between 10 and 15 percent of rice production is for export (MOALI 2022). China is the primary importer of rice from Myanmar, averaging approximately \$116 million annually between 2015 and 2019 (19.7 percent of Myanmar's total rice exports). However, data for rice exports to China may be underreported by up to

1 million tons per year because much of the rice exported to China uses informal trade channels (Dorosh, Win, and van Asselt 2019).

For the period between 2020 and 2022, BACI shows that rice exports to China surged to an average of $410 million annually. However, this may be explained by a combination of factors. First, while the volume of rice exports to China declined (Chapter 11), export prices for Myanmar rice reached an all-time high during this period (World Bank 2022). Second, as the land borders with China were often closed due to COVID-19 and conflict, exports through seaports increased. The unrecorded informal rice exports to China were through land borders, while exports through seaports were officially recorded. The actual decline in rice exports to China through land borders could be much larger than the officially recorded trade. Moreover, China began enforcing Sanitary and Phytosanitary Protocol certification for rice exports. These changes likely increased the quantity of formal exports that were recorded.

In contrast to pulses, Myanmar has a diverse set of trading partners for its rice exports. This is encouraging, given that global demand for rice is projected to continue growing over the next 10 to 15 years (World Bank 2014). Table 14.4 shows that between 2015 and 2019, excluding China, Myanmar exported annually more than $10 million in rice to 16 countries and over $1 million to 47 countries. Between 2020 and 2022, Myanmar continued to export more than $10 million in rice annually to 14 countries, excluding China, although the composition of the importing countries changed. Rice exports to Italy, Malaysia, Niger, the Netherlands, and Bulgaria exceeded the $10 million threshold for this period, while Sri Lanka, Guinea, Indonesia, Germany, and Burkina Faso dropped below the threshold. This suggests that improving the competitiveness of Myanmar's rice exports globally will enable the country to retain its current trading partners and to make inroads into new markets.

Excluding China, the European Union, where Myanmar enjoys duty-free access, was the largest market for Myanmar's rice exports, reaching an annual average of $131.5 million between 2015 and 2019 and increasing to $235.6 million annually between 2020 and 2022. Africa was the second-largest market between 2015 and 2019, averaging $165.5 million annually. However, ASEAN became a larger market between 2020 and 2022, averaging $130.7 million annually, with the Philippines and Malaysia increasing their imports of Myanmar rice substantially. Myanmar's rice exports are expected to continue to grow in the short term because India, an important competitor to Myanmar in global rice markets, has banned exports of non-Basmati rice

TABLE 14.4 **Value of rice exports between 1998 and 2022 to countries importing more than $1 million per year in 2015–2019, US$ millions**

Country	1998–2002	2015–2019	2020–2022		1998–2002	2015–2019	2020–2022		1998–2002	2015–2019	2020–2022
Europe	**3.8**	**174.9**	**266.8**	**Africa**	**10.0**	**165.5**	**112.0**	**ASEAN**	**9.4**	**80.3**	**130.7**
Belgium	0.2	46.8	84.8	Côte d'Ivoire	5.8	43.9	15.5	Philippines	0.0	34.7	77.4
Poland	0.0	18.2	31.0	Madagascar	0.0	33.4	14.5	Indonesia	5.1	22.0	8.4
Germany	0.0	15.7	5.5	Cameroon	1.8	29.6	13.6	Malaysia	1.0	9.1	31.2
UK	0.0	13.2	19.3	Guinea	0.7	19.5	5.6	Singapore	3.3	7.5	3.3
Spain	0.0	11.5	32.8	Burkina Faso	0.3	11.9	5.3	Viet Nam	0.0	5.3	7.0
Russia	0.0	10.0	1.9	Togo	0.0	3.8	6.3	Thailand	0.0	1.5	3.1
France	0.0	9.7	4.7	Ghana	0.0	3.7	1.9				
Bulgaria	0.2	8.6	10.7	Senegal	0.5	3.4	7.0	**Other Asia**	**1.0**	**46.9**	**41.5**
Netherlands	0.0	8.1	12.3	Mozambique	0.1	3.2	5.1	Bangladesh	0.7	20.4	33.8
Czechia	0.0	6.8	8.0	South Africa	0.0	2.5	0.3	Sri Lanka	0.0	16.8	1.1
Portugal	0.0	3.4	1.7	Benin	0.0	2.4	6.7	Afghanistan	0.0	3.8	0.0
Lithuania	0.0	3.2	6.3	Ethiopia	0.0	1.9	0.4	UAE	0.0	2.0	0.2
Italy	0.0	3.0	24.4	Mali	0.6	1.8	1.1	China, Taiwan	0.0	1.3	0.9
Greece	0.0	2.7	2.8					Japan	0.0	1.1	0.1
Romania	0.1	2.6	9.0								
Turkey	0.0	2.1	0.6								
Hungary	1.2	1.9	1.3								
Andorra	0.0	1.5	0.0								
Croatia	0.0	1.4	2.0								
Slovenia	0.0	1.3	1.7								

Source: Authors' calculations using BACI (2024).

Note: BACI data capture formal trade only. Because a large share of Myanmar's rice exports through informal channels to China is not captured by BACI, we exclude China from the table.

varieties to protect their domestic prices, and Thai and Vietnamese rice prices have risen sharply, forcing buyers to seek other sources.

Myanmar is not the dominant rice exporter to many of the rice-importing countries listed in Table 14.4. This means there is a smaller risk of market interruptions and price fluctuations caused by changes in the rice import policies of individual importing countries, unlike there is for Myanmar's pulse exports to India. Thus, to expand rice exports, Myanmar will need to focus primarily on the supply side by increasing land and labor productivity. For example, it is estimated that closing the rice yield gap so that productivity levels are closer to those of Viet Nam could generate about 13 million tons of surplus for export (World Bank 2014).

If Myanmar is to export more rice, attention will also need to be paid to quality. Currently, most rice exports from Myanmar are of low quality. Poor-quality rice not only constrains potential export earnings but also provides limited income to farmers and other actors along the rice value chain. To improve rice quality for exports, modernizing rice industries and diversifying to higher-value rice varieties for export markets is key. In this regard, there is strong regional competition from Cambodia and Viet Nam, which have both increased their exports of high-quality rice in recent years.

Myanmar has signed a few trade agreements with China in recent years. In 2019, China signed a reciprocal agreement that increased the formal rice export quota fourfold to 400,000 tons per year in exchange for an equal value of Chinese goods entering the Myanmar market. The agreement did not include broken rice exports, which could continue through regular channels. Furthermore, in early 2020, Myanmar signed a Sanitary and Phytosanitary Protocol with China. Thereafter, the General Administration of Customs of the People's Republic of China issued export licenses to 43 companies and 79 rice mills in Myanmar to export rice to China. As a result of these agreements, exports of broken and other low-quality rice to China increased.

Overall, export channels for rice to China have benefited Myanmar producers and exporters. Through improvements in quality and increases in production, Myanmar could expand its rice exports to China and broader international markets. This would provide great benefits for its rice sector and for the country's rural development in general (Dorosh, Win, and van Asselt 2019).

Increasing Myanmar's competitiveness in the global rice market also requires the establishment of policies and public services to create a favorable investment climate for farmers, millers, traders, and logistics providers and improve efficiency along the entire rice value chain. In addition to issues with farm-level productivity, inefficiencies in the milling sector further lower the country's competitiveness in exports (Chapter 13). Upgrading and modernizing the rice milling industry requires a policy environment that encourages foreign direct investment and enables domestic mills to gain access to long-term credit, technical and managerial know-how, and reliable, low-cost electricity.

Maize

Maize has become Myanmar's second most important cereal crop after rice. Maize's share of total agrifood exports grew from 1.4 percent between 1998 and 2002 to 5.6 percent between 2015 and 2019 and to 12.3 percent between 2020 and 2022. The value of maize exports averaged $600 million annually between 2020 and 2022, tripling in value from the period 2015 to 2019 (Figure 14.6). This increase was partially due to decreased domestic demand caused by the economic downturn starting in 2020 and increasing global maize prices, particularly in 2022 after the start of the Russia–Ukraine conflict. Since 2019, the maize sector has faced numerous challenges, including trade barriers, conflict, and economic instability. Nevertheless, the maize sector exhibited remarkable resilience and has experienced robust growth in recent years (MAPSA 2023).

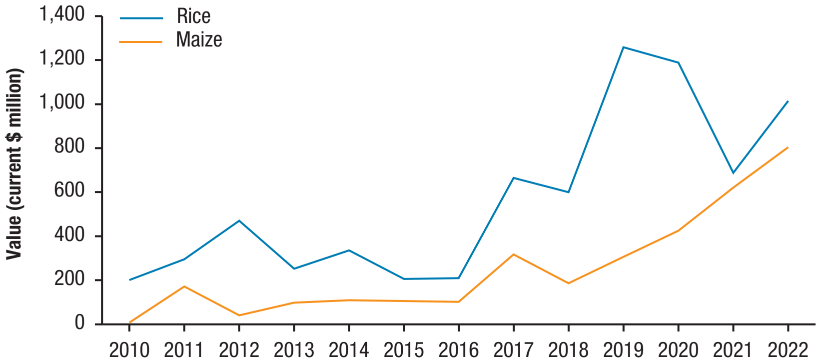
Maize production increased by approximately 84 percent between 2010 and 2019 (MAPSA 2023), primarily driven by growing domestic demand for animal feed. However, domestic demand was outpaced by exports. The share of maize grown for export was approximately 60 percent (MOALI 2022; USDA 2020). In southern Shan State, which accounts for 50 percent of national production, the number of maize growers tripled between 2007 and 2017 (Fang and Belton 2020).

While agroecological conditions in the Shan State are more favorable for maize than rice, maize has also been more profitable at the farm level. First, the unit value of maize is higher than that of rice. While the quantity of maize produced, as measured by harvest area and production, is only 7 percent that of rice, the value of maize exports was approximately 40 percent of the value of rice exports in 2018/19 (MOALI 2022). Second, maize requires minimal processing, which means farmers receive a higher share of the export price.

From 2010 to 2019, nearly all of Myanmar's maize exports went to China overland and were conducted informally to evade the high tariffs on formal maize imports. Maize exports to China reached $153.5 million annually between 2015 and 2019, accounting for more than 75 percent of Myanmar's total maize exports (Table 14.5). However, access to the Chinese market was unpredictable. China would tolerate illegal imports when its domestic production was low and temporarily enforce the informal import controls when domestic production was high. These unpredictable policies had the potential to crash Myanmar's entire maize market and quash farmers' incentives to expand production.

In October 2019, China implemented a near complete ban on the informal cross-border trade of maize that lasted for several years. Maize exports to China dropped to $40.8 million annually between 2020 and 2022, representing only 6.6 percent of total maize exports. New trade routes were established through Myawaddy (the land border crossing between Thailand and

FIGURE 14.6 Rice and maize exports, by value, 2010–2022



Source: Authors' analysis using BACI (2024).
Note: Rice exports are likely underreported due to informal cross-border exports to China that are not included in BACI.

TABLE 14.5 Top 10 countries importing Myanmar's maize, 1998–2022

Country	1998–2002 Value (US$ million)	1998–2002 Share (% of total)	2015–2019 Value (US$ million)	2015–2019 Share (% of total)	2020–2022 Value (US$ million)	2020–2022 Share (% of total)
China	0.0	0.6	153.5	75.5	40.8	6.6
Thailand	0.0	0.0	27.1	13.3	340.4	55.2
Philippines	0.0	0.0	12.0	5.9	97.1	15.7
India	0.0	0.6	4.3	2.1	26.2	4.2
Viet Nam	0.1	1.2	3.6	1.8	94.6	15.3
Sri Lanka	0.0	0.7	0.7	0.4	1.6	0.3
Malaysia	1.5	23.3	0.7	0.3	0.3	0.1
China, Taiwan	0.1	1.3	0.4	0.2	0.6	0.1
Singapore	1.4	21.4	0.3	0.1	0.1	0.0
Bangladesh	2.1	32.5	0.0	0.0	13.4	2.2
Total	5.2	81.7	216.0	99.7	615.0	99.7

Source: Authors' calculations using BACI (2024).

Myanmar) to Thailand, initially informally, but this route quickly became formalized through the ASEAN Free Trade Area agreement. This resulted in a surge of maize exports to Thailand, valued at $340.4 million annually between 2020 and 2022, representing 55.2 percent of total maize traded.

Simultaneously, many large multinational companies began to export maize by sea to other ASEAN countries. The Philippines and Viet Nam became the second and third largest markets for Myanmar maize. As a result of this shift away from the Chinese market, Myanmar was able to diversify its maize export markets, while expanding production.

Meanwhile, demand for maize in ASEAN countries is rising (Wai 2019) and may represent a growing market for Myanmar in the future. While many ASEAN countries grow maize, Myanmar has some comparative advantages. Maize is more climate resilient than alternative rainfed crops, it requires less labor than many other crops, and production credit is available from traders, all of which can help lower labor and other production costs (Fang and Belton 2020). As a result, Myanmar's maize exports have the potential to become more competitively priced and increasingly important among the country's agrifood exports.

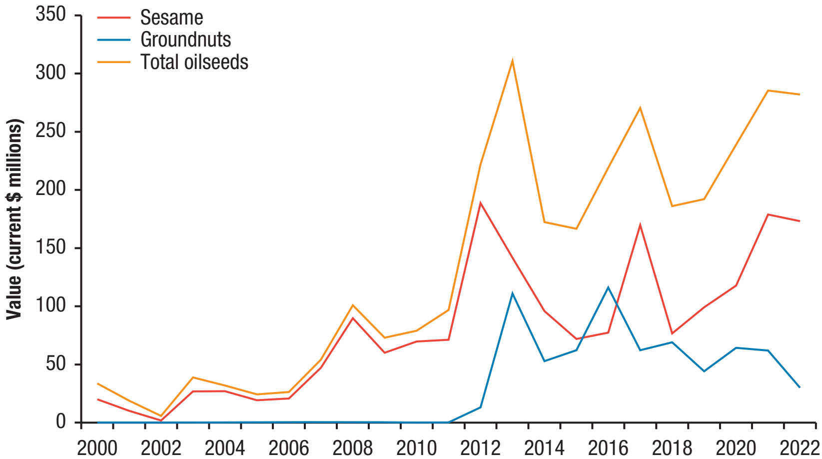
However, similar to the case for rice, efforts to expand exports of maize are constrained primarily by the supply side. Maize yields are less than 4 metric tons per hectare (ha)—low compared with those in other ASEAN countries. In countries such as Thailand and Viet Nam, where demand for maize is high due to highly developed poultry and other livestock sectors, maize yields average 4.7 metric tons per ha (FAO 2023). In addition, quality requirements are more stringent in the maize markets of many ASEAN countries than in China, the main destination for Myanmar's maize exports. For example, the lack of drying facilities in Myanmar could affect maize quality through the presence of storage pests. Expanding exports to ASEAN markets will require improvements in both the productivity and quality of maize.

High seasonal prices during monsoon months and large price variability are factors that affect incentives to produce maize for export. Increasing price stability through the provision of improved storage facilities would improve production incentives. Price variability leads to speculation and hoarding in Myanmar's maize markets. Increased use of commodity exchanges and warehouse receipt systems could also help reduce such variability and make Myanmar a more reliable participant in regional and global maize trade. Finally, because China may return as a major market for Myanmar maize, a long-term trade agreement providing reliable access to the Chinese market would provide additional stability needed for the maize sector to make these additional investments to expand exports.

Oilseeds

Oilseed exports, particularly groundnut and sesame, have grown between 2000 and 2022, even though export levels have been volatile annually (Figure 14.7). The share of sesame, the largest oilseed export crop, in total

FIGURE 14.7 Oilseed exports, by value, 2000–2022



Source: Authors' analysis using BACI (2024).

agrifood exports rose from 2.5 percent in the period from 1998 to 2002 to about 3 percent between 2020 and 2022. On average, sesame exports were valued at $157 million annually between 2020 and 2022. The share of groundnut in total agrifood exports reached 1.7 percent in 2015 to 2019 from almost zero in 1998 to 2002. However, this trend reversed direction between 2020 and 2022, dropping to about 1 percent of total agrifood exports in this period (Table 14.2). Overall, growth in groundnut and sesame exports, which together account for more than 75 percent of all oilseed exports, has been more rapid than the growth of overall agrifood exports.

China has been the primary market for Myanmar's sesame since at least 2015, with its share of sesame exports continuing to increase in recent years. Japan was the largest market between 1998 and 2002, followed by Singapore. However, the share of sesame exports to these markets has since declined. The six countries listed in Table 14.6 are the destinations for almost all (98.6 percent) of Myanmar's sesame exports, with China importing the most.

China and Thailand were the primary markets for Myanmar's groundnut between 2015 and 2019 (Table 14.7). While China remained the largest importer, its share dropped slightly between 2020 and 2022. Groundnut exports are highly concentrated, with more than 95 percent of exports going to China and Thailand in recent years. While the share of total groundnut exports going to Viet Nam has grown in recent years, the ASEAN countries

TABLE 14.6 Top seven countries importing Myanmar's sesame, by value, 1998–2022

	1998–2002		2015–2019		2020–2022	
Country	Value (US$ thousand)	Share (% of total)	Value (US$ thousand)	Share (% of total)	Value (US$ thousand)	Share (% of total)
China	4.0	3.5	606.8	61.3	1,190.1	76.0
Japan	54.5	47.6	170.0	17.2	112.6	7.2
China, Taiwan	13.9	12.1	105.7	10.7	123.5	7.9
Thailand	1.2	1.0	51.2	5.2	100.6	6.4
Singapore	31.4	27.4	23.5	2.4	18.4	1.2
Republic of Korea	0.0	0.0	11.8	1.2	7.7	0.5
Total	104.8	91.6	969.0	97.9	1,552.9	99.2

Source: Authors' calculations using BACI (2024).

TABLE 14.7 Top seven countries importing Myanmar's groundnut, by value, 1998–2022

	1998–2002		2015–2019		2020–2022	
Country	Value (US$ thousand)	Share (% of total)	Value (US$ thousand)	Share (% of total)	Value (US$ thousand)	Share (% of total)
China	0.0	6.3	458.3	64.7	313.0	60.1
Thailand	0.1	18.9	223.2	31.5	159.1	30.5
Indonesia	0.1	25.2	9.7	1.4	1.2	0.2
Viet Nam	0.0	0.0	9.3	1.3	31.9	6.1
Malaysia	0.3	49.7	3.8	0.5	1.2	0.2
China, Taiwan	0.0	0.0	1.2	0.2	1.2	0.2
Singapore	0.0	0.0	1.2	0.2	11.6	2.2
Total	0.6	100.0	706.8	99.8	519.2	99.6

Source: Authors' calculations using BACI (2024).

other than Thailand and Viet Nam together account for less than 3 percent of total groundnut exports.

Global demand for oilseeds is projected to increase by 9.3 percent by 2030 (OECD and FAO 2023). Meanwhile, production growth in Indonesia and Malaysia, which together account for 83 percent of global palm oil production and 34 percent of global vegetable oil production, is expected to be limited due to a slowdown in the expansion of the mature oil palm area (OECD and FAO 2023). Myanmar imports just under two-thirds of the edible oil it consumes (Moh et al. 2021). Therefore, there is potential for Myanmar to expand its oilseed exports or focus on import substitution, given the high demand for oilseeds both internationally and domestically.

Oilseeds have received increased attention from the military government in recent years, as Myanmar has not been able to import enough edible oil to meet domestic demand. This is due to decreased global exports, exacerbated by a temporary export ban on palm oil in Indonesia in early 2022. The ban resulted in soaring palm oil prices that were compounded by the depreciation of the Myanmar kyat. As a result, the military government temporarily suspended exports of oilseed crops. To reduce palm oil imports, it also promoted sunflower cultivation and the consumption of oil from locally produced groundnut, sesame, and sunflower. However, imported palm oil continues to be cheaper than locally produced oils, as groundnut and sesame oils receive a premium price in local markets due to their preferred flavor and limited supply.

As with other commodities, Myanmar will need to improve both productivity and processing in the oilseed sector. Oilseed yields, especially for groundnut, sesame, and sunflowers, are lower than in neighboring countries. To increase oilseed productivity will require access to quality seed, greater access to credit and agricultural extension, and increased use of fertilizer (MAPSA 2022). It will also require additional investments in oil mills, as most domestic mills use old equipment (Belton and Win 2019). However, as indicated in Chapter 13, the recent increase in oilseed prices has resulted in reinvestments in previously uncompetitive oil mills.

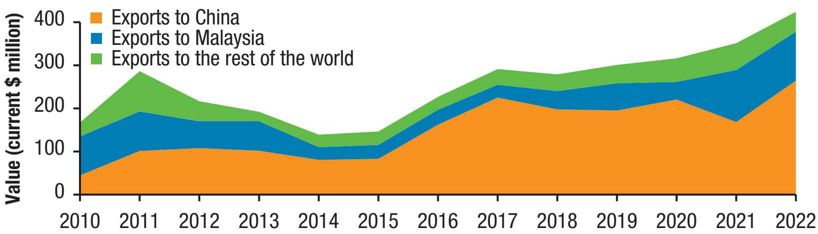
Rubber

Myanmar's rubber sector was liberalized in 2004. Since then, the planted area has tripled. According to the Myanmar Rubber Planter and Producer Association, more than 90 percent of rubber planters are smallholders who own plantations ranging from 1 to 40 hectares. The growing involvement of smallholders in rubber production has resulted in an increase from 200,000 hectares planted in 2004 to 650,000 in 2022 (Myint and Thu 2020; van Asselt, Htoo, and Dorosh 2017).

The downstream rubber market in Myanmar is small, leading to nearly all rubber being exported. Examining the post-2010 period, Figure 14.8 shows that natural rubber exports have been expanding steadily, rising in value from $167 million in 2010 to close to $424 million in 2022. However, in Asian markets, Myanmar's natural rubber exports are perceived as being of low quality. Exports are highly concentrated to China and Malaysia, which accounted for nearly 90 percent of Myanmar's rubber exports in 2022. China surpassed Malaysia as the largest importer of Myanmar rubber in 2011.

While Myanmar's rubber exports are highly concentrated in these two countries, Myanmar does not hold a dominant position as an exporter in

FIGURE 14.8 **Natural rubber exports to China, Malaysia, and rest of world, by value, 2010–2022**



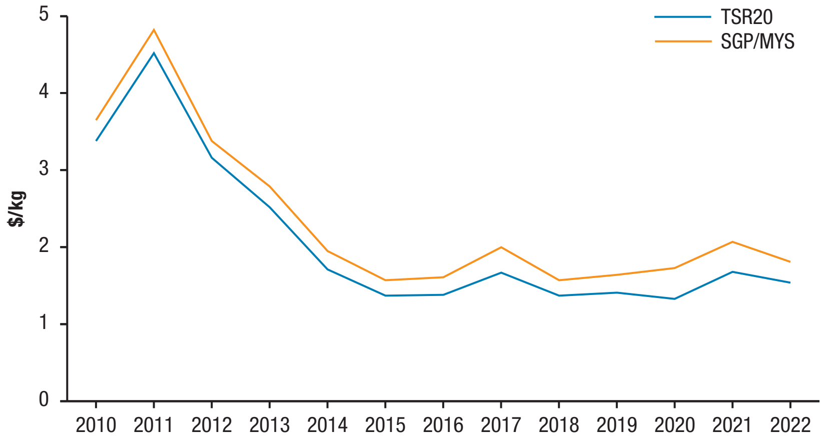
Source: Authors' analysis using BACI (2024).

either market. Consequently, it has limited influence on prices in these markets, which are determined by international rubber prices. Since 2012, the global price of rubber has declined, largely due to weak demand in China and other Asian countries (Figure 14.9). In line with this decrease, the per unit value of Myanmar's rubber exports has also fallen (Figure 14.10). Although prices have stabilized since 2015, they remain relatively low at 30 percent of the 2011 nominal price level. The lower price translates to reduced profitability for rubber farmers and producers in recent years, as it typically takes five or more years after establishing a plantation before harvesting becomes profitable.

Myanmar has lower rubber yields than other major rubber-producing countries, averaging 600 to 800 kg per ha across the states and regions. In contrast, average yields in neighboring countries range from 1,500 to 2,000 kg per ha. The main contributing factor to these low yields is poor tapping practices, which can also lead to a shortened lifespan for the tree (Charles and Aung 2015; van Asselt, Htoo, and Dorosh 2017). Therefore, it is critical that investments be made in training producers, supporting the adoption of improved varieties, and establishing marketing and certification schemes to encourage better tapping practices.

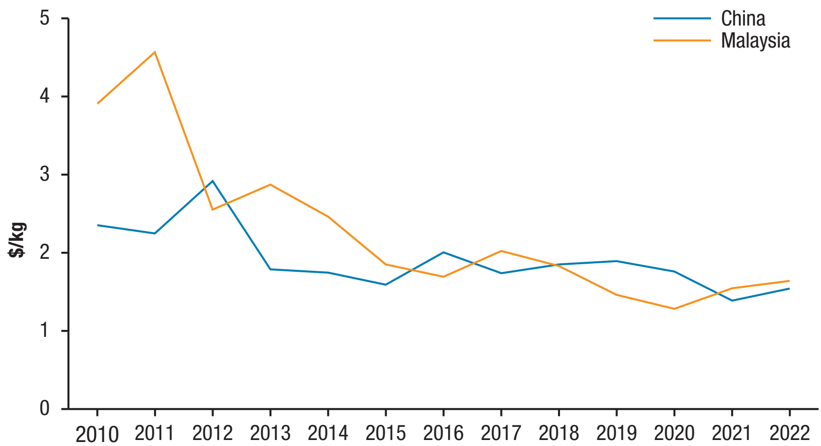
Improving the quality of processed rubber is also key to increasing export prices and improving the profitability of rubber production. However, there are limited incentives for actors to produce higher-quality rubber. At the producer level, smallholders now have no reason to keep rubber clean during initial processing, as traders purchase all rubber sheets regardless of quality, with only a small price difference for higher-quality sheets. Whereas in other countries, rubber sheets are graded on the basis of visual factors, such as texture,

FIGURE 14.9 World natural rubber prices, annual nominal, 2010–2022



Source: Commodity price data from World Bank (2024b).
Note: TSR20 = Technically Specified Rubber grade 20. SGP/MYS = Singapore/Malaysia.

FIGURE 14.10 Unit value of natural rubber exports to China and Malaysia, annual nominal, 2010–2022



Source: Authors' analysis using BACI (2024).

color, and resinous matter, in Myanmar, grading is primarily determined by the thickness of the rubber sheet. Therefore, prices are based on weight rather than the true quality of the rubber.

At the processing level, there is a lack of certification schemes or public laboratories to assess quality. The technologies used for rubber processing are often inadequate and outdated, and infrastructure is limited. Due to unreliable electricity supply, processing facilities rely on costly generators. The regulatory environment for processors is also weak—the Ministry of Industry issues operational licenses without regulations on production processes. Furthermore, there are no standardized procedures to ensure the quality of processed rubber, leading to uncertainty about product quality.

A series of potential interventions and policy options along the rubber value chain has been suggested (van Asselt, Htoo, and Dorosh 2017). Educational programs and training on acquiring improved planting materials, planting seedlings, using fertilizer, and adopting improved tapping techniques and collecting practices are necessary to raise awareness of best practices among rubber farmers. Smallholders should also receive training on field-level processing and information on various processing inputs and their applications. Extension services for rubber producers are also vital to improving cultivation management.

While most rubber-exporting countries have established technical specifications for block rubber, Myanmar lacks such standards. Therefore, the implementation of a rubber grading system and a standardized payment method based on graded rubber will be essential for the growth of the sector. Sheets, slabs, and clumps should be graded according to sheet thickness and visual qualities rather than based solely on the weight at the farmgate. Processors should use only rubber of the same grade to produce sheets. Testing for the level of dirt, ash, volatile matter, nitrogen content, plasticity, and color is necessary for grading and labeling. By adopting stringent grading, marketing, and payment standards across the rubber value chain, Myanmar can improve prices for producers and develop a competitive rubber sector.

Additionally, the establishment of a rubber certification system is vital for processors to access higher prices and key international rubber markets. Processed rubber is currently evaluated by the laboratory of the Research, Technology, and Training Center for Rubber Products. However, tests are conducted infrequently, and the laboratory lacks accreditation. Myanmar should aim to attain the ISO 9000 industrial standard series certification, which is the recognized standard for the rubber manufacturing industry. This certification would facilitate the promotion of Myanmar's rubber product exports, as international buyers are increasingly requiring the ISO 9000 standard.

Fishery products

With a coastline stretching nearly 3,000 km, abundant rivers, several large estuaries, and numerous offshore islands, Myanmar has historically possessed a comparative advantage in the fishery industry. The country's diverse range of coastal and freshwater habitats enables the export of a wide variety of fishery products. Based on the HS 6-digit commodity classification, Myanmar exports approximately 60 different fishery products, making this sector one of the most diverse within the agrifood export category.

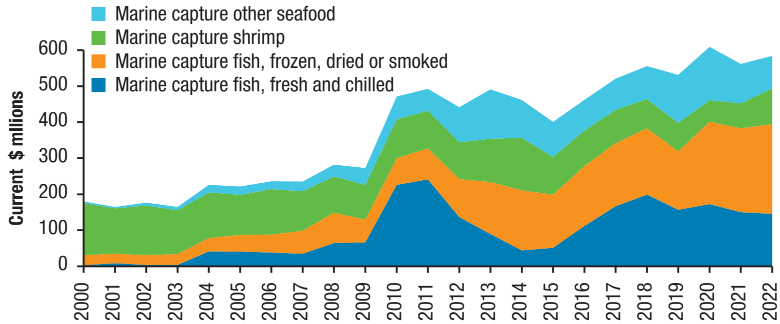
Over the past decade, the catch of wild fish and other aquatic species has steadily increased. However, the share of fish exports relative to total agrifood exports has declined from 34.3 percent between 1998 and 2002, when fishery products were the second-largest export commodity, to 15.1 percent between 2015 and 2019. Fishery product exports further declined to 11.8 percent between 2020 and 2022 (Table 14.2). This decline is primarily attributed to reduced exports of marine capture shrimp and prawns, which accounted for about 80 percent of total fishery exports between 1998 and 2002. In current prices, annual exports of marine capture shrimp and prawns were valued at $145 million in the early 2000s but fell below $100 million between 2015 and 2022 (Figure 14.11).

Conversely, the export of fish, especially fresh or chilled marine capture fish, has experienced rapid growth. In the early 2000s, the annual value of these fish exports was less than $5 million, but by 2022, it had surged to more than $150 million, peaking at almost $200 million in 2018.

Myanmar's fish exports reach a diverse set of markets. Frozen fish was shipped to more than 60 countries between 2015 and 2019, with a value exceeding $145 million annually. Between 2015 and 2019, 20 countries imported more than $1 million worth of frozen fish each year (Table 14.8), collectively accounting for 97.5 percent of Myanmar's total frozen fish exports.

Myanmar's various wild capture fishery products are unlikely to experience rapid growth in the future, and prawn fishing is expected to continue declining steadily. The most promising avenue for expanding exports lies in farmed fisheries. Although the production of farmed shrimp and crab is on the rise, it is starting from a very small base value. Farmed freshwater carp, for instance, has found a market in the Middle East. However, this market is limited, as carp is not widely consumed beyond these countries, many of which already produce fish domestically. Apart from farmed shrimp, the greatest potential

FIGURE 14.11 Exports of fishery products, by value, 2000–2022



Source: Authors' analysis using BACI (2024).

TABLE 14.8 Top 18 countries importing Myanmar's frozen fish, 1998–2022

	1998–2002		2015–2019		2020–2022	
Country	Value (US$ thousand)	Share (% of total)	Value (US$ thousand)	Share (% of total)	Value (US$ thousand)	Share (% of total)
Saudi Arabia	0.0	0.1	27.9	16.6	33.9	14.2
United Kingdom	4.5	19.2	20.8	12.3	17.2	7.2
China	0.9	4.0	20.3	12.0	37.3	15.6
Malaysia	5.9	25.4	16.9	10.0	21.5	9.0
Thailand	1.0	4.3	15.7	9.3	39.5	16.5
United Arab Emirates	0.0	0.0	10.7	6.4	10.8	4.5
United States	1.5	6.6	9.6	5.7	8.5	3.6
Bangladesh	0.0	0.2	5.2	3.1	6.7	2.8
Bahrain	0.0	0.1	4.9	2.9	4.1	1.7
Japan	1.2	5.2	4.7	2.8	4.4	1.9
Kuwait	0.0	0.0	4.1	2.4	6.5	2.7
Italy	0.0	0.0	4.1	2.4	6.2	2.6
India	0.1	0.5	3.8	2.3	15.7	6.6
Australia	2.8	11.8	2.8	1.6	1.6	0.7
Republic of Korea	0.2	1.0	2.4	1.5	1.8	0.7
Singapore	3.7	15.7	2.4	1.4	3.1	1.3
Qatar	0.2	0.7	2.3	1.4	4.3	1.8
Oman	0.0	0.0	2.1	1.3	3.8	1.6
Canada	0.2	1.0	2.1	1.2	2.6	1.1
Iraq	0.0	0.0	1.4	0.8	0.8	0.4
Total	22.3	95.6	164.2	97.5	230.3	96.3

Source: Authors' calculations using BACI (2024).

for the growth of aquaculture in Myanmar lies in serving the domestic market as a substitute for the decreasing production of capture fisheries.

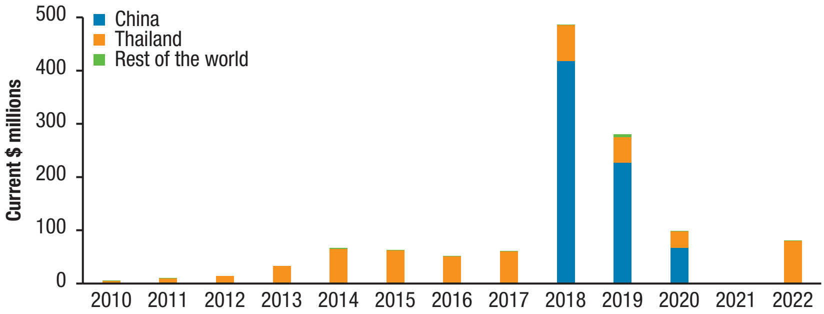
Cattle

Myanmar has the highest number of cattle and buffalo in Southeast Asia. These animals have been the most important livestock exports for Myanmar in recent years. Cattle exports rose from an average of $64 million annually between 2014 and 2017 to more than $500 million in 2018 (Figure 14.12). The spike in 2018 was a result of government implementing a new policy that officially allowed the export of livestock (MOC 2017). Before 2018, cattle exports were restricted due to the central role these animals played in Myanmar's agricultural production as draught animals. However, the rapid adoption of agricultural mechanization in recent years has diminished their necessity in this capacity. Therefore, regulations were revised to allow for the export of cattle.

Thailand was the primary importer of Myanmar's cattle prior to 2018. Even though cattle exports were illegal in Myanmar at the time, Thailand placed these cattle into its official system for quarantine, vaccination, documentation, and tagging. However, even at that time, China may have informally been the largest importer of Myanmar cattle (Zhizhi et al. 2018). This is evident in that China was immediately listed as the largest importer of cattle from Myanmar in 2018 after cattle exports from Myanmar became legal. Smith and colleagues (2019) estimated that more than 500,000 cattle were smuggled from Myanmar to China in 2015 alone. In comparison, the Ministry of Commerce data show that between October 2017 and March 2019, Myanmar officially exported 450,000 cattle and 52,000 buffalo (Htoon 2019).

Despite the initial surge in cattle exports, Myanmar introduced new regulations in 2019 that effectively halted exports. Concerns rose that the significant number of cattle leaving the country were not being replenished, rendering the trade unstable. Laitha and colleagues (2020) reported a decline in the cattle population from a peak of 17 million in 2017 to 9.1 million in 2020. The new regulations mandated that companies involved in cattle raising must update their land use registration to qualify for an export license. Land in Myanmar is registered for a specific use, and deviations from this designated use can lead to land confiscation (Chapter 6). This additional regulatory barrier resulted in costly delays in the formal cattle export process and provided further incentives for illegal cattle trade.

FIGURE 14.12 Value of cattle exports, by importing market, 2010–2022



Source: Authors' analysis using BACI (2024).

Figure 14.12 suggests a shift to informal trade channels, as exports to China notably decreased by 2020, with no formal trade recorded in 2021 and 2022. Nonetheless, as reported by the government-owned Global New Light of Myanmar newspaper, in 2021, an estimated 2,000 heads of cattle were being smuggled into China daily via the black market (GNLM 2021).

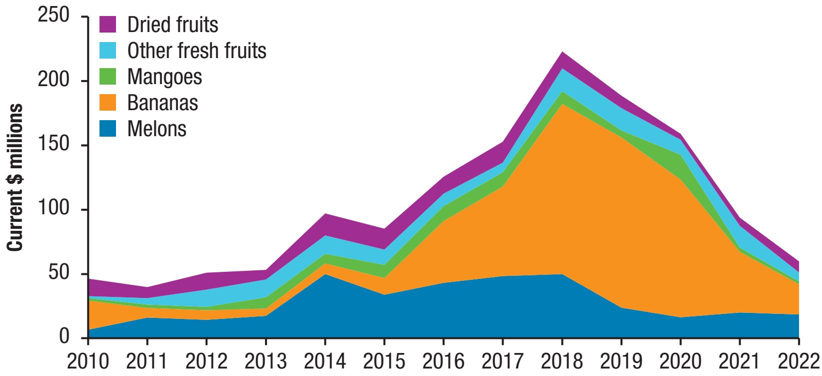
Access to the Chinese market will be crucial for stabilizing and expanding the cattle export sector. China's General Administration of Customs has provided recommendations to Myanmar that must be addressed before formal exports resume. In 2023, that agency relaxed some restrictions, permitting the import of cattle from Myanmar for slaughter use. However, Myanmar still needs to meet regulatory requirements and establish export facilities. Therefore, significant increases in formal exports are not expected in the short term (USDA 2023).

Exportable fruits

Fruit exports grew rapidly between 2010 and 2018, primarily to China. Figure 14.13 shows the export values of the major fruit exports from 2010 to 2022. Bananas were the top fruit export during this period. However, exports of melons were likely more significant than exports of bananas. There are considerable discrepancies between official figures in Myanmar and China, but figures from the Myanmar Fruit, Flower, Vegetable Producer, and Exporter Association show that the total volume of melon exports more than tripled from 2011 to 2018, with an estimated value of $169 million in 2016 (Kubo 2018; 2019).

Watermelon and muskmelons are the two major melon exports. Myanmar serves as an important off-season source of melons for China during the times

FIGURE 14.13 Fruit exports, by value, 2010–2022



Source: Authors' analysis using BACI (2024).

of the year when its farmers are not producing melons. In Myanmar, melons are primarily produced in the central Dry Zone. Through a unique broker system, exports are as simple as domestic sales. Farmers only need to ensure that their melons are transported to the town of Muse on the Myanmar–China border. In Muse, brokers will negotiate prices and ensure sales to buyers in China, minimizing risks to only price fluctuations for the producers. While melons are on China's General Administration of Quality Supervision, Inspection, and Quarantine (AQSIQ) positive list for imports, in practice, they generally enter China without sanitary and phytosanitary certificates (Kubo 2019).

Banana exports surged between 2015 and 2020, primarily from controversial Chinese investments in large tissue culture banana plantations in Kachin State. Such bananas are propagated using tissue culture techniques to maintain seedling quality. These bananas are grown primarily for export to China. While bananas are not on the AQSIQ positive list for imports to China, a network of Chinese border residents, who are allocated a daily quota of approximately 4 tons of bananas per day for commercial imports, are used to import the bananas (Hayward et al. 2020). Traditional bananas are also grown in the central parts of Myanmar and the Ayeyarwady Region. Traditional bananas are produced mainly for the domestic market, where demand has been growing in recent years, but there have been exports to China.

Myanmar was the top supplier of mango to the Chinese market from 2008 to 2013. However, exports have steadily declined in recent years (Kubo 2016). Mangoes are produced in Mandalay and southern Shan State and almost entirely exported to China through the Muse border, where there is a wholesale market for Chinese importers. While mango exports are formalized on the Myanmar side, they are not subject to the Chinese sanitary and phytosanitary measures, even though they are on the AQSIQ positive list for imports.

Because China is the dominant importer of Myanmar's fruit exports, both the prices received and quantities supplied are determined mainly by Chinese buyers. Fruit exports are also subject to changes in subnational trade policy across the border in Yunnan Province, China. Moreover, imports of watermelons, muskmelons, mangoes, and jujubes are restricted to specific border entry points into Yunnan. Other fruits, including lychees, longans, mangosteens, and rambutans, can be exported via all Chinese border crossings. However, demand for these fruits within Myanmar is high, so the quantity of exports is low.

Myanmar's dependence on the Chinese market for exports was evident during the COVID-19 pandemic, when China temporarily closed the border and then reopened it with stringent checks and new regulations. These restrictions resulted in long queues of trucks waiting to access the border as drivers were required to conduct personal temperature checks, show vaccination cards, and then transfer goods to a Chinese driver at the border. Given their short shelf-life, this led to fruits rotting on trucks and being dumped by the side of the road near the border. For instance, exports of watermelons dropped from 30,000 metric tons in 2020 to just 60 metric tons in 2021 (Frontier 2022). Moreover, when the border was reopened, watermelon exports were subject to an unstable and frequently changing import tariff.

China will continue to be the primary market for Myanmar fruit exports, as import demand is expected to continue rising. However, to meet this demand, Myanmar faces competition from its regional neighbors who produce the same fruits. For instance, Laos recently developed a special economic zone on the Chinese border in Mohan, where it has access to direct tariff-free trade for fresh fruits with China. Meanwhile, producers in Myanmar are currently contending with conflict in production areas, transportation disruptions, and uncertain access at border areas. Myanmar will need to reopen discussions with China's General Administration of Customs to stabilize access to the Chinese market, as they did recently with green bananas, which received approval for import by normal trade in June 2022.

Myanmar will also need to expand efforts to penetrate new markets, such as the European Union and the Middle East. However, fruit exports to these markets will require that Myanmar meet Good Agricultural Practices standards and other certification requirements, which presents many technical and institutional challenges. First, while Myanmar farmers have experience in growing these fruits with high export potential, they currently use local varieties and follow conventional practices that do not meet Good Agricultural Practices standards. Furthermore, standardization, quality management, accreditation, and metrology requirements pose a barrier to expanding these high-end fruit exports. The Ministry of Agriculture does not have the technical capacity to issue certain certifications, such as chemical residue certificates, and exporters must thus rely on private certification companies and private labs in Thailand for such documentation. Moreover, farmers and traders do not have incentives to sort and grade their products. Farmers and traders also have limited access to proper postharvest facilities. As a result, most fruit exports have little additional value added, resulting in a high concentration of exports to a single market, China, with generally low prices.

Trade policy environment

Agrifood trade policy pre-crisis

Myanmar has implemented several policies to increase its trade competitiveness and attract foreign investment since the reform period began in 2011. As a founding member of the World Trade Organization (WTO) and classified as a least developed country, Myanmar sought to take advantage of the special and differential treatment provisions that provide preferential market access for goods and services for such countries under regional and WTO agreements and of technical assistance related to trade. Furthermore, Myanmar made efforts to integrate and implement its commitments to ASEAN free trade agreements, including those with China, India, Japan, and the Republic of Korea, plus separately with Australia and New Zealand.

In learning from the experiences of its East Asian neighbors, Myanmar developed a National Export Strategy aiming to generate "sustainable export-led growth" that would create jobs and contribute to the overall socio-economic development of the country (MOC 2015). The strategy aims to improve the export competitiveness of seven priority sectors, of which four are agrifood exports: rice; fisheries; rubber; and beans, pulses, and oilseeds. Investments have been made to improve access to finance, quality management, trade facilitation and logistics, and trade information and promotion.

After the adoption of the Export Strategy in 2015, Myanmar saw some progress. Export volumes of priority sector goods increased by approximately 30 percent in 2017, Good Agricultural Practices certifications were issued for more than 15 crops, and promotional events for Myanmar's bean and pulses and fishery products were held abroad (MOC 2019).

However, Myanmar's export performance ranked poorly compared with that of its ASEAN counterparts. Bouët and Laborde (2019) developed a measure of trade integration that estimates trade costs in ad valorem equivalents. These costs include tariffs, nontariff measures, and the time and cost involved in border and documentary compliance. This unit allows for comparisons across countries and can serve as a measure of a country's competitiveness in international trade. Using this measure, the authors found Myanmar's export costs to be the highest among ASEAN countries, at 23 percent of the value for all goods and 59 percent for agricultural goods. The high trade costs for Myanmar were attributed primarily to the time required to successfully complete the logistical processes for exporting goods—that is, the average time needed to meet border and documentary compliance.

Impact of the triple crises on trade

The COVID-19 pandemic disrupted global supply chains through border closures, quarantine measures, and trade restrictions. In April 2020, Myanmar and neighboring China, India, and Thailand imposed border restrictions to prevent the spread of the virus. These measures closed key markets for perishable commodities, such as fruits and vegetables, which make up approximately 8 percent of total agricultural production. During this period, watermelon exports alone suffered an estimated $65 million loss (World Bank 2020). The uncertainty of border closures plus new restrictions, such as mandatory quarantine periods and restrictions on the entry of trucks and drivers, created additional costs and risks for farmers and traders. Meanwhile, higher shipping and container costs squeezed margins for sea-based exports.

Myanmar's COVID-19 Economic Relief Plan contained measures to mitigate the negative impacts of the pandemic on the economy and to promote a sustainable and inclusive recovery (GoM 2020). In the agriculture sector, the plan provided $430 million in loans to farmers to support input purchases for the 2020 monsoon production season and aimed to facilitate rice exports to maintain farmers' incentives. Measures were also taken to remove bottlenecks and fast-track the export process, including reducing the number of products requiring export licensing and waiving the 2 percent export tax. Moreover, investments were made to promote the use of e-commerce and mobile financial payments to create markets for products domestically and abroad.

As a result of the political instability generated by the military coup and recent global price shocks, the economic situation for Myanmar has further declined. Agricultural exporters face increasing logistical challenges in moving their commodities to export markets. Active conflict near major export nodes has temporarily closed borders and increased the risk of harassment, rent-seeking, and threats to personal safety at security checkpoints. These risks, compounded by the global increase in fuel costs, have had significant impacts on freight charges and the viability of agricultural exports, as their profitability remains highly contingent on freight rates. Furthermore, these logistical challenges have added to the increasing cost of agricultural inputs for farmers and reduced the competitiveness of agricultural exports.

The military regime has also imposed strict foreign currency controls to address shortages in its foreign reserve levels. The floating exchange rate has been abolished and replaced with a fixed reference rate against the US dollar. As of December 2022, the difference between the fixed reference rate and the black market rate was approximately 20 percent. Foreign exchange surrender requirements have been placed on exporters, requiring them to convert 65 percent of export earnings into Myanmar kyat at the overvalued official reference rate within one business day. This requirement has acted as a tax of approximately 20 percent, squeezing exporters' margins.

The policy environment continues to become more restrictive and unpredictable. In April 2022, only 11 percent of agricultural exports were subject to export licensing. This increased to 65 percent of agricultural products by November 2022 and then to all exports by April 2023. This is a regression in the progress made prior to 2020, when the use of export licenses declined from approximately 90 percent to 11 percent of all exports. Meanwhile, the requirements for attaining an export license can be arbitrary. For example, businesses must have a balance of exports and imports, and the issuing of new export licenses has been suspended for certain commodities to regulate domestic prices. These licensing requirements affect trade facilitation, increase trade and compliance costs for traders, create uncertainty in traders' ability to access export markets, and provide incentives for trade through informal channels.

Conclusions and policy recommendations

This chapter focuses on the role of agrifood exports in Myanmar and assesses their potential to broaden economic growth and agricultural transformation. Agrifood exports now make up about one-third of Myanmar's total exports, and their share of both total exports and as a ratio of total GDP has risen in recent years. While the share of agriculture's contribution to Myanmar's total

GDP has fallen, which is a common occurrence in national economic transformation processes, growth in agrifood exports has been more rapid than broad economic growth. If Myanmar can further enhance its position as a net agrifood exporter (Figure 14.13), agrifood exports will not only create increased income for farmers, traders, processors, and other players along agrifood value chains but also help the country with foreign exchange earnings to support the necessary imports of many manufactured products embodied with modern technology.

Myanmar's agrifood exports are highly concentrated in a few commodities with limited value-addition through processing. These include pulses, fish, rice, rubber, maize, cattle, groundnut, sesame, melons, and banana. Exports of agrifood products are destined primarily for Asian countries. China has become the most important trading partner, with Thailand and India ranking next. The concentration in both commodities and country destinations implies that these currently dominant commodities and export markets will continue to play important roles in agrifood export growth in the immediate future. Moreover, except for pulses exported to India, for most of the countries it supplies, Myanmar is not now the dominant source of their imported agrifood commodities. One implication of this is that there is potential for future growth in many of these markets through increasing the share of the agrifood imports they obtain from Myanmar. This growth potential depends primarily on Myanmar's ability to expand its supply of agrifood export commodities by improving productivity and quality and by improving the country's competitiveness internationally. Meanwhile, when a market for a dominant export commodity is highly concentrated, reliable market access is important, such as in pulse exports to India and in rubber, maize, cattle, and melon exports to China. Long-term government-to-government trade agreements between Myanmar and dominant importing countries are important for improving access to such export markets.

Increased trade market diversification is important to reduce risks to Myanmar's exports caused by policy uncertainty in the dominant importing countries. For pulses, exploring market opportunities in countries beyond India will require diversification in the varieties of pulses produced for export. The rice export market is relatively more diverse than that of pulses. Continuing such market diversification will require Myanmar to improve the quality of its rice to meet the standards of higher-value export markets beyond China.

While fish is still an important agrifood export, the share of fish exports in total agrifood exports has fallen. This is primarily because Myanmar's marine fisheries have been overexploited. Many of its wild capture products are unlikely to grow much more in the future. Farmed fisheries represent the best prospect for growing fish exports. However, except for farmed shrimp, most of the growth potential for aquaculture lies in supplying Myanmar's domestic market as a substitute for declining capture fisheries production.

Fruit and other horticultural exports have grown rapidly in recent years. Exports of melons, particularly watermelons and muskmelons, and bananas have dominated recent growth. As perishable commodities, fresh fruit exports are constrained by seasonality and difficulties in transportation, storage, and other logistics. Currently, border trade with China is the major export channel, but it is often influenced by trade policy changes. For Myanmar to be able to penetrate new markets in countries in the European Union and the Middle East, producers and exporters will need to follow global Good Agricultural Practices and other product certification requirements.

In conclusion, the following policy recommendations are important for increasing Myanmar's export competitiveness and making agrifood exports an important driver of its economic growth:

- Remove export licensing requirements on key agrifood export commodities and streamline export customs clearance requirements.
- Continue investments to improve the quality of key agrifood export commodities to meet Good Agricultural Practices and other standards to take advantage of preferential trade agreements under the WTO Global System of Preferences. Continue efforts to diversify trade to markets in advanced economies.
- Increase agricultural productivity through improved access to extension and services, financing, and inputs and by removing barriers in the supply chain.
- Build capacity to trace production processes to meet the product traceability standards required in countries where Myanmar seeks to export its agrifood products.
- Seek bilateral or multilateral agreements with regional trade partners to improve trade policy and market stability, including around sanitary and phytosanitary protocols.
- Provide producers, traders, processors, and agrifood exporters in Myanmar with market information on demand for goods, prices, and the standards and procedures required for exporting to specific countries.

- Promote Myanmar's products in targeted foreign markets and provide farmers and processors with information about any new export opportunities.

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Chapter 15

MIGRATION TRENDS AND IMPLICATIONS

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Following economic and political reforms initiated in 2011, the country's population has been adapting rapidly to new opportunities and challenges, including through relocation and migration. This chapter describes some of the patterns and dynamics related to these population flows, as well as their consequences for Myanmar's rural economy. Most of the chapter is based on data collected prior to the triple crises, but recent analyses allow us to give an overview of the migration landscape in the post-2020 era at the end of the chapter (MAPSA 2024c). These analyses confirm that overall migration dynamics have largely persisted.

The existence of substantial flows of migrants from and within Myanmar is not a novel phenomenon. However, the drivers and dynamics have evolved. In the pre-reform past, much of this migration was driven by conflict. Over the decade to 2020—with important exceptions, such as the mass exodus of Rohingya from Rakhine State—migration was driven more by economic factors. Following the coup, conflict again became a driving factor in migration (MAPSA 2024c). It drives refugees across borders in search of safety, along with students, government workers, and citizens who participated in the civil disobedience movement against the new regime. At the same time, economic opportunity remains the key determinant of migration in most of the country.

Most migrants seeking a higher income, an escape from poverty, or both head toward the country's growing cities or to economically vibrant neighboring countries where wages are higher. Some of these flows have been substantial for many years. In Thailand, major industries have been relying on Myanmar workers for decades (Chantavanich and Vungsiriphisal 2012; Griffiths and Ito 2016). Thai policies over the past decade have made it somewhat easier for migrants to enter and work in Thailand legally.

While rapid flows of migrants out of villages have sometimes been interpreted as draining rural areas of their resources, migrant earnings and remittances bolster rural incomes and may create opportunities for rural growth.

These remittances help maintain household consumption, finance house construction, contribute to the cost of agricultural operations, and fund business investments. Migration is an active part of structural transformation and important for building a dynamic and resilient rural economy in Myanmar.

At the same time, migration poses both challenges for the rural sector and risks to migrants themselves. Agriculture faces pressure to adapt and raise labor productivity to remain profitable, but many young migrants decide to cut short their education, which may have long-term adverse consequences for human capital development. Migrants may also face dangers, such as precarious work conditions, harassment, or exploitation. Recently, the COVID-19 crisis provided a stark reminder that remittance flows can be disrupted, leading to sudden income shortfalls for households that rely on them. Finally, outflows of educated migrants following the coup are threatening to drain human capital from the country, undermining future development potential.

This chapter provides an empirically based discussion of patterns of rural out-migration in Myanmar and the opportunities and challenges it presents, based primarily on datasets from four household surveys collected in person during the 2011–2020 decade when the country was opening up economically and politically. The four zones where household data were collected (Figure 15.1) are Mon State (2015), the Ayeyarwady Delta (2016), the central Dry Zone (2017), and Shan State (2018). Migration is an important component in the economies in these four zones, but each has specificities worth highlighting and contrasting. In addition, we draw on data from the recent nationally representative Myanmar Household Welfare Survey (MHWS), collected by phone in 2022 and 2023, to highlight how migration patterns have been impacted since the triple crises.

We first present the surveys used and the data analyzed. We follow this by reviewing the overall trends and patterns of migration, as well as migrant characteristics in each area. We then outline the economic incentives for migration and its role in household incomes. Next, we assess the impact of migration on agriculture and the nonfarm rural economy. Before concluding, we discuss the impacts of the recent crises on migration.

Surveys and data

The primary sources of data for this work are four large household surveys conducted by Michigan State University, the Center for Economic and Social Development, and the International Food Policy Research Institute between 2015 and 2018. Each survey was designed to answer a unique set of research

TABLE 15.1 Summary of household survey details, by state, region, or zone

	Mon State	Delta	Dry Zone	Shan State
Survey detail	2015	2016	2017	2018
Household sample size	1,632	1,102	1,578	1,562
Area and population represented	Rural population of all 10 townships of Mon State	40 rural village tracts from four townships of Ayeyarwady and Yangon—25 with high concentrations of fishponds, and 15 with paddy and pulses as main crops	Rural population of four townships from three regions (Magway, Mandalay, and Sagaing) covering major Dry Zone agroecologies	99 rural village tracts producing maize or pigeon pea, in nine townships in southern Shan State
Size of population represented, households	273,002	37,390	160,512	201,285

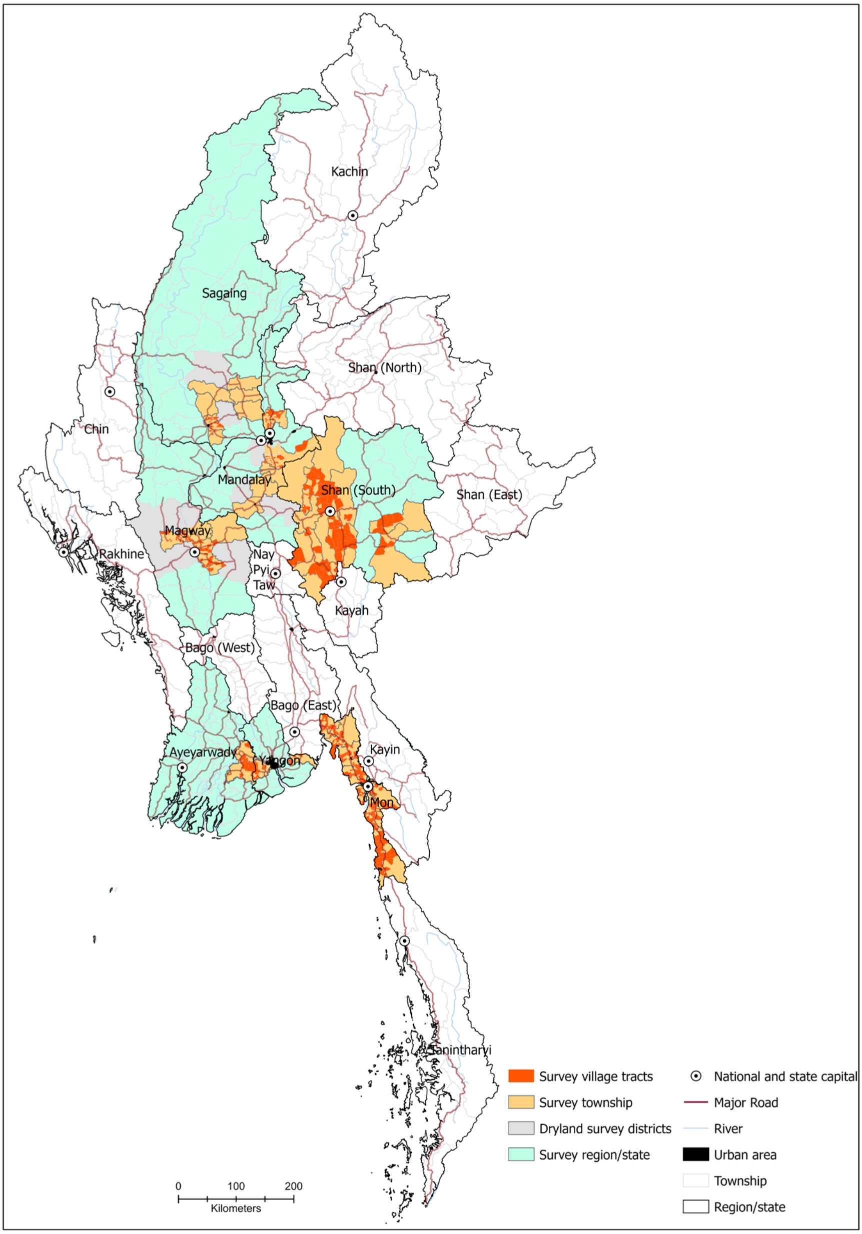
Source: Belton et al. (2021).

questions, but both surveys followed a similar structure in content, design, and implementation. Table 15.1 summarizes the details and Figure 15.1 presents the location of each survey, which included a household and a community questionnaire (see Belton et al. [2021] for full details).

The four household surveys were each designed to capture detailed information on rural livelihoods. All surveys included a migration module, which covered, at a minimum, the demographic characteristics, current location, and occupations of current migrants, as well as remittance flows. All surveys collected information on past migration and returned migrants, with the Mon State survey being the most detailed and the Delta survey the least (Belton et al. 2021).

All samples were based on the sample frame of the 2014 national census and were defined with support from staff of the Department of Planning. Enumeration areas were selected randomly by probability proportional to size. Specific sampling procedures varied with the purpose of each survey. The Mon State sample is representative of the entire rural population of the state, whereas the other surveys are representative at substate or subregion levels. The Delta survey was designed to compare areas with high and low concentrations of aquaculture, dictating the choice of village tracts surveyed, and is representative of parts of the Ayeyarwady Delta. The Dry Zone survey is representative of four townships selected to include the main agroecologies and farming systems of central Myanmar. Last, the Shan State survey is representative of the rural population of village tracts from nine townships in southern

FIGURE 15.1 Map of locations of household surveys



Source: Belton et al. (2021).

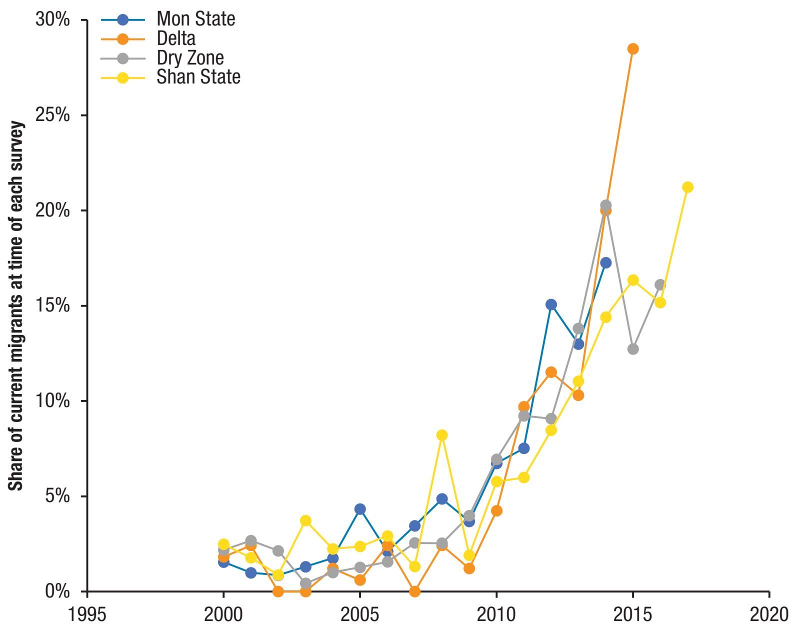
Shan where maize or pigeon pea is farmed and the security situation permitted access for survey implementation (Belton et al. 2021).

Migration prevalence, geography, demographics, and dynamics

Migration trends

Because historical data on Myanmar migration are scarce, trends over time are difficult to establish. Nevertheless, all indicate that migration both within and out of Myanmar increased dramatically after the 2011 reforms (Filipski et al. 2021). Figure 15.2 shows the year in which all migrants from survey households were reported to have migrated. While this figure does not capture all migration over time, the trends suggest that migration accelerated during that decade.

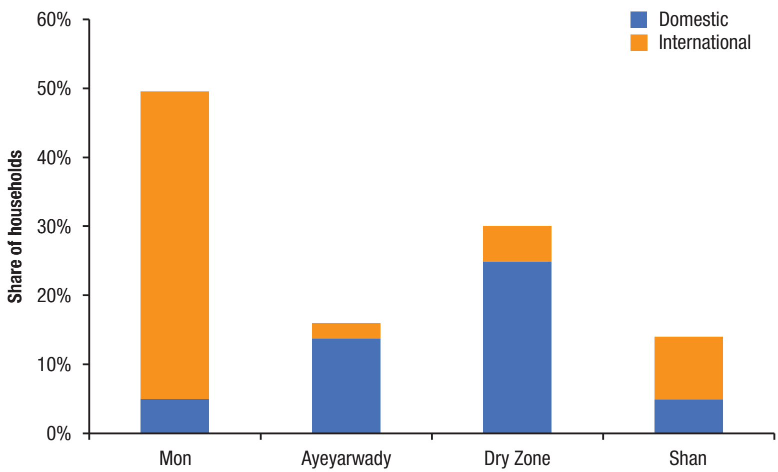
FIGURE 15.2 Year of migration for current migrants from surveyed households, by survey



Source: Filipski et al. (2017); Htoo and Zu (2016); Thu, Htun, and Belton (2019); and authors' calculations.

Note: Endpoint (year of survey) is 2015 for Mon State, 2016 for Ayeyarwady Delta, 2017 for Dry Zone, and 2018 for Shan State.

FIGURE 15.3 Share of households with a migrant, by state/zone



Sources: Authors' analysis using Filipski et al. (2017).

These data were collected prior to the onset of the COVID-19 pandemic, which disrupted migration suddenly and severely. Nevertheless, the most recent evidence suggests that migration has since picked up and is now exceeding pre-pandemic levels (MAPSA 2024a). We dedicate a section at the end of the chapter to migration dynamics since the onset of the triple crises. In the meantime, the four surveys offer a window into the demographic and economic factors underlying migration that have remained relevant.

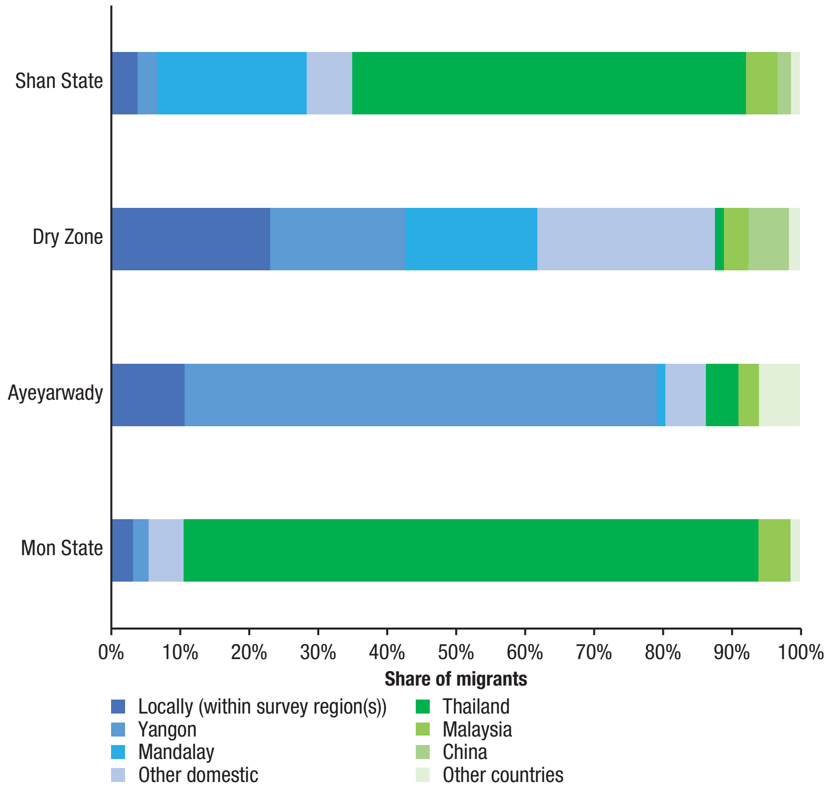
Migration prevalence in the four study areas

The overall prevalence of migration in any given area is highly context dependent, as it reflects location-specific geographic characteristics, transportation networks, and the historical development of migrant networks. Our four study areas reflect this diversity (Figure 15.3). We can contrast the four areas as follows:[1]

- Mon State is by far the biggest sender of migrants. Forty-nine percent of households had a migrating member at the time of the survey in 2016. This migration was mainly international.
- Dry Zone households also engage heavily in migration. Thirty percent had migrants in 2017, though that migration was mostly domestic.

1 These findings mostly line up with those from the Myanmar Living Conditions Survey 2017, though the MLCS classification distinguishes permanent and temporary migration, rather than domestic and international (CSO, UNDP, and World Bank 2020).

FIGURE 15.4 **Migrant destinations, by state/zone or country**



Source: Filipski et al. (2017); Htoo and Zu (2016); Thu, Htun, and Belton (2019).

- The Delta sends mainly domestic migrants. Nearly 16 percent of households reported migrants from their household at the time of the survey in 2016.
- Shan State in 2018 had the lowest migration rate (14 percent of households) and was the most balanced between international (9 percent) and domestic (5 percent) migration.

Destinations and migration corridors

Figure 15.4 further breaks down domestic migration destinations by region or state and international migration destinations by country. Thailand is by far the most common international destination. Most migrants from Mon State are in Thailand (83 percent), as are most migrants from our survey areas in southern Shan State (67 percent).[2] China is the most common international destination for Dry Zone migrants. However, it represents only 6 percent of this group, as most migrate domestically. Malaysia also attracts a small share of migrants from each of the four regions. These patterns owe partly to the geographic locations of our survey areas. However, the main finding is corroborated by analysis of the national census: 85 percent of all international remittances to Myanmar come from Thailand (CSO, UNDP, and World Bank 2020). In 2021/22, 52 percent of international migrants were in Thailand, followed by 22 percent in Malaysia and 6 percent in China.

Domestically, the most common destination for Ayeyarwady migrants is Yangon (69 percent). On the other hand, a large portion of Shan State migrants go to Mandalay (22 percent), while Mon State sends very few domestic migrants (<10 percent). The Dry Zone is the only area we surveyed where just one or two destinations did not dominate migration: Dry Zone migrants leave for Yangon and Mandalay; local destinations within the region; and other remote domestic destinations in roughly equal proportions, reflecting the geographic centrality of the Dry Zone.

While large cities are ultimately the primary attractors of domestic migrants, the role of rural-to-rural migration is significant. Many rural migrants from the Dry Zone travel to rural areas of Shan State for work. These rural-to-rural migration flows are sometimes the result of "secondary" migration pressures, whereby rural areas replace their outgoing migrant workers with incoming workers from other rural areas. For instance, during the rice harvest in Mon State, rural workers who leave for Thailand are often replaced by temporary migrants from Bago Region (Filipski et al. 2017).

Taken together, these migration flows define migration hubs and corridors, which we map in Figure 15.5. The dashed circular shapes delineate the general areas represented by our survey datasets. The arrows show the different types of migration flows we encountered in sizes that roughly capture their relative proportions. Migration generally flows southward through the country. Thailand dominates international flows, whereas domestic migration is centered around the two urban hubs of Yangon and Mandalay. As workers from border regions flow into Thailand, workers from central regions flow into cities, and workers from remote areas flow inward, migration corridors are formed throughout the country.

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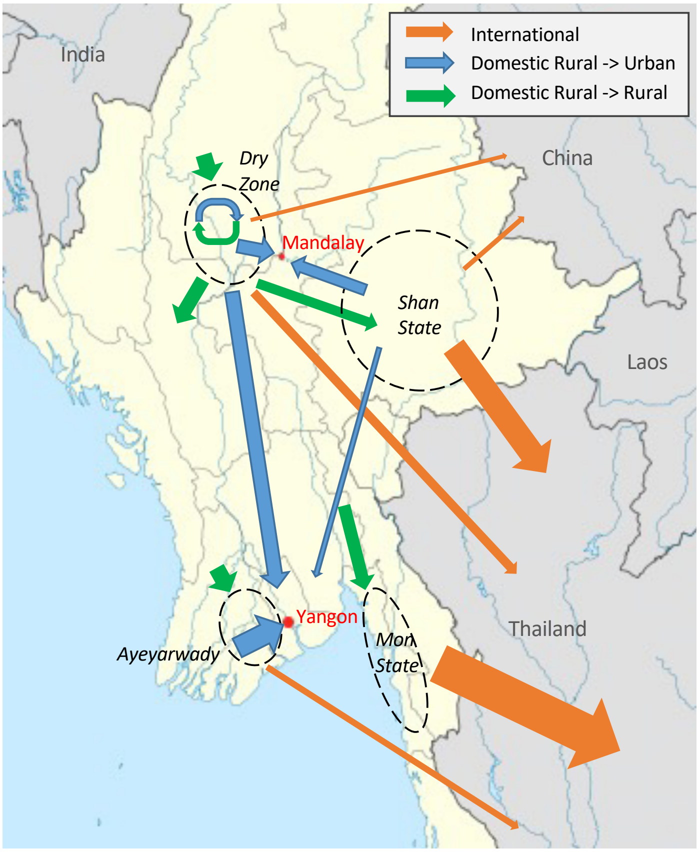
2 Migrants from northern Shan State would likely be going to China, but our survey did not reach those areas.

FIGURE 15.5 Approximate migration flows



Source: Filipski et al. (2017); Htoo and Zu (2016); Thu, Htun, and Belton (2019).

Migrant characteristics

Migrants from rural Myanmar are mostly young, low-skilled, working-age adults. Table 15.2 shows the demographic characteristics of our four migrant samples.

Migrants are split relatively evenly between women and men, though men hold a small majority. The average age of migrants at the time of their first departure is under 25. It is lowest in the Delta, where the average migrant is 20 years old. Most migrants are of working age, with only a small fraction of migrants leaving before the age of 16. The highest share of migrants under 16 years of age is in the Delta (12 percent).

TABLE 15.2 Migrant characteristics, by state/region

Characteristic	Mon State	Delta	Dry Zone	Shan State
Male (%)	54	55	62	52
Average age at time of departure (years)	24	20	21	—
Under 16 years (%)	8	12	2	3
Over 45 years (%)	10	—	12	3
Years of schooling	6	—	—	—
Never completed primary schooling (%)	27	—	49	38
From a landless household (%)	53	—	20	19

Source: Filipski et al. (2017); Htoo and Zu (2016); Thu, Htun, and Belton (2019).
Note: — = data not available.

Migrants tend to have low levels of education. In the Dry Zone, nearly half of all migrants never completed primary school. In Mon State, 27 percent never completed primary school. This is slightly higher than the national average for rural populations of 23 percent (CSO, UNDP, and World Bank 2020), suggesting that migrants tend to be less educated than their nonmigrant peers.

Migrants come from all economic strata: 53 percent of migrants from Mon State and 19 percent from Shan State came from a landless household, with rates of landlessness similar to the general population in those states. Across all surveys, we found that the socioeconomic profile of migrants was similar to that of the overall population.

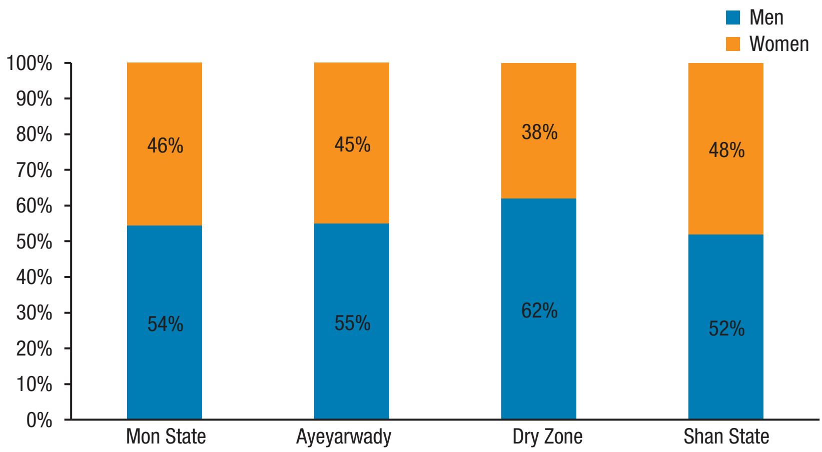
Gender and migration

Men and women in Myanmar are nearly equally likely to migrate, with migrant men only slightly more numerous than migrant women (Figure 15.6). The highest imbalance is in the Dry Zone.[3] This is largely driven by the higher propensity of Dry Zone men to engage in seasonal migration. Both men and women are generally less likely to migrate if they are married or have dependents, without much difference—that is, married women or mothers are just as unlikely to migrate as married men or fathers. However, in Shan State, we found evidence that the care of children left behind by migrant parents fell disproportionately on nonmigrant women (Thu, Htun, and Belton 2019).

We further found that most migration characteristics vary little by gender. Destinations are largely determined by origin (Mon migrants go to Thailand, Delta migrants go to Yangon, and so on), with no sizable gender differences.

3 See CSO, UNDP, and World Bank (2020) for a nationwide study of migration patterns that shows more differences by gender in propensity to migrate.

FIGURE 15.6 Gender of current migrants, by state/region



Source: Filipski et al. (2017); Htoo and Zu (2016); Thu, Htun, and Belton (2019).

The same goes for length of stay, propensity to remit, and amounts remitted. Men and women are equally likely to send money home, and they send similar amounts. The uses of remittances sent by men and women also exhibit no material differences.

The most visible differences by gender appear in the type of work that migrants engage in, though patterns appear to be highly regionalized, as migrants from different regions have access to different opportunities at their destinations (Table 15.3). For instance, Delta women are more likely than men to be working in factories in Yangon (51 vs. 46 percent), while Shan women are less likely to do so than men (10 vs. 16 percent). In contrast, Shan women tend to migrate into jobs as domestic staff (35 percent), while their male counterparts do not, nor do any migrants from the Dry Zone, whether men or women. Consistently, migrant men are more likely to work in construction, though women also engage in construction work. Table 15.3 shows some of these patterns for the Dry Zone and Shan State surveys.

Migrant jobs

The migrants in our samples can be characterized mainly as low skilled—their work experience prior to migrating is often limited to farm work. Young migrants tend to leave immediately after school, and many have no work experience. In Shan State, 70 percent of migrants listed farming as their primary occupation prior to migrating, reflecting high levels of ownership of agricultural land there (Thu, Htun, and Belton 2019).

TABLE 15.3 Differences in migrant occupations by gender, Dry Zone and Shan State

	Migrant engagement (%)			
	Dry Zone		Shan State	
Occupation	Men	Women	Men	Women
Farm work	12	25	6	5
Factory work	19	23	16	10
Domestic work	1	5	1	35
Services/trade	17	12	17	18
Construction/casual work	35	20	27	14
Government job	2	9	18	12
Natural resources	9	0	4	0
Other	6	6	13	6
Total	100	100	100	100

Source: Filipski et al. (2017); Htoo and Zu (2016); Thu, Htun, and Belton (2019).
Note: Mon State and Delta zone surveys did not provide the same level of occupational detail.

Most migrants go to urban destinations and take up a variety of nonfarm jobs (Table 15.4). While these jobs typically require a semi-skilled labor force, migrants can learn on the job and acquire these skills over time. The two most common occupations across all four regions we surveyed were construction work and factory work. Construction activities were the largest employer of migrants from Mon State (24 percent), the Dry Zone (29 percent), and Shan State (20 percent). Nearly half of Delta migrants do factory work in the Yangon area (43 percent). About 15 percent of migrants also engage in trade or services, such as food vending.

While most migration is rural to urban, migrants are also an important source of farm labor. Participation in farm work by migrants is highly correlated with the place of origin and destination of migration. Delta migrants from our sample area go to Yangon, with very few working on farms. Shan State migrants are also unlikely to work on farms (5 percent). However, 18 percent of Mon State migrants work on farms, mostly in Thailand on rubber or fruit plantations (Filipski et al. 2017), and nearly 17 percent of Dry Zone migrants work on farms, mostly within Myanmar growing field crops.

Migration as an investment

Economic opportunities are among the key drivers of migration, as numerous studies worldwide have documented. Myanmar is no exception. The New

TABLE 15.4 Distribution of migrant occupations at destination, percentage of migrants by state/region of origin

Occupation	Mon State	Delta	Dry Zone	Shan State
Farm work	18	0	17	5
Factory work	21	44	20	13
Domestic work	—	—	2	17
Services/trade	15	—	15	17
Construction/casual work	24	—	29	21
Government job	—	—	5	15
Natural resources	8	—	6	2
Other	14	56	6	10
Total	100	100	100	100

Source: Filipski et al. (2017); Htoo and Zu (2016); Thu, Htun, and Belton (2019).
Note: Questionnaires for Mon State and the Delta were less detailed, hence the missing details. — = data not available.

Economics of Migration school of thought frames migration as an investment decision taken at the household level; household members migrate to seek higher earnings, some of which flow back to the household as remittances (Stark and Bloom 1985; Taylor 1999). Even long-term migration is often thought of as temporary, with migrants planning to return home after several years or even decades. This section documents the role of remittances and return migration.

Cost of migration

Table 15.5 shows estimates of the cost of migration for three of our four surveys. Values in the table include transportation costs as well as any logistics costs, such as broker or visa fees, but not rent or cost of living at the destination. The table shows an expected high variability of costs depending on distance and destination; the cost of domestic migration out of the Dry Zone is only 22,000 kyat ($18) on average, while the mean cost of international migration out of Shan State reaches 545,000 kyat ($436).[4]

These patterns reflect the nature of migration decisions as an investment; more distant destinations cost more to get to—but also bring higher rewards. This is very clear when looking at Mon State migrants. Migrating to Malaysia is about twice as expensive as migrating to Thailand, but yearly remittance

4 Note that the area of the Delta we surveyed is about two hours away from Yangon, so most migrants will have negligible transportation and logistics costs.

TABLE 15.5 Migration costs, by state/region

Cost	Mon State	Dry Zone	Shan State
Domestic (average cost in $)	74	18	24
International (average cost in $)	349	78	436
Used loaned funds to migrate (%)	—	38	11

Source: Filipski et al. (2017); Htoo and Zu (2016); Thu, Htun, and Belton (2019).
Note: — = data not available.

amounts from Malaysia are also about twice as large (Filipski et al. 2017). More expensive migration can be more lucrative in the long run.

As with any potentially lucrative investment, households engaging in migration may decide to borrow money to finance the endeavor. Though we have loan data for migration only in the last two surveys, those for Shan State and the Dry Zone, we see that borrowing is not rare. While only 11 percent of households in Shan State take loans to migrate, up to 38 percent of Dry Zone migration is financed through loans. This highlights the nature of migration as not just an opportunity but also a risk, in some cases involving high-risk loans, dangerous working conditions, and exploitative labor arrangements (Belton, Marschke, and Vandergeest 2019; Griffiths and Ito 2016; Hein et al. 2015).

When migration occurs as an option of last resort, it leaves migrants vulnerable to harsh working conditions and exploitation. Many of the workers employed in offshore marine fisheries in Mon originate from impoverished areas of the Delta and the Dry Zone. These workers often accept wages at the beginning of the fishing season to pay off debts incurred elsewhere or to cover other emergency expenses. However, they are bound to spend the entire fishing season working on offshore rafts under extremely harsh and dangerous conditions (Belton, Marschke, and Vandergeest 2019). While the overall landscape of migration is one of economic opportunity, these less positive dynamics cannot be ignored.

The role of remittances in Myanmar's rural economy

Migrants in all four of our surveys were likely to send remittances back to their rural homes. Between 58 percent (Shan State, Dry Zone) and 81 percent (Delta) of migrants had either sent or brought money back in the past 12 months (Table 15.6). The sums involved are substantial: an average migrant sends nearly 1 million kyat per year (about $800), which is roughly equivalent to a full year of wages in their rural areas of origin. Dry Zone migrants send the lowest average remittance amount (662,000 kyat, or $529), and Delta migrants send the highest average amount (1.44 million kyat, or $1,152). Differences in levels of remittances likely reflect regional differences in wages and costs of living. For example, Delta migrants tend to work in or near Yangon, the economic capital of the country, where wages are relatively high.

Migration studies often argue that remittances can serve as the basis for rural development, as they provide households with funds that can be productively invested in agriculture and other growth activities (de Brauw 2019). However, our surveys suggest that most remittances are used to support everyday living expenses. Three of our four surveys collected information on the use of remittances (Table 15.6).

In both the Dry Zone and Shan State, nearly two-thirds of remittances are used for everyday expenses. In Mon State, one-third of remittances go to housing, which is a trend readily visible throughout rural Mon State, with the high density of homebuilding taking place. While home construction could be seen as a form of investment, it is not directly productive and can also be viewed as a form of conspicuous consumption (Wei, Zhang, and Liu 2012). Non-negligible shares of remittances are spent on medical expenses or debt service, which leaves less than one-third for savings or productive investments: 33 percent in Mon State, 21 percent in the Dry Zone, and 18 percent in Shan State. While these amounts are low—about 200,000 kyat per year (about $160)—they are not trivial, and they accumulate over time. This suggests that remittances likely contribute to significant productive investments for some households and to rural economic growth.

Beyond their contribution to investment, remittances play a key role in sustaining rural household incomes in potentially problematic ways. The bottom of Table 15.6 shows that between 12 and 42 percent of households receive remittances, depending on the region. While in the Delta, the share of remittances in total household income is only 5 percent, it is much higher in the other three areas we studied: 15 percent in the Dry Zone, 18 percent in Shan State, and 25 percent in Mon State. Remittances play a key role in supporting rural incomes and stabilizing them through diversification away from seasonally risk-prone agriculture. At the same time, some households that depend highly on remittances are left exposed to economic vicissitudes of a different kind, as the COVID-19 pandemic and lockdowns recently illustrated. This is discussed further below.

TABLE 15.6 Details of migrant remittances, by state/region

Remittance detail	Mon State	Delta	Dry Zone	Shan State
Share of migrants who sent remittances (%)	66	81	58	58
Average remittance amount ($/year)	654	1,152	529	640
Use of remittances				
Housing (%)	31	—	7	5
Day-to-day and other expenses (%)	14	—	64	66
Debt (%)	6	—	6	5
Medical (%)	15	—	3	6
Savings/investment (%)	33	—	21	18
Share of households receiving remittances (%)	42	12	30	15
Overall share of household income coming from remittances (%)	25	5	15	18

Source: Filipski et al. (2017); Htoo and Zu (2016); Thu, Htun, and Belton (2019).
Note: — = data not available.

Return migration

Many migrants migrate temporarily. Even long-term migrants often plan to return to their place of origin after having reaped enough returns, although not all are successful in achieving their targets. Because migrants often learn skills while they are away, some of the migration literature emphasizes their potential role as growth catalysts upon their return, having brought back skills that may have been previously missing in their home villages (Junge, Revilla Diez, and Schätzl 2015). However, this is not frequently the case in our data.

Among returned migrants, a majority reported family reasons as their impetus for return, including marriage, pregnancy, need to care for children or parents, death in the family, or a desire to be with family (Table 15.7). This is particularly the case for international migrants, who are less likely to settle permanently at their destination compared with domestic migrants. Forty-three percent of Mon State returned migrants stated family reasons as their primary motivation for returning. Poor working conditions are another major reason for migrants returning, a factor most frequently mentioned by Mon State returnees (20 percent). A substantial share of Dry Zone migrants (23 percent) reported loss of jobs and lack of opportunities as their main reasons for returning. It is noteworthy that poor working conditions, inability to find work, lack of legal status, and incapacity account collectively for between 37 percent (Mon State) and 46 percent (Dry Zone) of the reasons given for terminating migration, underlining some of the risks associated with migrating and indicating that it is not always a successful strategy.

TABLE 15.7 Primary reason for returning, by state/zone

	Share of responses (%)			
Reason	Mon State	Delta	Dry Zone	Shan State
Family reasons	43	—	17	23
Poor work conditions	20	—	14	17
Old age/incapacity to work	8	—	7	9
Loss of job/lack of opportunities	6	—	23	14
Lack of legal status	3	—	2	3
Job prospect at home/start business	9	—	25	28
Other	11	—	12	6
Total	100	—	100	100

Source: Filipski et al. (2017); Htoo and Zu (2016); Thu, Htun, and Belton (2019).
Note: — = data not available.

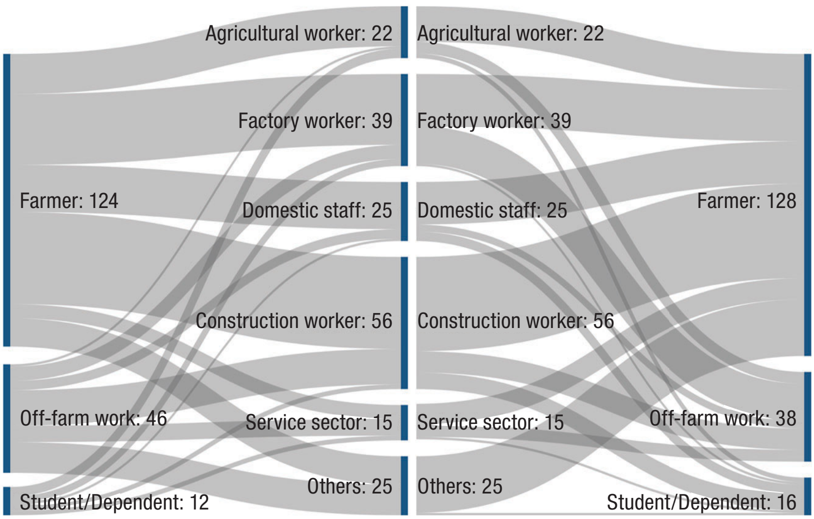
Mon State migrants seldom listed job prospects at home and job loss as major reasons for their return (9 and 6 percent, respectively). Migrants from Mon State mostly go to Thailand, where opportunities are both plentiful and relatively lucrative. In contrast, Dry Zone and Shan State migrants are more likely to return for economic reasons such as job loss (23 and 14 percent, respectively) or for an opportunity to find work or start a business at home (25 and 28 percent, respectively).

However, further analysis suggests that after their return, few migrants end up using the skills they acquired while away. In Mon State, while about half of migrants reported having acquired skills abroad, those were mostly language skills (Filipski et al. 2017). Although 10 percent reported having acquired skills in factory production, those are hard to translate into productive returns at home unless a factory is there. The most common use of skills acquired abroad by Mon State migrants was agricultural, as rubber workers returned home with seeds to start their own plantations. In Shan State, while very few migrants engage in farm work while away, the vast majority return to farming after they return home (Figure 15.7).

Migration and agriculture

The relationship between migration and agriculture is complex and multifaceted. On the one hand, migration removes part of the rural labor force, giving rise to concerns about agricultural production and food security. On the other hand, there is evidence that these concerns are overblown and that households

FIGURE 15.7 **Primary activity before, during, and after migration for returned migrants from Shan State**



Source: Thu, Htun, and Belton (2019).

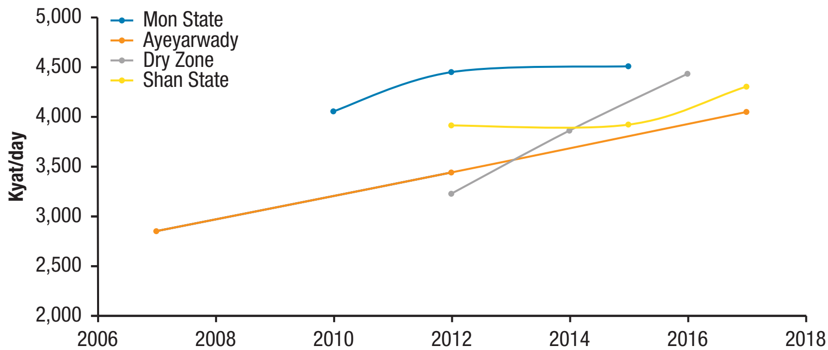
have options to maintain or increase food production despite labor out-migration (de Brauw 2019). This section reviews how some of these dynamics are playing out in Myanmar.

Migration and rural wages

It is often assumed that rural workers leave for the city because the lack of work in the rural sector renders them idle. However, the reality may not be as extreme. Workers may have existing opportunities in the rural sector that are poorly remunerated compared to urban ones. When this is the case, departing workers may leave rural producers with farm labor shortfalls. All four surveys indicate that this was happening in Myanmar's rural sector prior to 2020.

A good indicator of tight labor supply is an increasing wage rate. In all four surveys, we found that real rural wages—that is, after adjusting for inflation—had been rising, and quite sharply so in the Delta and the Dry Zone (Figure 15.8). Rising wages point to a tightening of rural labor markets as workers migrate away. Wage rates in different geographic zones also appear to be converging. This suggests that labor markets are increasingly integrated

FIGURE 15.8 Real wages over time, by state/zone



Source: Filipski et al. (2017); Htoo and Zu (2016); Thu, Htun, and Belton (2019).

over space, as would be expected given high levels of mobility and migration. This is a positive outcome for landless and land-poor rural households that derive a large share of their income from casual labor. These rising wages are reported to have contributed to improvements in welfare in the Dry Zone (Belton and Filipski 2019).

However, rising rural wages squeeze farm incomes. To compensate, rural producers may farm less intensively, switch to labor-saving crops, or even abandon production on marginal plots. Rural producers may also replace missing laborers with (in-)migrants or machines.

Out-migration begets in-migration

A major compensatory mechanism for the outflow of laborers through migration is the inflow of other laborers through migration. As discussed above, migration flows occur along corridors that link all areas of the country and likely reach even the most remote locations. As migrants from some areas leave for Yangon or Thailand, the labor shortage they leave behind may prompt other laborers to take their place, usually migrating from more remote rural areas. In Mon State, where nearly half of all households had migrant members away at the time of our survey, respondents reported that 20 percent of workers in paddy fields were migrants from Bago Region who came specifically for the rice harvest (Filipski et al. 2017).

What drives these secondary migration flows are, again, wage differentials. Thailand attracts Mon migrants across the border with daily wages for unskilled workers that are triple what they are in Mon State—roughly 10,000 to 12,000 kyat, or $8 to $10, in Thailand versus 3,000 to 5,000 kyat, or $2.50 to $4.00, in Mon State at the time of the survey. Mon State daily wages are, in turn, higher than those in Bago region—2,500 to 3,000 kyat, or $1.60 to $2.50, thus prompting a secondary migration flow, notably for temporary workers at harvest time. In our Delta study area, up to a quarter of the long-term fishpond workforce originated from more remote village tracts of the Delta (Htoo and Zu 2016). Although rigorous proof of causal impacts is difficult to obtain, evidence shows that wage levels in rural Mon State are higher precisely because so many of the workers have left for Thailand (Filipski et al. 2020), a finding that echoes studies of other countries (Mishra 2014).

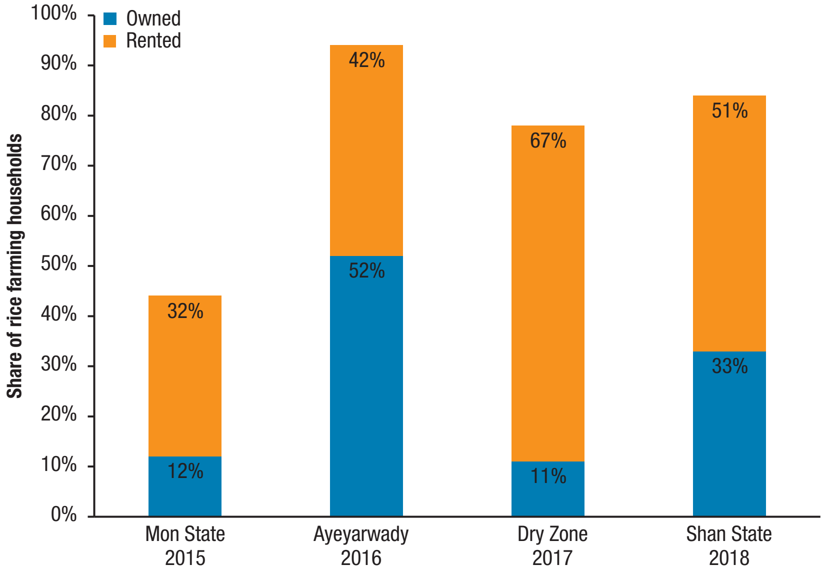
If all workers are easily replaced through secondary migration flows, production volumes can be maintained. However, this process is not entirely without friction. Replacing workers is easier when crops are similar across regions. Rubber workers from Mon State seek higher wages in Thai rubber plantations, but they are not easily replaced by incoming migrants from central Myanmar with no experience in rubber. The concentration of migrant workers is high in paddy fields, but only 3 percent of workers in rubber plantations are incoming migrants (Filipski et al. 2017). In addition, attracting these in-migrant workers requires offering wages high enough to make their trip worthwhile. Wages are indeed rising, but eventually further wage increases become economically infeasible for farmers, who may then consider labor-saving technology, including mechanization.

Migration and mechanization

A second major way in which farmers compensate for labor scarcity is mechanization, as discussed at length in Chapter 7. A common narrative assumes that replacing human workers with machines leads to unemployment, such that rural-to-urban migration results from the displacement of surplus rural workers. However, in rural Myanmar prior to 2020, the causality ran mainly in the opposite direction. That is, farmers were seeking to mechanize because migration was creating labor scarcity, not the other way around. The best evidence for this is the trend in rural wages. If there were large surpluses of idle rural workers, wages would be falling, but Figure 15.8 shows they are rising.

The signs of a rapid spread of mechanization are compellingly demonstrated in Chapter 7 for the Delta and Dry Zone. However, such signs are visible throughout Myanmar, including in all four of our surveys. Figure 15.9

FIGURE 15.9 Use of machinery in rice production, by state/zone



Source: Filipski et al. (2017); Htoo and Zu (2016); Thu, Htun, and Belton (2019).

shows that a large share of rice farmers uses machinery (two-wheel tractors, four-wheel tractors, or combine harvesters). Nearly all rice growers in the Delta (94 percent) and Shan State (84 percent) use machines, as do a large majority in the Dry Zone. Mechanization in Mon State is somewhat lower, likely because growing rice tends to be a minor activity for households there. In addition, the Mon State survey was conducted in 2015. This early date may make a significant difference in our results given that mechanization advanced at breakneck speed in Myanmar over the five years prior to 2020 (Belton and Filipski 2019).

Migration and agricultural land

Our data do not show evidence of land consolidation occurring in the wake of out-migration. A common narrative about rural-to-urban migration posits that it should go together with consolidation of agricultural landholdings—as some workers leave the countryside, others supposedly buy up or lease in the abandoned land to expand their holdings. Yet, we do not find evidence of this pattern occurring.

In Mon State, the average agricultural landholding stayed at 2.5 acres between 2010 and 2015 (Filipski et al. 2017). In the Delta, while there had been a wave of land confiscations and appropriations for the creation of fish-ponds in the 1980s and 1990s, our survey revealed very few occurrences of land loss or disposal in the more recent past.

This absence of land consolidation despite rapid structural transformation is common in Southeast Asia. Liu and colleagues (2020) find a remarkably stable distribution of landholding sizes in Viet Nam over the period from 1992 to 2016 despite dramatic structural change in the economy. Similar patterns are observed in other countries in the region (Rigg, Salamanca, and Thompson 2016).

The reasons for these trends are likely manifold and complex. One is that landlessness in Myanmar tends to be high. In Mon State, 60 percent of households do not own agricultural land (Filipski et al. 2017). In the Dry Zone, 40 percent of rural households neither own nor operate any land, and landlessness is increasing with each generation (Hein et al. 2015). Migration may be linked partly to this landlessness. Another reason we do not see out-migration leading to land consolidation may be that migrants remain strongly attached to their home village. They typically leave family members behind and often plan to return. This is particularly the case with international migrants, whose goal is almost invariably to return after they have met their income goals, even after a decade or more away. As Figure 15.7 shows, returning migrants tend to return to farming. As observed in neighboring Thailand, the reluctance of many rural households to divest of even small and fragmented agricultural landholdings may also reflect the precarity of many forms of off-farm employment, including migrant work, and the near absence of social safety nets (Rigg 2019).

In some cases, migrants rent out their land in their absence. In Mon State, many farmers reported cultivating land they rented from their absent neighbors. However, rental rates were low, and respondents suggested that these arrangements were aimed more at safekeeping than at creating a significant income stream (Filipski et al. 2017).

Migration and agricultural investment

Because migration and remittances tend to be associated with rising incomes for rural households, there is scope for migration to spur growth in agriculture. Farmers with access to liquidity, such as through receipt of remittances, should be better able to invest in productivity-enhancing inputs or capital such as seeds, fertilizer, labor, or machinery. While we see relatively limited evidence of this in our four surveys, migration is clearly shaping the long-term prospects for the farming sector.

The share of households reportedly using remittances for agricultural operating costs is relatively small, at 9 percent in Shan State and 17 percent in the Dry Zone (Table 15.6). It is hard to infer a trend from these figures alone; on the one hand, the cumulative impact of remittances may be contributing significantly to agricultural growth over time. Even when migrant earnings are used to cover the costs of everyday living expenses rather than agricultural inputs, they can support agriculture indirectly by underpinning the ability of farm households to sustain themselves. On the other hand, the use of remittances for agricultural operating costs may simply be underwriting an underperforming agriculture sector, slowing decline rather than stimulating growth.

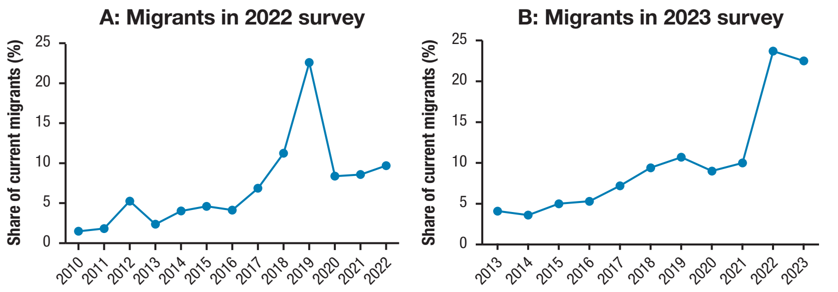
Remittances may lead to growth in agricultural productivity through investment in technology. A small fraction of households reported that their primary use of remittances was for the purchase of agricultural assets such as machinery (2, 5, and 8 percent in the Dry Zone, Shan State, and Mon State, respectively). If these technologies lead to yield growth over time, rather than simply reducing losses from rising labor costs, then remittances may have a lasting positive impact on agriculture.

Most migrants eventually return to farming (Figure 15.7), and many of them try to accumulate land in anticipation of that return. Returning migrants are more likely to have funds to invest in technologies for improved agricultural operations, including in machinery, irrigation, and commercial inputs. However, the impact of these agricultural investments may not appear clearly in agricultural production data for several years after their return. In Mon State, 24 percent of households receiving remittances reported their primary use being for agricultural land purchase, often to set up rubber plantations. Returns on such investments appear with a significant delay, making it difficult to assess the contributions of migration to agricultural growth.

Migration since the onset of the triple crises

Most of the previous sections relied on data collected prior to the onset of the COVID-19 pandemic and the 2021 coup. While much remains unclear about the current period, post-crisis data show that (1) COVID-19 disrupted migration abruptly and severely, and (2) this disruption was short-lived. Both of these findings can be seen in Figure 15.10, which shows when current migrants first left their homes, based on MHWS responses from the first half of 2022 (panel A) and then again in 2023 (panel B).

FIGURE 15.10 Year of first migration for migrants surveyed in 2022 and 2023



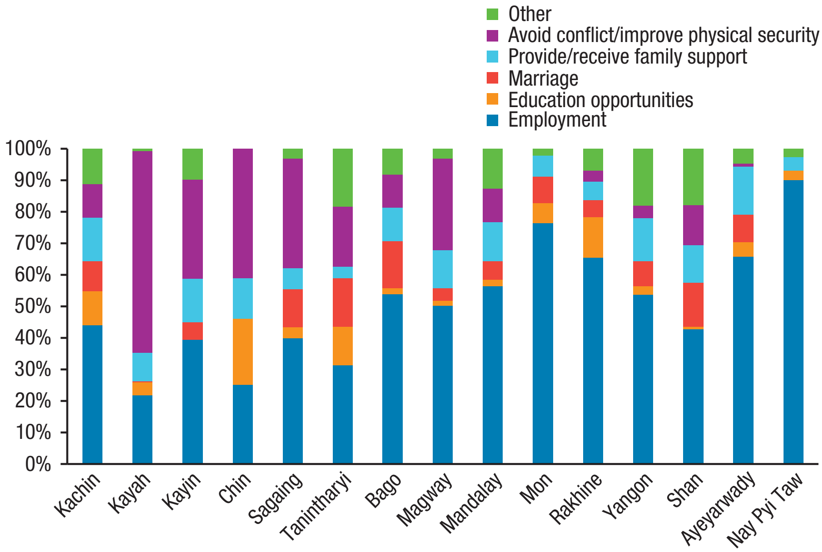
Source: Authors' analysis using MHWS and MAPSA (2024c). Migrants refers to household members migrating at time of survey.

In March 2020, Myanmar reported its first positive case of COVID-19, and the government put travel restrictions and lockdown measures in place shortly after that. China, Malaysia, and Thailand all severely restricted legal border crossings. Domestically, Myanmar dramatically reduced passenger transit services and restricted the use of certain highways (Diao et al. 2020). As a result, out-migration from the rural sector essentially halted for a few months, leading to the sharp drop we see in panel (A) of Figure 15.10. Studies have shown that this also led to rapid and massive return migration, as those who had already migrated found themselves out of work and sometimes without accommodation. An estimated 1 million migrants returned from abroad (Diao et al. 2020). This also decreased remittance flows, with severe consequences for income and consumption, providing a stark reminder that reliance on remittances can increase the vulnerability of an economy to shocks (Boughton et al. 2021; Diao et al. 2020).

In the years since the onset of the crisis, however, the migration trends from before the COVID-19 shock have resumed. The right side of Figure 15.10 shows a sharp increase in 2022, and the years 2019 to 2020 appear as a mere slowdown. Between December 2021 and June 2023, an estimated 19.9 percent of the adult population left their household (MAPSA 2024c). The crises may have, in fact, accelerated migration, as it remains one of the primary coping mechanisms in difficult economic times (see Chapter 5).

Part of the resumption of migration may be due to the political situation. On a nationwide scale, economic factors still dominate. Recent analyses show that about 70 percent of migrants cite economic opportunities as their primary reason for migration in 2021 to 2023, the same share as in the 2010s (MAPSA 2024c). Only 2 percent cite conflict as the primary reason.

FIGURE 15.11 Main drivers reported for whole-household internal migration, February 2021–July 2023



Source: Author's calculations based on MHWS data.

However, regionally, conflict emerges as a key driver. This is especially stark if we look at whole-household migration rather than household-member migration (Figure 15.11).

Between February 2021 and June 2023, approximately 10 percent of households migrated as a family unit. Nationwide, employment is the main driver, and only 15 percent cite physical security as the main reason for moving. However, in Kayah State, 70 percent of migration was conflict-driven (Figure 15.11). In the states of Chin, Sagaing, Kayin, and Magway, 30 to 50 percent of households that migrated cited conflict avoidance as their primary reason.

In terms of who migrates, where they migrate to, and what jobs they undertake while migrating, current patterns largely reflect those of the pre-crisis period (MAPSA 2024c). Remittances remain a major contributor to household incomes. In the 2023 survey, 16 percent of households were receiving remittances, which accounted for 7 percent of total income in the rural sector but 39 percent of the income of households receiving remittances (MAPSA 2024b). Remittances continue to be spent mostly on day-to-day expenses. Only a small share of households (12 to 15 percent) reports using remittances for savings or productive investments.

Conclusion

Myanmar's sustained migration flows and accompanying structural transformation are not unique in Southeast Asia. Other countries in the region, like Thailand and Viet Nam, began similar processes several decades earlier (Tarp 2015). Yet, Myanmar presents several specificities, including certain advantages that come with being a late starter in the region, such as technology spillovers to draw upon and developed regional markets in which to participate. Myanmar can cheaply and easily send millions of migrants to higher-income neighboring countries where labor is needed and wages are significantly higher. This situation contributed to the acceleration of migration seen in the years since 2011.

A good indicator of the economic importance of migration as an income-generating strategy is the total estimated size of remittances. According to World Bank data, total international remittances have hovered roughly between \$3 billion and \$4 billion per year in the past decade (World Bank 2024), not far behind the total value of agrifood exports, which hovered between \$3.5 billion and \$5.0 billion in the pre-COVID years (Chapter 14). If we add domestic remittances to that total, migration certainly cannot be ignored as a major economic driver.

Though migration appears to have contributed to income growth, rural economic diversification, and perhaps agricultural development, many uncertainties remain regarding these benefits. All migration is inspired by a combination of push and pull factors, and its contribution to economic growth and the welfare of populations depends in part on which dominates. Following the triple crisis, escaping conflict is increasingly the push factor behind migration. Remittances are increasingly being used to meet daily household needs instead of savings or productive investments. However, households that receive remittances are less likely to be income poor (see Chapter 5). In the face of the current economic challenges, migration likely will continue to increase, but the hope that remittances will help reinvigorate Myanmar's farm sector remains slim.

Even as migration continues to grow as a driver of household incomes, policy challenges remain. Migration remains a risky activity, with migrants being vulnerable to crime and exploitation, particularly when they are undocumented. In a conflict-prone environment, this is even more important, as individuals are more willing to risk migrating into a precarious situation in order to escape conflict. Domestic and foreign policy efforts are needed to ensure that migration is safe and legal and that migrants benefit from legal protection in Myanmar and abroad.

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Chapter 16

INCOME DIVERSIFICATION AND THE RURAL NONFARM ECONOMY

Susan Paudel, Mateusz Filipski, and Bart Minten

The rapid transformation of the rural sector between 2011 and 2021 has been well-documented in relation to farming and included profound changes in crops grown, farming practices, markets, and value chains. This transformation has been described in this volume, as well as in Belton and Filipski (2019), Filipski et al. (2020), Boughton et al. (2018), and World Bank (2017). However, this period also witnessed a diversification of activities away from agriculture (Boughton et al. 2020; Phyo et al. 2016; Pritchard, Rammohan, and Vicol 2018), with incomes shifting away from reliance on subsistence farming and agriculture in general. The contributions of wage work and rural nonfarm businesses are growing in importance as the rural sector moves beyond an agrarian model in which primary agricultural production is the dominant source of wealth (Belton et al. 2017). Though the general equilibrium analysis from Chapter 2 shows that agriculture remains a major driver of economic activity, a micro-level analysis finds that activities either downstream in the food value chain or outside of the food system entirely are now responsible for large shares of rural incomes.

This chapter sheds light on the nature and extent of these diversification processes, based primarily on nationally representative data from the 2017 Myanmar Living Conditions Survey (MLCS) (CSO 2019), as well as on the Myanmar Household Welfare Survey (MHWS) of 2021/22. We analyze patterns in income generation off the farm, including wage employment (agricultural and nonagricultural) and nonfarm businesses. Beyond documenting a propensity to participate in these off-farm income-generating activities, we provide a detailed snapshot of the relevant sectoral and demographic patterns, along with statistical and econometric analyses. A unique feature is our use of a national dataset, which complements regional efforts to document rural diversification in Myanmar, such as done by Phyo and colleagues (2016) for the Delta Zone.

We find evidence of extensive diversification: more than half of rural households engage in nonfarm activities, which contribute at least one-third of total rural household incomes. Despite this large participation, the nonfarm sector is informal and has yet to reach its full job-creating potential. Diversification is broad-reaching and prevalent at all levels of income, though wealthier households participate more heavily in the nonfarm sector. Land constraints, household size, education levels, and gender all appear to be correlated with households' propensity to diversify.

Following Barrett, Reardon, and Webb (2001), we clarify some terms used throughout this chapter. "Farm" or "agricultural" work refers to any activity directly related to the production and sale of crops, livestock, or fish on a farm, whether the farm is owned or not, and includes agricultural wage work. As in MLCS, primary sector workers in forestry and fishery are included with agriculture—we refer to this as the agriculture sector, as farming is the overwhelmingly dominant category. All other work is considered "nonagricultural" or "nonfarm"—that is, nonfarm wage employment and nonfarm business activities. Nonfarm business activities may include the processing of agricultural goods or the transport or trading of agricultural goods other than those from one's own production. We also refer to the hybrid "off-farm work" category as any work away from one's own or rented farm, including any wage work or business activity, whether agricultural or not. Finally, all the categories defined above exclude passive income sources, such as rents or transfers, including remittances from relatives, as these do not require active work by current household members.

The chapter is organized as follows: we start with an overview of income diversification in the rural economy, and then give a detailed description of wage employment opportunities and the nonfarm business landscape. We next provide an econometric analysis of the correlates of income diversification. Before concluding, we analyze recent household data to shed light on the impact that the recent crises of COVID-19 in 2020 and the military coup in 2021 have had on these diversification processes.

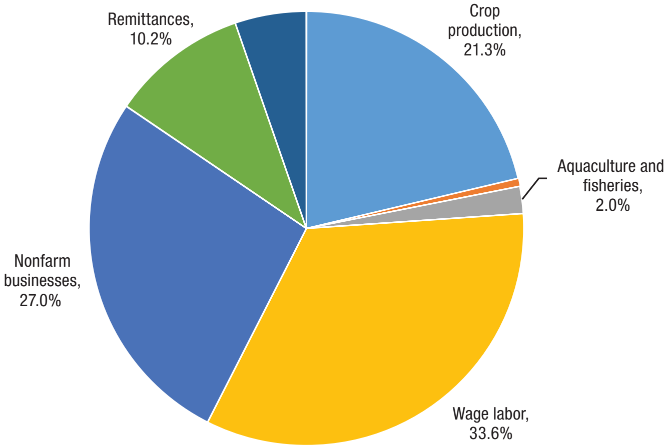
Diversification beyond agriculture

This section examines income sources by type of activity: on and off the farm, agricultural or not, for a wage or not. While agriculture remains important for the incomes of rural households, we show that it is far from dominant.

A reduced role for primary agriculture in rural incomes

While a large majority of rural households (70 percent) still engage in some form of agricultural production (crops, livestock, or fish), the importance of

FIGURE 16.1 Average distribution of income sources in Myanmar's rural sector



Source: Authors' analysis using MLCS 2017.

farming as an income-generating activity is far smaller. Figure 16.1 shows that merely 21 percent of rural incomes come from crop production, with livestock sales adding less than 1 percent and aquaculture only 2 percent (even when lumped with fisheries).[1] These shares refer to production on plots operated by the household (owned or potentially rented in). They include own consumption of farmed goods (valued at their market equivalent), so they account for subsistence farming. Overall, rural households generate only about 25 percent of their income on their farms.

The remaining income comes from wage labor (34 percent) and nonagricultural businesses (27 percent), with about 15 percent coming from passive sources (remittances and others). Broadly speaking, rural households draw about a quarter of their income from farming, a third from wage work, another quarter from running nonfarm businesses, and the remaining sixth mostly from transfers. This indicates a highly diversified rural economy. This finding echoes Chapter 2, which also demonstrates diverse contributions to GDP. The importance of remittances also echoes Chapter 15 on migration.

The largest source of rural income by far is wage labor at 34 percent. Wage labor is an off-farm activity, though not necessarily a nonfarm one. This

1 Note that the pie chart in Figure 16.1 shows shares of total incomes generated. Looking at average income shares produces a similar ranking of activities, with the difference being that the average income share from nonfarm businesses is lower (only 15 percent), and all other shares are higher by 1 to 3 percentage points.

distinction is particularly relevant in Myanmar, where landlessness among the rural population is high, as discussed in Chapter 6. For comparison, the rate of rural landlessness in Myanmar hovers around 50 percent (Boughton et al. 2018; Lambrecht et al. 2022; World Bank 2016) but is only 22 percent in Viet Nam (World Bank 2012), and below 28 percent in Cambodia (GRET 2021; Mellac and Castellanet 2015; Phann et al. 2015). A large class of landless agricultural laborers could explain why 33.6 percent of rural income derives from off-farm wage work, with 55.8 percent of households participating in it. However, further breaking down wage work into agricultural and nonagricultural jobs shows that the two contribute roughly equally to income—about 17 percent each (Table 16.1). While we do not know the number of workers involved or days worked, we can still conclude that nonagricultural jobs are now as big an income generator as farm jobs in Myanmar's rural sector.

Because earnings in the farm sector are low, the small contribution of agriculture to incomes is explained partly by sectoral earning disparities. Indeed, the shares of participation in agricultural activities (bottom panel of Table 16.1) are much higher than the shares of income from these activities (upper panel of Table 16.1), meaning that many workers engage in them but make little money. Similarly, participation in agricultural wage work tends to be higher, but it is less lucrative. More than a quarter of households (26.8 percent) have wage workers who work only on farms, compared with 19 percent with only nonfarm wage workers; only 9.4 percent do both. In total, 36.2 percent of households have at least some members engaging in some nonfarm wage work, bringing in 16.7 percent of income.

The rightmost four columns of Table 16.1 further break down these statistics by agroecological zones (AEZs). They reveal only mild disparities overall. The Delta and the Coastal Zone are less reliant on farming (even when including fishing and fish farming) than the Dry Zone or the Hills and Mountains. This likely reflects an array of factors, such as proximity to urban centers and higher rates of landlessness (Belton et al. 2021). The Hills and Mountains zone is the most agriculture-intensive region in both participation and income. However, even there, the total share of rural income from any agricultural work (farming plus farm wage work) is only 56 percent. At the turn of the millennium, primary agriculture was the dominant income generator for Myanmar's rural population (Dapice 2003). This is not the case anymore.

Rural wealth is becoming detached from land

We look for associations in our data between wealth and income diversification along two dimensions of wealth: total income and total landholdings.

TABLE 16.1 Importance of different activities in household income, by agroecological zone

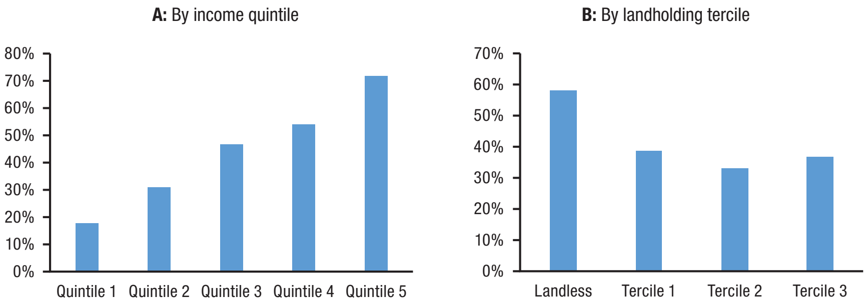
Activity	All	Delta	Coastal Zone	Dry Zone	Hills and Mountains
Share of household income from activity (%)					
Aquaculture/fisheries	2.9	2.6	8.1	0.5	0.3
Crop production	20.1	21.8	10.8	21.1	26.9
Livestock	0.7	0.2	0.2	0.9	1.4
Nonfarm businesses	27.5	24.6	31.7	29.5	24.0
Remittances	10.5	10.0	10.6	9.6	11.9
Wage labor, of which:	33.7	34.6	34.8	32.7	32.9
a. Agricultural	16.7	14.8	19.6	20.2	12.3
b. Nonagricultural	17.0	19.8	15.2	12.5	20.7
Others	4.6	6.2	3.7	5.8	2.5
All agricultural work (farm or wage)	45.9	39.4	44.0	44.3	56.4
Share of households engaged in activity (%)					
Aquaculture/fisheries	11.9	18.3	19.4	2.1	13.0
Crop production	52.5	43.1	45.4	55.8	69.3
Livestock	58.5	58.9	54.3	59.7	57.7
Nonfarm businesses	30.0	33.0	33.5	30.0	22.4
Remittances	19.8	20.0	24.8	18.9	19.0
Wage labor, of which:	55.8	58.7	52.9	58.5	46.3
a. Only agricultural	26.8	28.5	28.5	26.3	20.9
b. Only nonagricultural	19.5	20.8	15.4	21.9	17.6
c. Both	9.4	9.5	9.0	10.2	7.8
Others	20.7	22.7	9.8	29.3	6.2
Any agricultural work (farm or wage)	78.9	71.8	78.8	77.4	85.9

Source: Authors' calculations using MLCS 2017.

We define five income quintiles (1 being the poorest and 5 the wealthiest) and three landholding terciles (1 being the smallest at 33.3 percent of landholdings and 3 the largest).

There is a very strong relationship between income levels and participation in nonagricultural activities, meaning nonfarm businesses or nonfarm wage work. Participation shares grow from each income quintile to the next (Figure 16.2, panel A). Only 24 percent of the poorest quintile households derive income from nonagricultural sources; among the richest households, that share is 77 percent.

FIGURE 16.2 Participation by rural households in nonagricultural work, by income quintile and landholding tercile



Source: Authors' analysis using MLCS 2017.

This strong association likely reflects a bidirectional causal relationship. Wealthier households are likely to be better able to engage in nonagricultural activities, having the financial means and likely greater human capital and more expansive network connections. Conversely, engaging in nonagricultural activities likely generates higher incomes. While this does not preclude the existence of "distress diversification" (whereby the poorest households are forced into the nonfarm sector by lack of other options), this is clearly not the norm in our data.

The correlation between land ownership and nonagricultural work is much weaker. Landless households are, perhaps unsurprisingly, the most likely to engage in nonagricultural work, at 58 percent (Figure 16.2, panel B). However, among landed households, the shares are remarkably similar: roughly 35 percent of landed households derive some income from nonagricultural activity. Even households with the largest landholdings in tercile 3 are likely to have members engaging in nonfarm work.

Taken together, these results suggest that the sources of wealth in the rural sector may be shifting. Rural wealth may increasingly be determined by other forms of capital-supporting nonfarm activities rather than being based primarily on farmland, as it would be in a purely agrarian economy. This also echoes the important role of off-farm activities in GDP, as documented in Chapter 2. As Rigg (2006) observed more than a decade ago for several low-income countries, "[rural livelihoods] are becoming delinked from land." It also follows that diversification in the rural sector is likely linked to economic growth rather than distress. Martin and Lorenzen (2016) have reached similar conclusions for the neighboring Lao People's Democratic Republic.

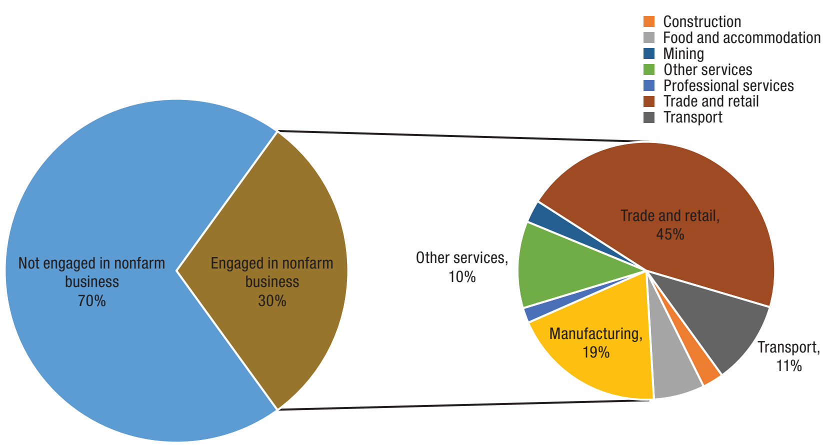
The rural nonfarm business landscape

Operating a nonfarm business is the second most common occupation after agriculture in the sample. Thirty percent of surveyed rural households engage in some form of nonfarm business (Figure 16.3). Additionally, a quarter of households with nonfarm businesses operate more than one. Regionally, participation in rural nonfarm enterprise is slightly higher (40 percent) than in Thailand (Chawanote 2012), slightly lower (22 percent) than in the Philippines (Anabo 2021), and relatively close (32 percent) to the level in Bangladesh (Sen, Dorosh, and Ahmed 2021).

A diversity of businesses operate in the rural sector, but trade and retail dominate (45 percent). This includes any wholesale or retail trade, from food to motor vehicles. The next largest category is manufacturing (19 percent), which includes a diverse range of activities. The most common are food processing and textiles, but also manufacturing refined petroleum, furniture, paper products, and rubber and plastic products, among others. Transport services account for 11 percent of rural businesses.

The remaining categories include mining, food and accommodation, construction, utilities (small-scale electricity, water collection services), and professional services, such as health, education, and finances, as well as the catch-all category of "other services." Businesses linked to the agriculture sector are spread across all these different subcategories: 11 percent of nonfarm businesses still reported being agriculture-related, for example, food processing. Among the remaining activities, some may still be linked to a part of

FIGURE 16.3 Rural households engaging in various types of nonfarm businesses



Source: Authors' analysis using MLCS 2017.

the agrifood system writ large, for example, restaurants, but are increasingly remote from farming itself. These results suggest a decreased role for farming in rural enterprise.

Regional patterns

Trade and retail businesses are the most widespread type of nonfarm business across all four AEZs (Table 16.2). Overall, the second most important business type is manufacturing, which is particularly dominant in the Dry Zone. Transport services also occupy a large share in the Delta, likely reflecting higher population densities and proximity to Yangon markets and infrastructure.

Conversely, some types of businesses are more likely to be concentrated in some areas. The Delta Zone, which is home to 42.2 percent of the rural population and close to the fast-growing Yangon metropolitan area, has a disproportionately high share of transport, construction, and food and accommodation businesses. The Dry Zone is home to about a third of the rural population but hosts more than half of manufacturing (56.8 percent) and mining (54 percent) enterprises in the country. Similarly, the Hills and Mountains zone hosts a large share of mining businesses, consistent with its significant mineral reserves, but a low share of manufacturing, utilities, and professional services, reflecting limited access to opportunities and infrastructure (Mohanty et al. 2018).

Characteristics of businesses

Most nonfarm businesses were established recently. Figure 16.4 reveals that most nonfarm businesses are relatively new. While some businesses have been operating for decades (above 60 years for the oldest), there are few of those in the sample. Of the businesses interviewed during the MLCS, 70 percent were less than 10 years old, and 60 percent were established after 2011, when economic reforms started. This suggests a rapid increase in the number of nonfarm businesses in the recent past.[2]

Almost 95 percent of businesses operate year-round. Because rural labor markets tend to tighten significantly at harvest time, this may imply that agriculture has released enough labor to staff nonfarm businesses throughout the year. More detailed data are needed to shed light on the underlying

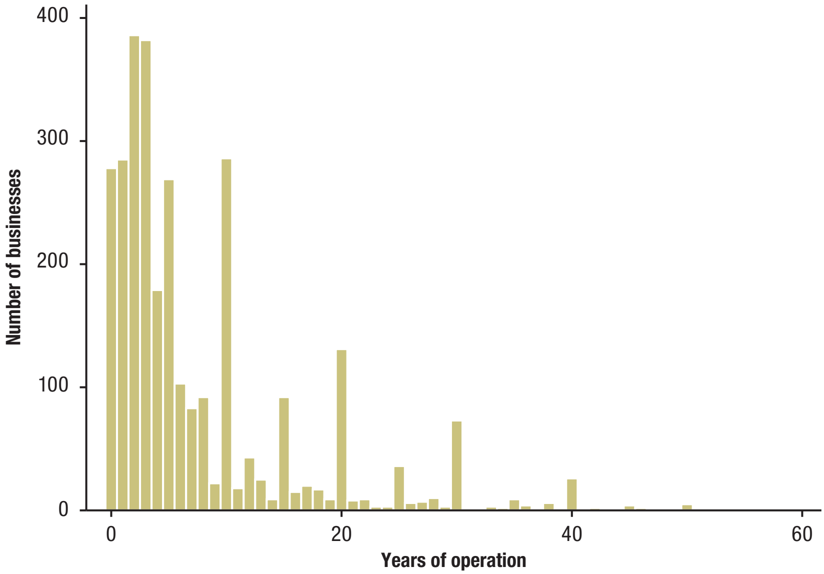
2 Because of a lack of historical data, we cannot rule out that these new businesses are simply replacing other failed businesses, in which case the total number of businesses would not be increasing. However, anecdotal evidence points overwhelmingly to a rapid growth in the number of rural nonfarm businesses.

TABLE 16.2 Distribution of businesses, by agroecological zone, percentage of all businesses

Nonfarm business	Total	Delta	Coastal Zone	Dry Zone	Hills and Mountains
Construction	2.6	3.0	3.3	1.3	4.3
Food and accommodation	6.4	7.6	5.8	4.5	7.9
Manufacturing	19.4	11.2	16.8	32.4	14.2
Mining	1.9	0.3	0.5	3.1	5.2
Professional services	2.8	2.4	3.5	3.5	2.1
Trade and retail	45.5	47.3	50.8	41.7	45.3
Transport	10.5	15.6	9.2	4.7	9.9
Utilities	0.2	0.1	0.4	0.2	0.1
Other services	10.8	12.5	9.7	8.8	11.1
Total	100.0	100.0	100.0	100.0	100.0

Source: Authors' calculations using MLCS 2017.

FIGURE 16.4 Distribution of businesses in rural Myanmar based on years of operation



Source: Authors' analysis using MLCS 2017.

causes, which could include population growth, labor-saving technologies, and deagrarianization.

Relatively informal enterprises dominate the business landscape. Of these, 52 percent are home operated, with another 26 percent mobile, including transport businesses but also some retail. Manufacturing businesses are overwhelmingly home based (86 percent), suggesting a dominance of informal operations with low capital investment. The vast majority (93 percent) of businesses interviewed in the MLCS were not registered in the municipal council or with the township/city development committee. Though this could partly reflect the complexity of registration procedures or lack of knowledge regarding legal obligations, it provides further evidence that most businesses are informal and likely small in scale.

A large proportion of enterprises (67 percent) are micro in scale, with only one worker involved (Figure 16.5), including the owner and any family or hired help. The share of enterprises involving more than 10 people is negligible, at only 1 percent. This figure is slightly higher for construction businesses, but even here, only 16 percent of businesses have more than 10 workers.

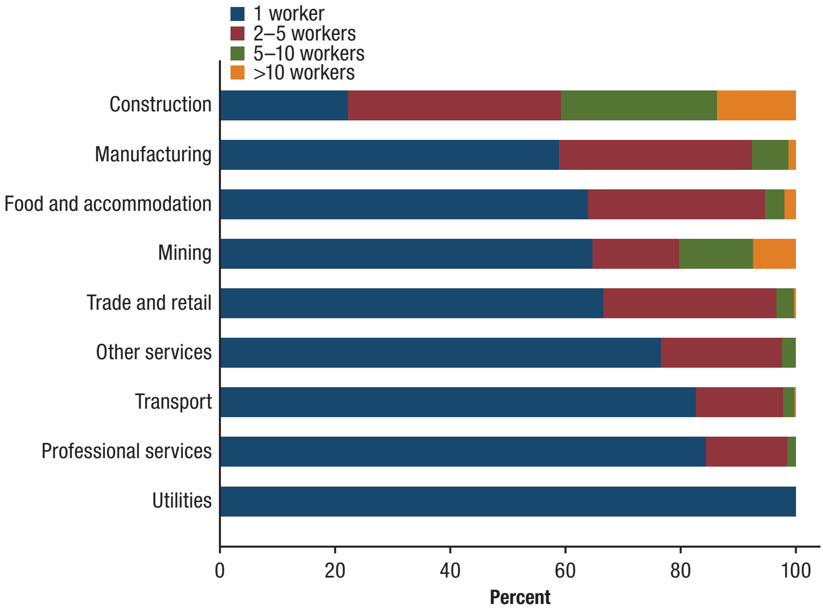
When there are several workers in the business, they are usually unpaid family members. About 88 percent of businesses rely purely on family labor. Among the remaining 12 percent, most hire very few workers. The dominance of self-employed, small-scale enterprises without paid employees is consistent with regional patterns and developing economies in general (Anabo 2021; Chawanote and Barrett 2012; Haggblade, Hazell, and Reardon 2007).

Construction and mining businesses generate slightly greater demand for hired labor, but the numbers remain low, with five and two people hired per business on average, respectively. This points to the small-scale and limited capital investment of these construction or mining operations. Thus, although nonfarm businesses are widespread and seem to be absorbing a growing share of the labor force, their ability to generate opportunities for hired employment remains limited.

Women represent 53 percent of nonfarm business owners (Table 16.3). Business owners tend to be relatively young (34 years old on average), and only 28 percent of them are the head of their household. Most are married (52 percent). Those characteristics are roughly in line with those of the general population.

Although the shares of men and women owning nonfarm enterprises are roughly equal, there is a high degree of gender differentiation in some specific businesses. Female ownership is lowest in mining (40 percent). In contrast,

FIGURE 16.5 Average number of workers (hired or family) in nonfarm businesses, by type



Source: Authors' analysis using MLCS 2017.

TABLE 16.3 Demographics of nonfarm business owners

Business type	Age (years) (mean)	Head of household (%)	Female (%)	Married (%)
Construction	30.0	29.2	50.7	46.2
Food and accommodation	35.6	27.1	57.6	49.6
Manufacturing	34.1	24.9	53.6	51.0
Mining	29.1	21.5	40.1	61.2
Professional services	36.6	21.5	52.1	62.8
Trade and retail	33.5	28.9	54.5	50.4
Transport	29.5	29.4	48.0	56.8
Utilities	40.8	33.5	50.6	58.3
Other services	35.2	30.5	51.6	52.9
All business owners	33.5	27.9	53.1	51.9
Population	31.3	23.3	52.7	48.0

Source: Authors' calculations using MLCS 2017.

food and accommodation businesses have higher shares of female owners (58 percent).

Business activities and wealth

More than half (56 percent) of business-owning households are landless (Table 16.4). Even accounting for the high rates of landlessness, the contribution of landless households to nonfarm businesses is disproportionately high. How to interpret this is not clear: it may be that land constraints push households to engage in nonfarm enterprises as an income-generating strategy. It may also be that low profits in farming lead people to abandon agriculture and sell their land or that a lack of wage work opportunities fuels self-employment. More research is needed to interpret the origins of this correlation fully.

Construction and transport businesses earn the most. Panel A of Figure 16.6 shows that average earnings are highest for construction businesses, followed by transport. This likely reflects capital intensity: construction businesses tend to require tools or machinery; transport service providers usually purchase or rent a single vehicle for their business. Manufacturing and utility businesses lie at the other extreme of median incomes, even though they are typically thought of as capital intensive, again suggesting that these are very small-scale operations.

Differences in earnings could simply reflect the scale of businesses, but these results are nearly perfectly reproduced using earnings per worker. Panel B of Figure 16.6 shows again that construction and transport businesses have the highest productivity in terms of earnings per worker, followed by food and accommodation. Manufacturing, professional services, and utilities are still at the bottom of the ranking.

The role of wage employment

This section takes a more in-depth look at wage employment, using data at the household member level from 5,398 household members who reported working for a wage (in cash or kind) during the previous 12 months. Note that about a third of these respondents reported working several jobs and provided information on their two primary wage activities.

Sectoral patterns

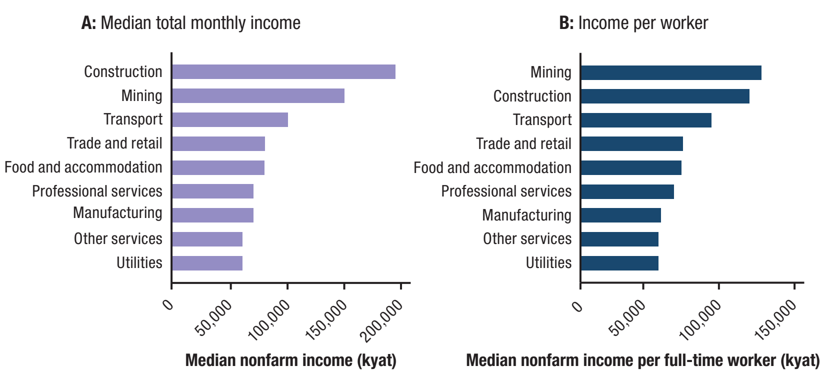
The household data analyzed in the previous section show that the share of households with at least one member engaging in nonagricultural wage work is large and, in fact, larger than the share of households with at least one

TABLE 16.4 Nonfarm businesses by landholding group, percentage owned by members of landholding group

Business type	Landless	Tercile 1 (smallest)	Tercile 2	Tercile 3 (largest)	Total
Construction	77.1	8.6	10.4	3.9	100.0
Food and accommodation	68.6	9.8	10.8	10.8	100.0
Manufacturing	48.0	15.2	19.8	17.1	100.0
Mining	51.7	6.8	20.8	20.7	100.0
Professional services	62.7	16.3	12.7	8.3	100.0
Trade and retail	56.3	12.7	14.5	16.5	100.0
Transport	67.6	8.3	11.4	12.7	100.0
Utilities	74.9	0.0	0.0	25.1	100.0
Other services	49.3	13.9	16.1	20.7	100.0
Total businesses	56.1	12.7	15.4	15.9	100.0
Population (%)	45.3	15.6	20.9	18.2	100.0

Source: Authors' calculations using MLCS 2017.

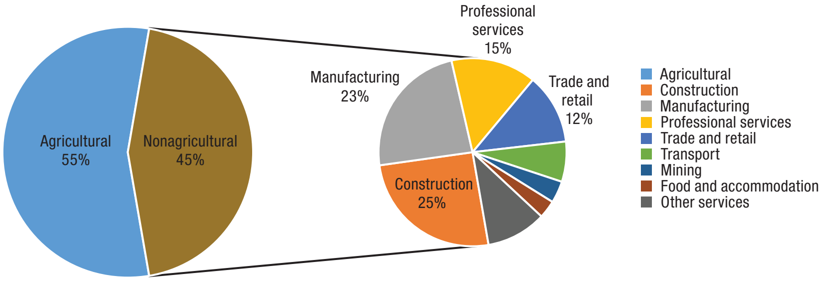
FIGURE 16.6 Median total monthly income and income per worker in nonfarm businesses, by type



Source: Authors' analysis using MLCS 2017.

agricultural worker. At the household member level, however, the picture is slightly different: of all the jobs reported in the data, 55 percent are agricultural, compared with 45 percent nonagricultural (Figure 16.7). This is likely because many members of the same household tend to work on farms. Thus, while the share of households relying on agricultural wage work has declined below that for nonagricultural wage work, farming is still the larger employer in terms of job numbers.

FIGURE 16.7 Sectoral division of wage occupations



Source: Authors' analysis using MLCS 2017.

Among nonagricultural wage occupations, the manufacturing and construction industries are the largest employers, with 23 and 25 percent each. Professional services provide 15 percent of nonagricultural paid jobs, and retail 12 percent. A number of categories split the remaining quarter of occupations. Overall, this points to a highly diversified set of nonfarm jobs for rural workers.

Table 16.5 shows the distribution of wage industries by AEZ. Some patterns emerge in the distribution of wage industries compared with population (given in the last row). The Hills and Mountains zone, which is home to 19 percent of the total population, has a significantly higher share of mining industries (38.2 percent), a lower share of agriculture (12.2 percent), and a much lower share of manufacturing (5.4 percent). This likely reflects the large mineral reserves in the area and poor agricultural land characteristics. Compared with the population distribution, the Delta has relatively higher shares of wage industries, particularly transport.

The wage employment sector is predominantly low skilled, with a majority of workers (64 percent) being categorized as such (Table 16.6). The remaining 36 percent includes skilled workers in the primary sector, craftspeople, and other workers who can be categorized as skilled and, thus, likely command a higher wage.

Wage work is almost invariably informal. An almost insignificant share (5 percent) of wage employees reported having a written contract. About 10 percent of wage-employed individuals have a pension plan from their employer, and a similar share is paid annual leave. About 85 percent of wage workers are employed by private individuals, and another 7 percent work for private organizations. The remaining 7 percent work as government employees.

TABLE 16.5 Industry of wage work, percentage distribution by agroecological zone

Industry	Delta	Coastal Zone	Dry Zone	Hills and Mountains	Total
Agriculture and fishing	42.9	9.1	35.8	12.2	100.0
Construction	38.4	7.0	41.3	13.3	100.0
Food and accommodation	36.8	10.9	24.7	27.6	100.0
Manufacturing	49.1	6.1	39.4	5.4	100.0
Mining	12.4	6.8	42.6	38.2	100.0
Professional services	37.1	8.6	32.1	22.2	100.0
Trade and retail	35.7	8.1	44.0	12.1	100.0
Transport	56.6	2.0	31.0	10.5	100.0
Other services	50.3	3.3	37.7	8.8	100.0
Total	42.5	8.9	36.8	12.7	100.0
Population (%)	36.0	9.6	35.3	19.0	100.0

Source: Authors' calculations using MLCS 2017.

TABLE 16.6 Wage work by occupational category

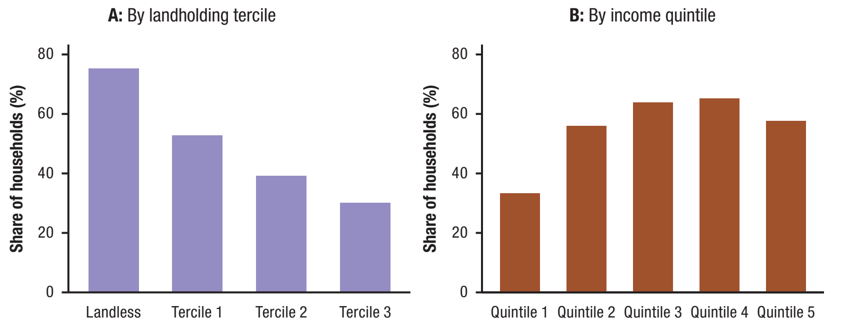
Main occupation	Number	Share (%)
Crafts and skilled trades	523	9.7
Low-skilled occupation	3,454	64.0
Managers	41	0.8
Plant operators and assemblers	136	2.5
Professionals	263	4.9
Services and sales workers	160	3.0
Skilled agriculture, forestry, and fishery workers	626	11.6
Others	195	3.6
Total	5,398	100.0

Source: Authors' calculations using MLCS 2017.

Wage work and wealth

Wage employment decreases gradually with wealth. Figure 16.8 shows the negative correlation between wage employment and landholding (panel A). Seventy-two percent of landless households are involved in wage employment. This share decreases in each successive landholding tercile to only 31 percent in tercile 3. We also find a somewhat less dramatic positive correlation between wage employment and household income (panel B). Wage labor is generally thought of as low-productivity work. Better-off households tend

FIGURE 16.8 Household participation in wage employment, by income quintile and landholding tercile



Source: Authors' analysis using MLCS 2017.

Note: Income quintile 1 consists of the poorest households. Landholding tercile 1 is made up of households with the smallest landholdings.

to engage in trade and industry, where they can earn higher incomes (Gordon and Craig 2001). However, here we find that the wealthier are more likely to engage in wage work. This suggests that the earnings potential from wage work can remain attractive in this rural economy. This result is likely driven by the large share of nonagricultural wage work within wage employment, which positively affects the participation of wealthier households.

Characteristics associated with diversification

Which household characteristics are most predictive of business activities? Which worker characteristics are associated with wage work? This section uses statistics and regression analysis to shed light on who powers the engines of this diversification.

We present the results of the analysis in two parts. First, we use regressions to explore the factors associated with participation in nonfarm business activities or nonfarm wage work. Second, we compute indices of income diversification at the household level and explore their correlates. Table 16.7 describes the variables used in the regression analysis.

Correlates of participation in nonfarm activities

Table 16.8 presents an analysis of the significant associates of household participation in nonfarm business and nonagricultural wage activities (marginals of logistic regression). Each value represents the increase (or, if negative, the

TABLE 16.7 Variables used in the regression analysis

Variable	Mean	Standard deviation
Dependent variable		
Nonfarm business participation	0.30	0.46
Nonagricultural wage participation	0.24	0.43
Nonfarm income share	0.35	0.44
Simpson's Diversity Index	0.17	0.21
Livelihood strategies		
Farm only	0.21	0.40
Farm and off-farm	0.54	0.49
Off-farm only	0.25	0.44
Explanatory variable		
Age of head of household (years)	50.60	14.73
Female head of household (1 = female)	0.20	0.40
Married head of household (1 = married)	0.75	0.43
Completed primary education, head of household (1 = yes)	0.29	0.46
Adult equivalents in household	4.13	1.84
Has migrant (1 = yes)	0.20	0.40
Area of farmland owned (hectares)	1.47	3.69
Household agricultural assets index	0.43	1.28
Agroecological zone (AEZ) (1 = yes)		
Delta	0.37	0.48
Coastal Zone	0.09	0.28
Dry Zone	0.34	0.47
Hills and Mountains	0.19	0.38

Source: Authors' calculations using MLCS 2017.

decrease) in the probability of participating in those activities associated with a 1-unit increase in the different variables.

Several factors appear significantly associated with nonfarm businesses (first column), some of which likely reflect life-cycle dynamics. A household with an older head is more likely to participate in nonfarm businesses (by 0.1 percent for each year of age), as are married households and those with more adults. Most strikingly, the educational level of the household head has a strongly significant association with the propensity to engage in nonfarm business activities: someone who completed primary school (or more) is 11.5 percent more likely to have a business than someone who did not. Land area is negatively associated with nonfarm business activities, reflecting

TABLE 16.8 Correlates of participation in nonfarm business activities

Correlate	Engagement in nonfarm business		Nonagricultural wage employment	
	Marginal effect	Standard error	Marginal effect	Standard error
Age of head of household (years)	0.001*	(0.000)	−0.001***	(0.000)
Female head of household (1 = female)	0.015	(0.020)	0.019	(0.018)
Married head of household (1 = married)	0.060**	(0.020)	−0.021	(0.018)
Completed primary education, head of household (1 = yes)	0.115***	(0.010)	0.118***	(0.009)
Adult equivalents in household	0.015***	(0.003)	0.030***	(0.002)
Has migrant (1 = yes)	−0.041**	(0.012)	−0.049***	(0.012)
Agricultural land area (hectares)	−0.008***	(0.002)	−0.020***	(0.003)
Household agricultural assets index	−0.006	(0.005)	−0.029***	(0.006)
Coastal AEZ (relative to Delta)	0.014	(0.017)	−0.091***	(0.015)
Dry Zone AEZ (relative to Delta)	−0.050***	(0.014)	−0.030*	(0.013)
Hills and Mountains AEZ (relative to Delta)	−0.125***	(0.013)	−0.084***	(0.012)
Observations	8,388		8,388	

Source: Authors' calculations using MLCS 2017.
Note: Marginals are from logistic regressions. AEZ = agroecological zone. * $p < .1$; ** $p < .05$; *** $p < .01$.

the propensity of the landless to start businesses, as well as smaller landholders needing to complement their farming income. We can expect these businesses to require low investment and have low barriers to entry for capital-constrained households, as revealed by Lanjouw, Quizon, and Sparrow (2001) in Tanzania.

The presence of migrants in the household is associated with decreased engagement in nonfarm businesses (even when controlling for household size). This may seem puzzling, as the literature often considers remittances as an important source of liquidity for investing in business activities. Our contrary finding could have a variety of explanations: nonfarm businesses may be considered too risky or not profitable enough, remittances may be too low to support investment, or high enough that the household gives up seeking business opportunities (dependency). Regardless, this finding echoes Chapter 15, which showed that remittances are primarily used for day-to-day purchases, not investment.

Participation in nonagricultural wage employment (second column of Table 16.8) follows very similar association patterns as for nonfarm business. Again, demographics and agricultural wealth matter significantly, as does the education of the household head. The importance of education in opening up higher-return nonfarm activities, and in particular high-paying nonagricultural jobs, has been well documented in the literature (Babatunde and Qaim 2010; Barrett, Reardon, and Webb 2001; Deininger and Olinto 2001; Reardon et al. 2000). Again, we find that having migrants is negatively associated with nonfarm wage participation.

Livelihood strategies and diversification

We classify households into three “livelihood strategy” categories according to whether their income comprises farm sources only, off-farm sources only, or a mix of the two. Table 16.9 presents characteristics associated with each strategy as marginals drawn from a multinomial logit regression.

Some household head characteristics correlate strongly with certain strategies. Older heads are more likely to draw income purely from off-farm activities. Women-headed households are also more likely to participate in off-farm activities only and less likely to rely on farm income only. The regression controls for land area owned, so this is likely not reflecting access to land, but rather other gendered patterns, perhaps related to land quality or productivity, time constraints, or social capital—we cannot know without further research. Education is again strongly associated with an off-farm early strategy. This reflects the high returns to education in terms of work opportunities and perhaps also the lower social status associated with farmwork.

Unsurprisingly, we also find that households with more working-age members are more likely to engage in a mix of farm and off-farm activities, and households with more land and agricultural assets are more likely to engage in farming (whether alone or in a mix of activities). Regionally, households in the Delta (the reference region) are least likely to engage in farming alone and most likely to engage in a mix, highlighting the opportunities that come with proximity to Yangon.

We further explore these questions by looking at the associates of two measures of income diversification. The first is the nonagricultural income share, which is simply the share of total household income generated from nonagricultural activities (business or wage work); the second is the Simpson’s Diversity Index. Figure 16.9 plots regression coefficients akin to those presented in Table 16.8 but uses tobit regressions to account for the fact that these explained variables are bounded.

The results are mostly in line with previous regressions. Education is highly correlated with the share of income from nonagricultural activities. Household agricultural assets and land ownership are both negatively associated with the nonagricultural income share. More adults in the household

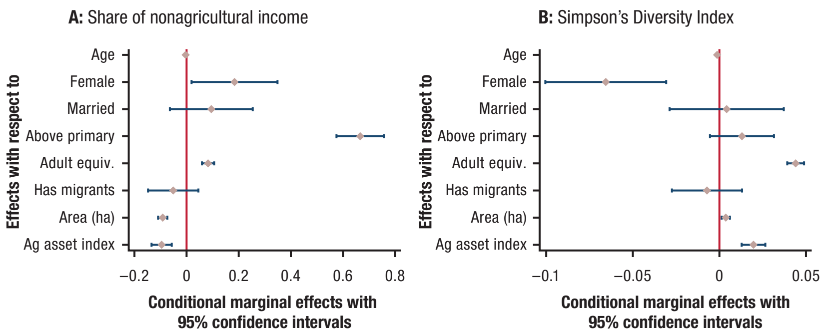
TABLE 16.9 Associates of livelihood strategies

Associate	Farm only		Farm + off-farm		Off-farm only	
	Marginal effect	Standard error	Marginal effect	Standard error	Marginal effect	Standard error
Age of head of household (years)	–0.000	(0.000)	–0.001***	(0.000)	0.001***	(0.000)
Female head of household (1 = female)	–0.043**	(0.017)	–0.008	(0.020)	0.050***	(0.015)
Married head of household (1 = married)	–0.018	(0.016)	0.025	(0.019)	–0.007	(0.015)
Completed primary education, head of household (1 = yes)	–0.066***	(0.009)	–0.003	(0.011)	0.069***	(0.009)
Adult equivalents in household	–0.010***	(0.002)	0.029***	(0.003)	–0.019***	(0.002)
Has migrant (1 = yes)	–2.581	(79.541)	1.994	(60.812)	0.586	(18.729)
Agricultural land area (hectares)	0.048***	(0.002)	0.149***	(0.005)	–0.196***	(0.007)
Household agricultural assets index	0.088***	(0.008)	0.244***	(0.024)	–0.332***	(0.031)
Coastal Zone (relative to Delta)	0.035**	(0.015)	–0.037**	(0.019)	0.002	(0.015)
Dry Zone (relative to Delta)	0.024**	(0.009)	–0.063***	(0.012)	0.039***	(0.010)
Hills and Mountains (relative to Delta)	0.201***	(0.013)	–0.150***	(0.014)	–0.051***	(0.012)
Observations	8,388		8,388		8,388	

Source: Authors' calculations using MLCS 2017.

Note: Marginals from logistic regressions. * $p < .1$; ** $p < .05$; *** $p < .01$.

FIGURE 16.9 Correlates of the nonagricultural share of income (tobit regressions)



Source: Authors' analysis using MLCS 2017.

Note: "Age," "Female," "Married," and "Above primary" refer to the household head. "Area (ha)" refers to the household's arable land area. ha = hectares. Ag = agricultural.

correlates with higher shares of nonagricultural income, but having migrants is again negatively correlated, echoing the results from Table 16.8.

Turning to the Simpson's Diversity Index, two results stand out. Households headed by women are correlated with lower income diversification (controlling for other factors), which may suggest opportunity constraints. Agricultural assets are associated with higher diversification, which is likely capturing a wealth effect.

The rural nonfarm sector since 2021

Since the survey used to generate the above results was conducted in 2017, the crises of COVID-19 in 2020 and the 2021 military coup have substantially altered the activities of Myanmar's rural landscape. To shed light on these changes, we analyze three rounds of the MHWS, conducted roughly around January/February 2022 (Round 1), April/May 2022 (Round 2), and July/August 2022 (Round 3). The phone surveys are not from the same sample as the MLCS used in the rest of the chapter, nor did they ask the exact same questions. Nevertheless, they provide the most comparable existing estimates in terms of scope and nature and help clarify how the situation has evolved since the MLCS.

With pandemic-related lockdowns and political instability, a first concern is that labor markets may have thinned, reducing work opportunities and disrupting business operations. We see evidence of this in the MHWS when looking at challenges reported by nonfarm business operators (Table 16.10). Most businesses report having recently experienced some challenges. In Round 1, only 27 percent reported no difficulties, while 27 percent complained of high input prices. Access to businesses became an issue, with 15 percent complaining that their customers could not reach them and another 18.5 percent lamenting the low number of customers. Both of these shares decreased in Rounds 2 and 3, suggesting the situation has improved somewhat—but issues remain.

We further see evidence of a slowdown for wage laborers, with nearly half reporting some difficulties (Table 16.11). The most common issue reported is reduction of working hours, followed by reduction in wages, which reflects the labor surplus.

These challenges are likely harming household incomes. Indeed, a substantial share of rural households in the MHWS reported a considerable drop in income (Table 16.11). The data presented refer to the change for each income source between July/August 2021 and July/August 2022, when the third

TABLE 16.10 Difficulties encountered by nonfarm rural businesses in the triple crisis in 2022

Difficulty (%)	Round 1	Round 2	Round 3
No difficulty	27.1	41.3	40.7
Customers cannot reach business	14.8	6.9	8.8
Disruption to banking or loans	4.1	5.1	1.5
Fewer customers	18.5	12.2	9.6
High prices of supply, fuel, transport, or electricity	27.0	25.4	24.5
Labor shortages	1.7	0.7	1.1
Supply disruptions	6.5	7.8	7.5
Other COVID-related disruptions	0.1	0.1	0.2
Other	0.3	0.6	6.1
Total	100.0	100.0	100.0

Source: Authors' calculations using MHWS 2022.

TABLE 16.11 Difficulties encountered by rural wage workers in the triple crisis in 2022

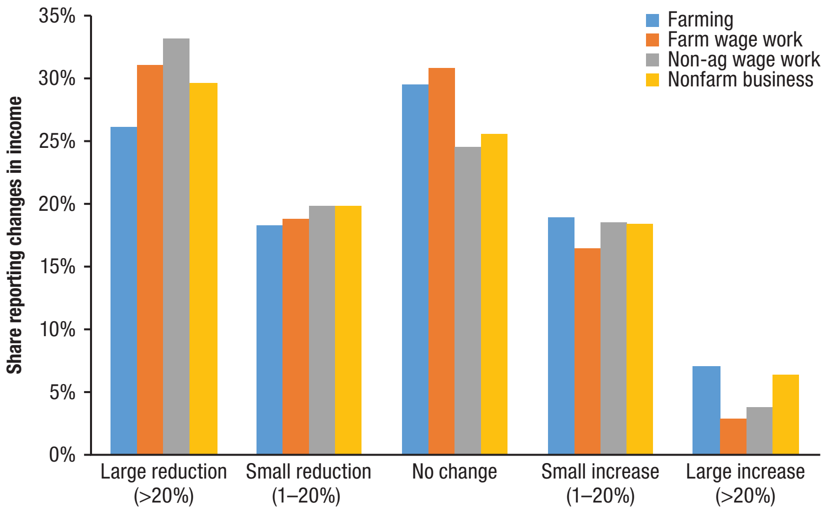
Difficulty (%)	Round 2	Round 3
No difficulty	55.2	54.0
Health issues (self or household member)	3.3	4.0
Low or reduced wages	8.8	6.9
Not able to reach work location	1.2	1.6
Not safe at work location	2.2	2.6
Not safe to travel to work location	6.5	6.6
Reduced working hours or less work	22.5	21.6
Other	0.4	2.7
Total	100.0	100.0

Source: Authors' calculations using MHWS 2022.
Note: Data for Round 1 are not available.

round of the survey was conducted. An important caveat is that the baseline here is mid-2021, when households may already have been affected by COVID-19 and the political crisis—so we cannot say for sure how this compares with pre-crisis levels and that this reflects nominal income changes.

Nearly a third of households reported decreases of income of more than 20 percent across all activity types (Figure 16.10). Meanwhile, only about 5 percent of households reported increases of more than 20 percent. This demonstrates the overall economic difficulties in 2022: many more households had a bad year as opposed to a good one. However, a majority of

FIGURE 16.10 Change in income compared with the previous year (July/August 2022 vs. July/August 2021)



Source: Authors' analysis using MHWS 2022.

households did not report significant changes, with about 30 percent reporting no change and roughly equal shares reporting small reductions or small increases, balancing out on average.

The reported trends above do not capture changes in real terms very well—inflation was substantial in 2022. To get at real changes, we look at the wages of agricultural laborers in particular, taking advantage of data in the MHWS on wage levels for men and women for different periods of the agricultural year and for previous years. As reliable price inflation numbers are lacking in rural Myanmar, we estimate real wages in three ways—by adjusting the wages received using a food price inflation index, by converting wages to kilograms of rice, and by converting them to US dollars using market exchange rates.

We use the three measures to derive estimates of real wages (Figure 16.11), as follows:

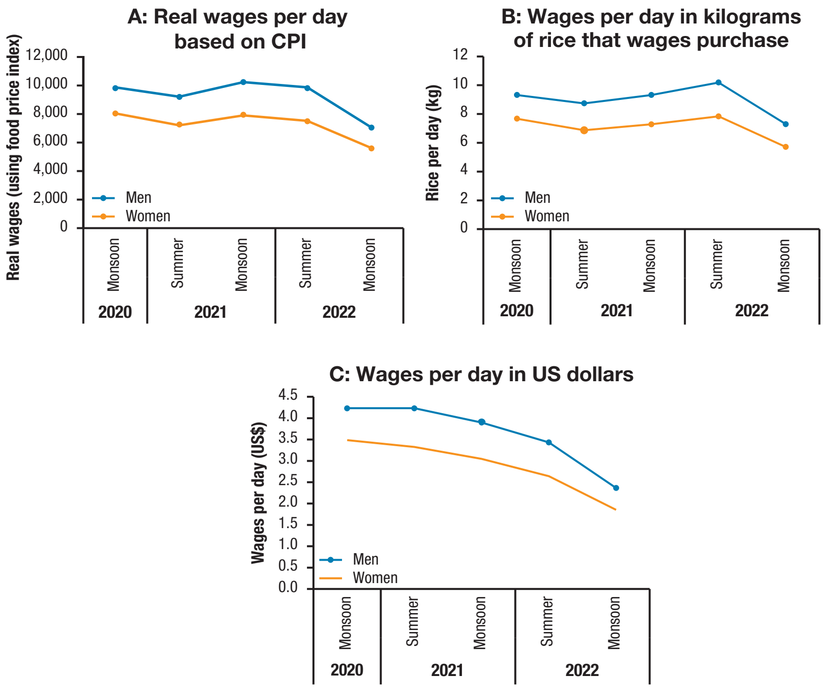
- First, when we consider the costs of a standard food basket and calculate the purchasing power of agricultural laborers' wages, we find that these "real" wages had declined in August 2022 by 27 percent for men and 30 percent for women compared with two years earlier. Compared with one year earlier, the decline was 29 percent.

- Second, when wages are expressed in kilograms of rice that agricultural workers can buy, wages of men and women had declined by 22 percent over the previous year, from 9.3 kg to 7.3 kg for men and from 7.3 kg to 5.7 kg for women.
- Third, when agricultural wages are expressed in US dollars, during the monsoon of 2020, the mean wage paid was US$4.20 per day for men and US$3.50 per day for women. In the same period in 2022, these wages had fallen to almost half that level, by 44 percent for men to US$2.40 per day and by 47 percent for women to US$1.80 per day. In 2022 alone, a decline of 39 percent was seen.

These trends illustrate the significant real declines in 2022 in wages—and, therefore, incomes—for farm wage workers.

Finally, Figure 16.10 does not suggest major differences between the farm and nonfarm sectors: all four sectors have suffered very similar income shocks.

FIGURE 16.11 Real agricultural wages, 2020–2022, by gender of worker



Source: Authors' analysis using MHWS 2022.
Note: CPI = Consumer Price Index.

TABLE 16.12 Household participation in farm and nonfarm activities, by data source

	MLCS	MHWS (2022)		
Activity (% of households)	(2017)	Round 1	Round 2	Round 3
Farming	70.0	67.2	73.9	71.5
Agricultural wage work	36.2	34.7	29.4	35.6
Nonagricultural wage work	28.8	34.5	40.3	37.2
Nonfarm business	30.0	37.2	38.2	36.1

Source: Authors' calculations using MHWS 2022.

This suggests that the triple crisis has not disproportionately affected either the farm or nonfarm sector.

This is confirmed in Table 16.12, which shows participation shares in farm and nonfarm activities in our four surveys. The share of farming households is very similar in all surveys, as is the share of households engaging in agricultural wage activities. Participation in nonagricultural wage and nonfarm business activities is slightly lower in the MLCS than in the MHWS. This may reflect slightly different activity definitions between surveys, sampling differences, or the true increase in nonagricultural activities over time. Either way, the trend toward rural income diversification does not seem to have been interrupted.

Discussion and conclusion

Far from being dominated by subsistence agriculture, Myanmar's rural sector hosts a range of diversified economic activities. Most households engage in some form of off-farm work, and less than half of all incomes come directly from agriculture.

At the time of data collection, more than 55 percent of households had members engaged in wage work. While about half of these were farmworkers, the rest were employed in construction, manufacturing, trade, and other nonagricultural activities. Similarly, about a third of households had members engaged in a variety of nonfarm businesses, ranging from trade to construction to manufacturing. These data further demonstrate the diversity of activities beyond subsistence farming that support rural livelihoods.

Diversification is not unusual in developing rural areas (Barrett, Reardon, and Webb 2001), particularly where farming cycles release workers in the off-season (Losch, Fréguin-Gresh, and White 2012). Nor is it necessarily a sign of growth, as households may be driven to engage in odd jobs and informal businesses by resource constraints, that is, "distress diversification" (Martin and Lorenzen 2016). Our data show a clear correlation between diversification and wealth, suggesting that diversification is not predominantly of the distress type. Chapter 2 shows the growing importance of downstream food-system activities in processing, services, marketing, and trade, which further suggests that some of the diversification we see could be linked to growth opportunities. At the same time, diversification may also be viewed as a necessity to hedge against risks in an economic environment characterized by high uncertainty.

Since 2020, the rural sector has, along with the rest of the country, faced significant challenges related to COVID-19 and political instability. An encouraging sign is that incomes seem to have more or less stabilized for part of the population (at least in nominal terms), and the diversity of rural economic activities has been maintained. Nevertheless, our data also show that a sizeable portion (about a third) of respondents have faced significant hardships and nominal income losses of more than 20 percent. Casual agricultural wage laborers—among the poorest in the country—seem to have been hit particularly hard, as shown by strong declines in purchasing power since the start of the triple crisis.

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Chapter 17

WOMEN AND YOUTH IN AGRICULTURE

Isabel Lambrecht, Kristi Mahrt, Ame Cho, and Hnin Ei Win

Gendered social and cultural norms often strongly emphasize women's roles as caregivers. Such norms may, in turn, contribute to gender patterns in economic activity, including agricultural activity. Meanwhile, youth are at a critical stage in their lives as they transition from being "dependent" household members to a more independent stage of life, with increasing caregiving and income-generating responsibilities (Arslan et al. 2021). There may, therefore, be generational differences between youth and non-youth in terms of their contributions to economic activities—including the extent to which they are involved in one sector or another.

Knowing and understanding the gendered and generational contributions and roles of women, men, and youth in rural livelihoods and the inequalities therein are critical to designing policies and interventions (Abay et al. 2021; Christiaensen 2017; Cole et al. 2021). Without such evidence, policies and projects risk being designed on the basis of false assumptions, at best lowering efficiency and, at worst, leading to harmful outcomes. So far, only a handful of studies have described gender roles in Myanmar agriculture, and these rely on case study evidence and qualitative data. Little quantitative evidence is available about women's and youth's roles in agriculture in Myanmar and, more broadly, in the rural economy.

This chapter provides quantitative descriptive information on women's and youth's involvement in agriculture in rural Myanmar. We follow recent literature on youth's livelihoods and classify youth as those ages 15 to 24 years (Arslan et al. 2021). The chapter starts with a brief literature review, followed by a descriptive analysis based on a nationally representative survey. First, we focus on employment patterns in rural areas, in agriculture in particular. Second, we look at women's and youth's access to farmland, a key prerequisite for most household agricultural activities in a country where rental markets are thin. Third, we analyze access to credit, which is strongly associated with the ability to invest in farm and nonfarm enterprises. We follow with reflections on the impact of Myanmar's current crises on women's and youth's roles in agriculture and end with concluding remarks.

Gender and youth in rural Myanmar

Whether and to what extent gender inequalities and discrimination exist in Myanmar is an area of considerable debate—and confusion (Winterberger 2017). Historically, women in Myanmar are portrayed as having high status (Ikeya 2005). They are also considered to be freer and more independent than women in neighboring countries, such as China or India (Thawnghmung 2019). Yet attitudes about gender roles in Myanmar tend to be conservative (Htun and Jensenius 2020), and manifestations of gender inequality are apparent in several domains—such as women's political representation, positions in religious institutions, and attitudes about domestic violence (GEN 2015; Than 2014; Thawnghmung 2019). The extent of gender inequalities and discrimination thus depends heavily on the specific domain or topic, the unit of analysis, and the reference point (Winterberger 2017).

Contrasting pictures also emerge about Myanmar youth. On the one hand, some portray Myanmar's youth as being limited in access to economic opportunities and largely absent in political representation. Respect toward elders and "generational" systems of social norms may constrain young people's decision-making at home and about their livelihoods (Park 2021). However, others have also described youth as a powerful segment of the population. Myanmar's youth are recognized as drivers of past political change and a promising group advocating for future political change (Ra et al. 2021; SFCG 2018). Moreover, youth, particularly those migrating for work, can be drivers of economic prosperity for their households and communities (Belton and Filipski 2019; Filipski et al. 2021; Ra and Ju 2021).

Women outnumber men in Myanmar, with relatively similar gender ratios in rural areas (94 men to 100 women) and in urban centers (92 men to 100 women) (MoLIP 2017b). Rural-to-urban migration in Myanmar does not exhibit stark gender differences: exactly half of all rural-to-urban migrants in 2014 were women.[1] International migration is higher among men than women, but women still made up 38 percent of international migrants in 2014. Migration is more common among younger people. Nearly half

1 The census survey report defines recent migrants as those who have migrated in the past five years (MoLIP 2017a).

(47.5 percent) of all recent international migrants left Myanmar between the ages of 15 and 24 years old (MoLIP 2016).

Gender roles at home

Traditionally, household headship is assigned to men. In most communities, however, when a male household head passes away and is survived by a female spouse, she is considered the new head of household even if there are adult sons (Lambrecht et al. 2024). Men are expected to be the main income earners for their households, whereas women are expected to prioritize domestic and care-related activities (Faxon 2017; Lambrecht et al. 2024). Nevertheless, household members in Myanmar commonly pool their income (Akter et al. 2017; Lambrecht et al. 2024). Women play a prominent role in household finances and generally lead the day-to-day management of the household budget (Carnegie et al. 2020).

In the central part of the Dry Zone, Carnegie and colleagues (2020) find that women spend, on average, 4 to 5 hours per day on household and care work, while the average time men spend on such work is 0.5 to 1.0 hours per day. Carrying the responsibility for and taking on the largest share of household work leads to restrictions in women's time and mobility; married women with children often engage in small home-based economic activities that can be combined with their household and care responsibilities, such as selling food or offering services such as weaving, tailoring, or hairdressing (Thawnghmung 2019).

Education is often considered a powerful and empowering asset (Tembon and Fort 2008). In rural areas, among those at least 25 years old, more men than women have completed any education beyond the primary level (33.5 percent of men and 22.3 percent of women). However, more women than men have attained higher education (MoLIP 2017b). The gender gap in literacy rates is smaller: 90.7 percent of rural adult men are literate, compared with only 83.8 percent of rural adult women. Furthermore, we find much smaller gender gaps in younger age groups. Only a small gender gap is observed in youth literacy (94.5 percent for men and 93.5 percent for women). In rural areas, school attendance rates of rural children and young adults ages 5 to 24 years show a gender gap of 1.5 percent (MoLIP 2017a).

Property is considered jointly owned by both spouses or by all adult household members. Key assets such as agricultural land are thus perceived to be jointly owned (Lambrecht et al. 2024). Officially, land documents can have two names, but few people are aware of this (Boutry et al. 2017). Typically, only the name of the household head is written on the document, resulting in a gender gap in documented land rights (Lambrecht et al. 2024). Regardless of formal asset ownership status, spouses decide jointly on the purchase and sale of land, housing, or major assets (Akter et al. 2017).

Rural finance is an important tool for poverty reduction (Aung et al. 2019). Myanmar Agricultural Development Bank (MADB) is the main formal provider of credit in rural areas to farmers, mainly in support of paddy production (Okamoto, Lwin, and Fujita 2021). Having formal farmland ownership is a prerequisite to accessing MADB loans (Boutry et al. 2017). As land titles are often in the name of men, there is a risk that this requirement will reduce women's ability to borrow from MADB (Lambrecht et al. 2024).

A range of other formal lending options are available in rural Myanmar, including village revolving funds and credit cooperatives. Informal credit sources remain important and include loans from relatives, friends, gold shops, employers, traders, moneylenders, and village common funds (Okamoto, Lwin, and Fujita 2021). Saving, taking loans for basic consumption, and participating in microcredit groups are all often considered women's domains, but decisions to engage in savings or loans are generally made jointly (Carnegie et al. 2020).

Gender roles and youth agriculture

Both men and women work in the agriculture sector in Myanmar, yet men are considered "farmers" and women more often "helpers" or "laborers" (Carnegie et al. 2020; Faxon 2017). Generally, men are involved in specific tasks such as seedbed and land preparation, fertilizer spraying, and pesticide application. They are also more likely to perform tasks that require the use of machinery. Men and women share tasks such as weeding, manual harvesting, and postharvest activities. Women perform more manual tasks, such as spreading manure or hand weeding. Women often form small groups for transplanting rice, while men are often involved in uprooting and distributing seedlings. Women are also often charged with preparing lunch or snacks for hired laborers (Akter et al. 2017; Carnegie et al. 2020). These gender patterns are found across the diverse agroecological and ethnic settings in Myanmar (Faxon 2017).

A lower valuation of women's work is evident from a gender wage gap in agriculture. Women earn less than men, sometimes even for the same task (Faxon 2017; Thawnghmung 2019). Overall, men are more likely to be the main decision-makers in agriculture (Carnegie et al. 2020; Ragasa et al. 2020). Therefore, it is primarily men who engage with extension agents or participate in farmer groups and agricultural training (Akter et al. 2017; Carnegie et al. 2020; Ragasa et al. 2020). However, women's opinions are taken into consideration, and agricultural decisions are still often made jointly (Akter et al. 2017).

Little is documented about the roles of youth in agriculture in Myanmar. The general narrative is that youth no longer like working in the fields. Parents, too, may prefer their children to work in nonfarm activities rather than in the field. Young people often seek nonagricultural employment opportunities, and a significant share of youth migrate out of rural areas to urban centers or abroad for work (Aung 2019; Belton and Filipski 2019; Boutry et al. 2017; MoLIP 2016; World Bank, EMRF, and ARA 2018).

Myanmar households experience significant life-cycle effects in relation to access to land and, therefore, occupational choice. Younger households are often "temporarily" landless—that is, until they inherit or can purchase land and other necessary agricultural assets. Meanwhile, temporary arrangements for accessing farmland, such as renting or sharecropping, may provide an alternative to wage employment during such a transition period for young adults (Boutry et al. 2017).

Data and methodology

We rely primarily on the 2015 Myanmar Poverty and Living Conditions Survey (MPLCS) for our quantitative analysis,[2] which focuses on rural household members. Individual-level information is limited to adults ages 15 to 59 years. Following other recent work on youth and employment, for example, Arslan et al. (2021), we define youth as individuals between 15 and 24 years of age.

We focus on employment, agricultural labor, land rights, and loans. For each household member, the MPLCS employment module asks about work in the past seven days as well as any other employment in the past 12 months. We consider four main employment categories: household agricultural activities, nonagricultural enterprises, and agricultural and nonagricultural wage employment.[3] We categorize anyone who worked on household agricultural

2 In our analysis, the Coastal agroecological zone (AEZ) contains Tanintharyi, Mon, and Rakhine; the Dry AEZ—Sagaing, Magway, Mandalay, and Naypyidaw; the Delta AEZ—Bago, Yangon, and Ayeyarwady; and the Hills and Mountains AEZ—Kachin, Kayin, Kayah, Chin, and Shan.

3 The International Labour Organization (ILO) differentiates between work for pay or profit ("employment") and own-use production work, apprenticeships, or volunteer work (not considered employment). We adhere to the definition of employment as work for pay or profit. However, we capture a 12-month period rather than a seven-day recall, and, because of the survey structure, we are unable to adjust for own consumption of agricultural goods.

activities in the previous seven days or 12 months as employed. If the agricultural activities in a household are exclusively for home consumption purposes, this definition results in a small overestimation of agricultural self-employment in our analysis.[4] The variable “not in employment, education, or training” (NEET) focuses on those who have not been employed and were not in education or training in the past 12 months.

The quantitative analysis is mainly descriptive. The descriptive statistics are calculated using sampling weights to correct for biases related to the sampling strategy. We also employ exploratory regression analyses. These analyses are not intended to draw causal inferences but to obtain a more robust understanding of trends depending on the interplay of key life-cycle characteristics—gender, age, and parenthood—while controlling for education levels and geographic zones. We do not include land ownership as a variable in our employment regressions (Heckert et al. 2021), as the direct linkages with employment will disturb any clear patterns associated with the other life-cycle characteristics of interest. We use regular ordinary least squares regressions on employment. We tested significant differences of coefficients in men’s and women’s regressions following Clogg, Petkova, and Haritou (1995).

Results

Employment

RURAL EMPLOYMENT

Table 17.1 demonstrates the important contribution of agriculture to rural livelihoods in Myanmar. Forty-three percent of adults had worked in household agricultural activities in the previous year, whereas 22 percent had worked as agricultural wage workers. Moreover, a substantial proportion of nonagricultural enterprises and nonagricultural wage work is associated with the agrifood sector. An estimated 34 to 40 percent of enterprises fall within the agrifood sector, such as agricultural machinery dealers and operators and food processing, transport, and trading activities. Twenty-one percent of adults are not employed, among whom most are in the NEET category (18 percent of all adults) (Table 17.1).

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4 Agriculture includes farming, raising livestock, fishing, and forestry activities. Household agricultural activities include production both for household use and for sale. Among those who had performed any household agricultural activities in the previous seven days, 10 percent indicated that this was only for household consumption. There was no significant difference in this indicator between men and women.

TABLE 17.1 Rural adults (ages 15–59 years) participating in different types of employment, among all adults and among employed adults only

	All adults (%)				Employed adults (%)			
Employment past year	All	Men	Women	Test	All	Men	Women	Test
Household agriculture	43.3	53.7	34.5	**	55.1	58.4	51.2	**
Nonagricultural enterprise	18.7	18.6	18.9		23.8	20.2	28.1	**
Wage	35.2	44.2	27.6	**	44.7	48.0	40.9	**
Agricultural wage	22.1	25.7	19.1	**	28.2	27.9	28.5	
Nonagricultural wage	15.2	22.2	9.3	**	19.4	24.1	13.9	**
No employment	21.4	8.0	32.7	**	NA	NA	NA	
NEET	17.5	4.8	28.2	**	NA	NA	NA	
Education or training	3.9	3.2	4.5	*	NA	NA	NA	
Observations	6,162	2,821	3,341		4,698	2,558	2,140	

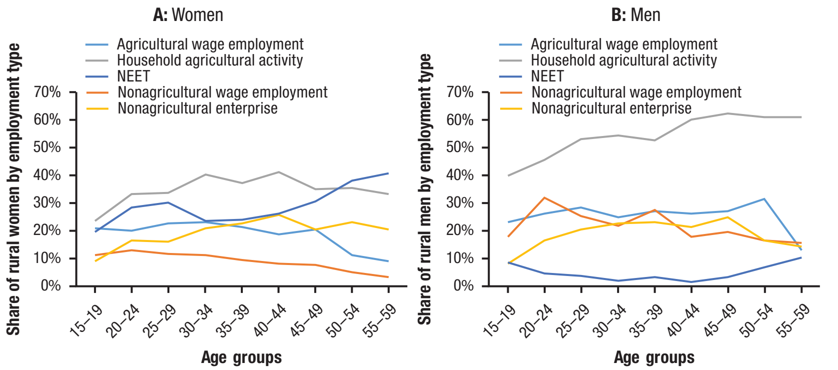
Source: Authors' calculations using MPLCS 2015.

Note: NEET = not in employment, education, or training. NA = not applicable. Individuals may engage in more than one type of employment. Individuals engaging in multiple activities are counted in each applicable category. Asterisks indicate statistically significant differences between men and women at * $p < .05$; ** $p < .01$.

Many women work in household agricultural activities or in agricultural wage employment—but to a lesser extent than men (Table 17.1 and Figure 17.1). About half of men (54 percent) and a third of women (35 percent) are engaged in household agricultural activities, and 26 percent of men and 19 percent of women in agricultural wage employment. The observed gender gap in agricultural employment is much smaller when considering the subgroup of employed adults: 58 percent of employed men and 51 percent of employed women are engaged in household agricultural activities. There is no longer a significant difference between the share of men and women employed in agricultural wage labor (each 28 percent).

Women are as likely as men to work in nonagricultural enterprises (Table 17.1). When considering only those who are employed, we find that employed women more often work in a nonagricultural enterprise than do employed men (28 vs. 20 percent) but are less likely to be in nonagricultural wage employment (14 vs. 24 percent). Women's participation in self-employment in nonagricultural enterprises likely relates to their greater work flexibility and the opportunities to combine this work with household and care activities. More women are classified as NEET (28 percent) when compared with men (5 percent), which is strongly related to women's responsibilities for household chores and care activities. Indeed, among those classified as NEET, 76 percent of women reported family responsibilities or household chores as a

FIGURE 17.1 Employment in the past 12 months, male and female rural adults, by age



Source: Authors' analysis using MPLCS 2015.
Note: NEET = not in employment, education, or training. Individuals may engage in multiple activities.

reason for not working in the previous seven days, but only 9 percent of men did so (not shown here).

Similar gender patterns emerge among youth, with young men more likely to work on household agricultural activities compared with young women, and young women, in particular, less likely to be employed than young men (Table 17.2). Youth more often work in wage labor than non-youth (38 vs. 35 percent) but are less likely to work in household agricultural and non-agricultural enterprise activities (Figure 17.1). Young people may lack the resources required for self-employment, including land for agricultural activities. As expected, many young people are engaged in education or training; therefore, a smaller share of youth than non-youth are employed. Yet, when we exclude people in education or training, a lower share of youth than non-youth are not employed (NEET) (16 vs. 18 percent). This is mainly because of high shares of NEET among those over 50 years old.

The regression results in Table 17.3 shed more light on how the gender gap changes at critical points in men's and women's lives by controlling for headship, marital status, parenthood, education, age, and geographic zone. After controlling for these characteristics, we continue to see that women are less often employed in household agriculture and more often are in the NEET category than men, based on significant differences in the constant term for those models. However, we do not observe such gender differences for the other employment types.

Employment patterns may change after critical life-cycle events, such as marriage and raising young children, and patterns of change for men and

TABLE 17.2 Employment in rural areas, comparing youth and non-youth

Employment past year	Youth ages 15–24 (%)				Non-youth ages 25–59 (%)				Youth vs. non-youth		
	All	Men	Women	Test	All	Men	Women	Test	All	Men	Women
Household agriculture	34.8	42.8	28.0	***	46.5	57.8	36.9	***	***	***	***
Nonagricultural enterprise	12.2	12.0	12.4		21.2	21.0	21.3		***	***	***
Wage	37.8	46.2	30.7	***	34.2	43.5	26.4	***	**		**
Agricultural wage	22.3	24.5	20.4	*	22.1	26.1	18.7	***			
Nonagricultural wage	17.7	24.4	12.1	***	14.3	21.4	8.2	***	***		***
No employment	29.8	18.1	39.5	***	18.2	4.2	30.1	***	***	***	***
NEET	15.9	6.6	23.6	***	18.0	4.1	29.9	***	*	**	***
Education or training	13.9	11.5	15.9	**	0.2	0.1	0.2		***	***	***
Observations	1,707	778	929		4,455	2,043	2,412				

Source: Authors' calculations using MPLCS 2015.

Note: Individuals engaging in multiple activities are counted in each applicable category. Stars indicate significant differences by gender and by age categories at * $p < .10$; ** $p < .05$; *** $p < .01$.

women may differ (Table 17.3). Married men are more likely to be employed as agricultural wage workers and in household agriculture compared with unmarried men, even when controlling for age. Meanwhile, married women are less likely than unmarried women to be employed as agricultural wage workers. Whereas married men are less likely to be in the NEET category, married women are more likely to be in it. The different impact of marriage on NEET for men and women, while controlling for being parents of young children (see next paragraph), suggests that marriage is a constraint to employment or to employment-related education for women. Women in Myanmar face strong cultural expectations related to household and care activities, which limits employment opportunities, discourages continued engagement in employment after marriage, or discourages marriage as such.

Parenthood affects men and women in different ways. Mothers of young children are more likely NEET than women without children, but we do not observe such a difference between men with or without young children (Table 17.3). Rather, fathers with young children more often perform nonagricultural wage employment than other men. This again demonstrates the strong influence of norms related to women's greater responsibility for care activities in contrast with men's focus on income earning and employment. Parents of young children less often engage in household agricultural activity compared with other adults, regardless of gender. This pattern may be explained in part by parents of young children being at a relatively early

TABLE 17.3 Characteristics associated with different types of employment

	Agricultural wage			Nonagricultural wage			Household agriculture		
Characteristic	Men	Women	Test	Men	Women	Test	Men	Women	Test
Constant	0.349***	0.311***		0.105***	0.069***		0.391***	0.229***	***
Married	0.063**	−0.057***	***	0.003	−0.055***	**	0.091***	0.002	**
Parent of child under five	0.022	−0.034*	**	0.050**	−0.008	**	−0.049*	−0.067***	
Household head	0.088***	0.071***		0.021	0.005		−0.041	−0.059*	
Completed primary education	−0.169***	−0.124***	*	0.062***	0.114***	**	−0.060**	−0.105***	
20–24 years	0.019	0.003		0.114***	0.049**	*	0.068*	0.095***	
25–29 years	−0.027	0.030		0.065**	0.063***		0.138***	0.117***	
30–34 years	−0.062*	0.041	**	0.039	0.074***		0.120***	0.155***	
35–39 years	−0.108***	0.034	***	0.068*	0.059***		0.131***	0.143***	
40–44 years	−0.105***	0.006	**	−0.011	0.038*		0.175***	0.157***	
45–49 years	−0.128***	−0.006	**	0.011	0.026		0.228***	0.106***	**
50–54 years	−0.097**	−0.074**		−0.018	0.006		0.185***	0.097***	
55–59 years	−0.248***	−0.114***	***	−0.034	−0.006		0.193***	0.059	**
Hills and Mountains	−0.196***	−0.148***	*	0.047**	−0.012	**	0.146***	0.198***	
Dry Zone	−0.124***	−0.047***	***	0.146***	0.033**	***	−0.049*	0.079***	***
Coastal Zone	−0.102***	−0.146***	*	0.060***	−0.003	***	−0.157***	−0.124***	
Observations	2,821	3,341		2,821	3,341		2,821	3,341	

	Nonagricultural enterprise			NEET		
Characteristic	Men	Women	Test	Men	Women	Test
Constant	0.049**	0.059***		0.116***	0.224***	***
Married	0.014	−0.020		−0.077***	0.125***	***
Parent of child under five	0.000	−0.034*		0.003	0.109***	***
Household head	0.009	0.113***	***	−0.019	−0.058*	
Completed primary education	0.084***	0.098***		−0.041***	−0.109***	***
20–24 years	0.078***	0.096***		−0.041**	0.015	
25–29 years	0.115***	0.123***		−0.025	−0.030	
30–34 years	0.179***	0.189***		−0.032*	−0.120***	**
35–39 years	0.172***	0.197***		−0.017	−0.135***	***
40–44 years	0.138***	0.204***		−0.017	−0.072**	
45–49 years	0.144***	0.146***		−0.007	−0.015	
50–54 years	0.135***	0.145***		0.025	0.074**	
55–59 years	0.072*	0.121***		0.073***	0.122***	
Hills and Mountains	−0.025	−0.033*		−0.003	−0.038*	
Dry Zone	−0.018	0.029	*	0.013	−0.058***	***
Coastal Zone	0.040**	0.003		0.047***	0.195***	***
Observations	2,821	3,341		2,821	3,341	

Source: Authors' calculations using MPLCS 2015.

Note: NEET = not in employment, education, or training. "15–19 years" and Delta AEZ are base categories. Full results from these analyses, including standard errors of coefficients, are presented in Lambrecht, Mahrt, and Cho (2021). Asterisks indicate statistical significance of regression coefficients and statistically significant differences between men's and women's coefficients: * $p < .10$; ** $p < .05$; *** $p < .01$.

stage of household formation, and often not yet having their own farmland to cultivate.

When controlling for several key characteristics, with respect to most types of employment, household heads are not very different from individuals who are not household heads. However, household heads are more likely to perform agricultural wage work than are other household members. We found in our analysis that women, whether or not they are a household head, are more likely to run a nonfarm enterprise than men.

Both men and women work less often in agriculture, work more often in the nonagricultural sector, and are less often in the NEET category when they attained at least a primary level of education. However, the differences between those with and without primary education are significantly larger for women compared with men. The observed associations between age and employment in our regression analyses resemble the patterns described earlier, based on Figure 17.1 and Table 17.2. It is striking here that we find few gender differences—except in agricultural wage employment. Men are less often engaged in agricultural wage employment as they grow older, yet we do not observe such a pattern for women. We also notice regional differences in employment patterns, which vary for men and women. Compared with women in the Delta, women are more often NEET in the Coastal Zone but less often NEET in the Dry Zone.

AGRICULTURAL WAGE AND SELF-EMPLOYMENT

On average, female agricultural workers work fewer days than do male agricultural workers, although the difference is relatively small—roughly 10 percent (Table 17.4). The number of days that youth spend in agricultural wage employment does not differ considerably from that for non-youth. Strikingly, men who perform agricultural wage labor earn significantly higher wages than do women. Women's daily wages are, on average, only 71 percent of those of men. On a yearly basis, this wage gap is larger, with women earning on average 62 percent of men's yearly wage. Among youth, the gender gap is smaller and not significant, though still sizable (average of 3,076 kyat for men compared with 2,438 kyat for women).[5] Remarkably, young men's wages are significantly lower than those of older men, whereas the wages of young women are not significantly different than those for older women.

5 Any values cited in kyat refer to the 2015 kyat value. On April 30, 2015, the exchange rate for one US dollar was 1,093 kyat.

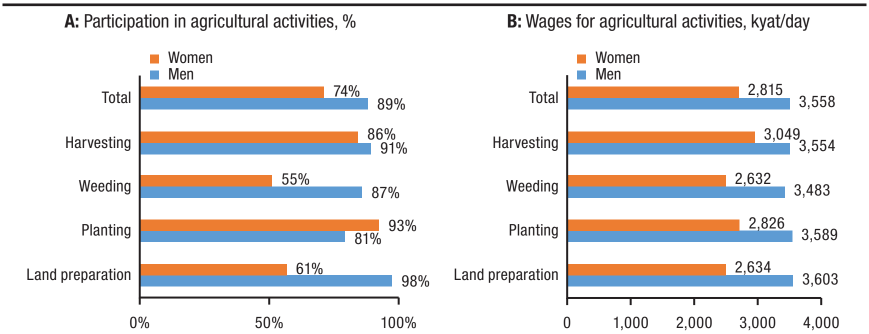
TABLE 17.4 Average days worked in the past 12 months, daily and annual wage reported by agricultural wage workers, by youth and non-youth and by gender

	Days worked in the past 12 months			Daily wage (kyat)			Annual wage ('000 kyat)		
Agricultural worker	Men	Women	Test	Men	Women	Test	Men	Women	Test
Agricultural workers	157 (n = 760)	141 (n = 623)	*	3,558 (n = 740)	2,517 (n = 621)	**	531 (n = 740)	327 (n = 621)	**
Youth (15–24 years) agricultural workers	160 (n = 202)	150 (n = 169)		**3,076** (n = 193)	2,438 (n = 168)	**	**470** (n = 193)	348 (n = 168)	**
Non-youth agricultural workers	156 (n = 558)	137 (n = 454)	*	**3,728** (n = 547)	2,550 (n = 453)	**	**553** (n = 547)	318 (n = 453)	**

Source: Authors' calculations using MPLCS 2015.

Note: Observations for each cell are presented in parentheses. T-test of statistically significant difference between men and women: * $p < .05$; ** $p < .01$. Youth and non-youth outcomes are in **bold** when statistically significantly different at $p < .10$.

FIGURE 17.2 Share of men and women participating in agricultural activities, community-level data



Source: Authors' analysis using MPLCS 2015.

Note: Men's and women's numbers are significantly different at $p < .01$, except for harvesting.

Figure 17.2 shows the share of communities where respondents reported that men or women performed specific farming tasks (Figure 17.2, panel A) and the wages they received (Figure 17.2, panel B). There are no tasks that are exclusively done by men or women in the country, but we do find some gender differences. Men more often perform land preparation and weeding, whereas women are more often reported to be planting. The finding related to weeding is somewhat unexpected, given that manual weeding is typically a woman's task. Nevertheless, this question likely also includes other methods of weed control that are more often implemented by men, such as the use of an inter-cultivator or another mechanical device for weeding, applying herbicide,

TABLE 17.5 Male and female labor contribution to household crop production in rural Myanmar

	Household labor days, average per year			Ratio of female labor days to total household labor days	Observations
	Men	Women	Test		
All crops (household level)	136	105	*	0.39	1,141

Source: Authors' calculations using MPLCS 2015.
Note: T-test of statistically significant difference between men and women: * $p < .01$.

or burning weeds. There is no significant difference in the share of communities with men and women harvesting.

The community data show a less dramatic, though still sizable, gender gap in agricultural wages, with little diversity depending on the farm activity (Table 17.4). In particular, the gender wage gap is largest during planting, where women earn, on average, 79 percent of men's daily wages. The wage gap is lowest for harvesting (87 percent).

When considering men's and women's contributions to household crop production, we find that female household members work fewer days on the farm than do male household members (Table 17.5). Their contributions are nevertheless sizeable. Among households that farm, women perform on average 39 percent of the days worked on the farm by household members. In total, male household members spend on average 136 days per year working on the farm, whereas female household members work on average 105 days per year on the farm.

Land rights

Access to agricultural land is a prerequisite for crop production. Women are less likely than men to have documented land rights and perceived rights to sell and to make parcel management decisions—though the discrepancies vary among those three components (Table 17.6; Figure 17.3). The largest male–female differences involve documented land ownership: 19 percent of adult men have land documents in their name, compared with only 7 percent of adult women. Not all parcels have documents, though, and a larger share of adult men (23 percent) and adult women (18 percent) have the right to sell a parcel. A much larger share, 34 percent of men and 19 percent of women, are considered parcel decision-makers. Conditional on having land rights, there are no significant differences in land sizes between men and women.

An equal share of adult men and women are considered joint documented landowners (5 percent) or to have joint rights to sell a plot (about 15 percent)

TABLE 17.6 Land rights of rural adults and older adults, by gender

	Adults ages 15–59 years			Adults in landholding households ages 15–59			Older adults ages >59 years		
Characteristic	Men	Women	Test	Men	Women	Test	Men	Women	Test
Documented landowner (%)	18.8	7.4	***	30.8	12.2	***	40.3	17.9	***
Joint (%)	5.0	4.6		8.2	7.6		9.9	6.4	*
Sole (%)	13.8	2.8	***	22.6	4.6	***	30.5	11.5	***
If so, land size (acres)	6.5	6.2		6.6	6.2		7.2	8.1	
Has right to sell (%)	22.8	17.9	***	37.3	29.3	***	47.1	31.1	***
Joint (%)	15.6	15.2		25.5	25.0		29.7	20.2	***
Sole (%)	7.2	2.6	***	11.8	4.3	***	17.4	11.0	**
If so, land size (acres)	6.4	6.1		6.4	6.1		7.6	7.4	
Parcel decision-maker (%)	33.7	19.0	***	55.3	31.1	***	53.3	23.2	***
Joint (%)	18.3	15.9	**	30.0	26.0	**	27.9	14.6	***
Sole (%)	15.4	3.1	***	25.3	5.0	***	25.4	8.6	***
If so, land size (acres)	6.2	5.8		6.2	5.8		6.6	7.6	
Observations		6,162			3,595			1,033	

Source: Authors' calculations using MPLCS 2015.
Note: T-test of statistically significant difference between men and women: * $p < .10$; ** $p < .05$; *** $p < .01$.

(Table 17.6). The low share of joint documented land rights is likely the consequence of the usual practice of only one name being written on land documents. Overall, men are significantly more likely to have sole land rights compared with women, as documented owners (14 vs. 3 percent), as those having rights to sell (7 vs. 3 percent), and as parcel decision-makers (15 vs. 3 percent). The extent to which one household member effectively exercises his or her land rights alone would merit further research, as social norms in many communities in Myanmar prescribe that these rights are shared with other household members through intra-household dialogue and agreement (Akter et al. 2017).

Age is an important consideration when studying land rights. Figure 17.3, Table 17.6, and Table 17.7 all show how the share of adult men and women who have the right to sell land increases with age. Male and female youth rarely are the documented landowners (1.3 and 0.6 percent, respectively), have rights to sell a parcel (2.5 and 1.0 percent), or are parcel decision-makers

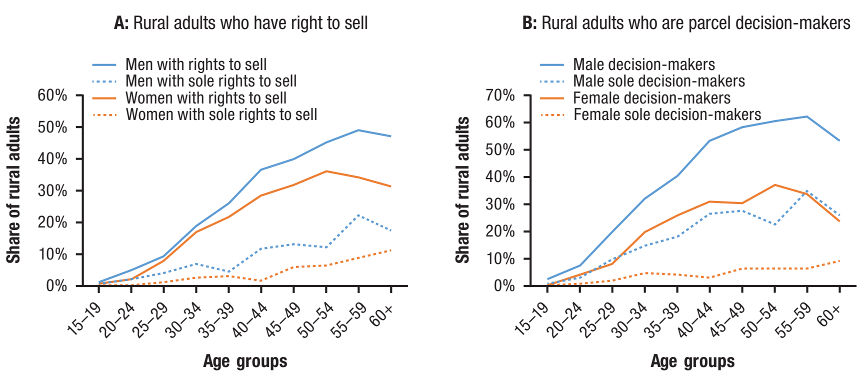
TABLE 17.7 Land rights of rural adults, comparing youth and non-youth

	Youth ages 15–24 years			Non-youth ages 25–59 years			Youth vs. non-youth		
Characteristic	Men	Women	Test	Men	Women	Test	Men	Women	Test
Documented landowner (%)	1.3	0.6		25.3	10.0	***	***	***	***
Joint (%)	0.7	0.6		6.6	6.2		***	***	***
Sole (%)	0.6	0.0		18.6	3.9	***	***	***	***
If so, land size (acres)	3.5	4.1		6.6	6.3		***	***	
Has right to sell (%)	2.5	1.0	**	30.2	24.2	***	***	***	***
Joint (%)	1.5	1.0		20.8	20.6		***	***	***
Sole (%)	1.0	0.0	**	9.5	3.6	***	***	***	***
If so, land size (acres)	3.3	3.3		6.5	6.1		***	***	***
Parcel decision-maker (%)	4.2	1.7	***	44.7	25.5	***	***	***	***
Joint (%)	2.9	1.5		24.0	21.3	*	***	***	***
Sole (%)	1.3	0.2	**	20.7	4.2	***	***	***	***
If so, land size (acres)	3.3	6.5		6.3	5.8			***	
Observations		1,707			4,455				

Source: Authors' calculations using MPLCS.

Note: T-test of statistically significant difference between men and women or youth and non-youth: * $p < .10$; ** $p < .05$; *** $p < .01$.

FIGURE 17.3 Male and female rural adults who have right to sell or are parcel decision-makers, by age



Source: Authors' analysis using MPLCS 2015.

(4.2 and 1.7 percent). These shares increase with age, though they reverse downward again for women over 54 years old and for men over 59 years old. Among those who are at least 60 years old, 40 percent of men and 18 percent of women are documented as landowners, and 47 and 31 percent, respectively, have the right to sell a plot. They also continue to actively engage in parcel decision-making, at 53 and 23 percent, respectively.

Table 17.8 shows the results of regression analyses on how key life-cycle events, including marriage and parenthood, are associated with land rights and parcel decision-making. Note that these analyses are restricted to non-youth, given that there are so few youth who have rights to sell land or who make parcel decisions—especially among women. Our dataset does not include any rural female youth who have sole rights to sell a parcel. Overall, women less often have sole rights to sell a parcel and are less often joint or sole parcel decision-makers compared with men, even after controlling for a set of potentially confounding factors such as household headship, marital status, parenthood, education, or age.

Household heads more often have land rights and more often make decisions related to land. However, among female household heads, we do not observe a positive association between headship and joint rights, but we do observe a stronger association between sole rights and decision-making. This is likely because female household heads are often widowed.[6] Marriage strengthens joint land rights and decision-making and does not have a significantly different effect on men and women. Fathers of young children less often have the right to sell land or make decisions, which again may relate to the early stage they are at in household formation. Rights and decision-making increase with age, and women, in particular, seem to catch up with men as they age and gain joint parcel decision-making power.

There are also significant differences across geographic zones. Delta is the base AEZ category in our analysis, to which we compare the other zones. Notable is the higher share of rural men and women with joint land rights in the Hills and Mountains, where landlessness is lower on average compared with other parts of the country and land rights are often regulated differently. In other words, adults more often have rights to sell land in the Hills and Mountains, and those land rights are mostly jointly held. Compared with the Delta, women in the Dry Zone more often report joint land rights, whereas men there less often report sole land rights. Whereas an adult in the Dry Zone

6 Sixty percent of women household heads ages 15 to 59 years are widowed, 10 percent are divorced or separated, and 12 percent are single.

TABLE 17.8 Multivariate probit analysis of joint and sole rights to sell land and parcel management decisions, for non-youth (25–59 years)

Characteristic	Joint right to sell			Sole right to sell			Joint parcel decisions			Sole parcel decisions		
	Men	Women	Test	Men	Women	Test	Men	Women	Test	Men	Women	Test
Constant	–2.856***	-2.977***		–2.619***	–3.539***	**	–2.355***	–2.970***	***	–2.262***	–3.381***	***
	0.223	*0.205*		*0.256*	*0.350*		*0.189*	*0.202*		*0.203*	*0.346*	
Married	0.586***	0.896***		–0.072	0.300		0.562***	0.779***		0.272	–0.054	
	0.186	*0.137*		*0.208*	*0.204*		*0.164*	*0.131*		*0.175*	*0.196*	
Parent of under five	–0.222*	–0.129		–0.021	–0.113		–0.205*	–0.177	*	0.059	–0.134	
	0.116	*0.119*		*0.139*	*0.239*		*0.112*	*0.117*		*0.116*	*0.233*	
Household head	0.732***	–0.049	***	1.160***	1.883***	**	0.705***	0.123	***	1.071***	2.146***	***
	0.146	*0.187*		*0.196*	*0.210*		*0.132*	*0.178*		*0.146*	*0.201*	
Completed primary	0.015	0.035		–0.404**	0.139		–0.319**	–0.260*		–0.178	–1.073**	*
	0.147	*0.152*		*0.206*	*0.267*		*0.144*	*0.156*		*0.149*	*0.476*	
30–34 years	0.416**	0.536***		0.231	0.404		0.324*	0.790***	*	0.159	0.696**	
	0.212	*0.191*		*0.244*	*0.345*		*0.180*	*0.188*		*0.193*	*0.343*	
35–39 years	0.770***	0.883***		0.036	0.482		0.563***	1.082***	**	0.298	0.543	
	0.200	*0.186*		*0.245*	*0.340*		*0.174*	*0.185*		*0.185*	*0.348*	
40–44 years	0.994***	1.229***		0.580**	0.116		0.644***	1.342***	***	0.629***	0.589*	
	0.205	*0.190*		*0.236*	*0.394*		*0.183*	*0.190*		*0.188*	*0.355*	
45–49 years	1.048***	1.195***		0.821***	0.848**		0.877***	1.159***		0.922***	0.869**	
	0.213	*0.195*		*0.239*	*0.341*		*0.192*	*0.195*		*0.197*	*0.343*	
50–54 years	1.194***	1.518***		0.698***	0.688**		0.923***	1.506***	**	0.640***	0.259	
	0.217	*0.198*		*0.250*	*0.350*		*0.196*	*0.198*		*0.207*	*0.369*	
55–59 years	1.134***	1.356***		1.144***	1.084***		0.863***	1.365***	*	1.074***	0.363	*
	0.229	*0.209*		*0.251*	*0.342*		*0.210*	*0.207*		*0.212*	*0.367*	
Hills and Mts.	0.363***	0.608***		–0.024	0.260		0.814***	0.913***		0.282**	0.676***	
	0.128	*0.120*		*0.151*	*0.211*		*0.128*	*0.119*		*0.133*	*0.215*	
Dry Zone	0.059	0.305**		–0.378**	0.142	**	0.255**	0.327***		–0.146	0.336	*
	0.128	*0.120*		*0.155*	*0.212*		*0.125*	*0.120*		*0.128*	*0.218*	
Coastal Zone	–0.434***	–0.308**		–0.543***	–0.241		–0.274**	–0.098		–0.697***	–0.212	*
	0.132	*0.125*		*0.151*	*0.218*		*0.126*	*0.122*		*0.131*	*0.237*	
Observations				2,043	2,412					2,043	2,412	

Source: Authors' calculations using MPLCS 2015.

Note: "25–29 years" and Delta AEZ are base categories. Asterisks indicate statistical significance of regression coefficients and statistically significant differences between men's and women's coefficients: * $p < .10$; ** $p < .05$; *** $p < .01$. Standard errors are in italics. Mts. = mountains.

is slightly less likely to have any land rights, those who do have land rights more often have joint rather than sole land rights. Adults in the Coastal Zone are least likely to have the right to sell land.

Loans

About 26 percent of adult men and 21 percent of adult women had received a loan in their name in the previous 12 months, but only 4 percent of rural youth had done so (Table 17.9). When considering all loans taken by rural adults, women receive almost half (52 percent) of all loans. This apparent discrepancy is explained by a higher share of women taking multiple loans than men and the fact that there are more adult women than adult men living in rural households.

Loans received by women and youth are significantly smaller in value compared with those received by men (Table 17.9). The average value of women's loans is significantly lower (218,317 kyat) than the value of men's loans (396,738 kyat). This gender difference is not offset by the fact that women take more loans than men; the total size of loans women take is significantly and substantially lower than those taken by men (respectively, 332,135 kyat and 552,781 kyat). Loans received by youth are smaller (166,432 kyat) compared with those of non-youth (310,641 kyat).

Agriculture is the main purpose of loans, and such loans are nearly twice as often taken by men than by women (46 vs. 24 percent). Women's loans are more often driven by food consumption needs (31 percent) or health expenditures (26 percent) than are loans taken by men (respectively, 22 and 19 percent). Youth take fewer loans for agricultural purposes (24 percent) than non-youth (35 percent). These lending patterns by gender and age group follow trends in employment and household roles.

MADB is the source of 32 percent of loans received by rural men, compared with only 9 percent for women. To a large extent, this pattern coincides with gender differences in documented land ownership. However, we find that, among reported recipients of MADB loans, 19 percent of men and 46 percent of women do not have land certificates in their name. It is likely that some branches have allowed these household members to receive loans on behalf of documented owners or have relied on other methods to identify formal landownership. Loans taken by women compared with men are more often provided by moneylenders (37 vs. 25 percent) or by group lending or microfinance institutions (13 vs. 8 percent). Finally, women's loans more often required collateral, which is likely related to their more frequent engagement with pawn shops and moneylenders. Most loans that require collateral are from moneylenders or pawn shops (76 percent), but a major portion also comes from friends or relatives (16 percent).

TABLE 17.9 Characteristics of loans received by rural adults, by gender and age group

Characteristic	Men	Women	Test	Non-Youth	Youth	Test
Per adult						
Did person receive a loan? (%)	25.6	21.1	***	30.4	3.8	***
Adults (number)	2,821	3,341		4,455	1,707	
If any loan						
Loans per adult receiving (average number)	1.4	1.5	**	1.5	1.3	
Total value of loans (kyat)	552,781	332,135	***	454,392	220,152	***
Adults receiving loans (number)	690	689		1,320	59	
Per loan received by rural adults						
Share of loans received (%)		51.5			4.1	
Loan value (kyat)	396,738	218,317	***	310,641	166,432	***
Loan purpose						
Agriculture (%)	46.1	24.2	***	35.3	23.6	*
Nonfarm enterprise (%)	3.8	7.4	***	5.5	9.0	
Health expenditure (%)	19.2	25.6	***	22.5	23.7	
Food expenditure (%)	21.8	31.0	***	26.5	28.1	
Loan source						
MADB (%)	31.5	8.5	***	20.1	9.7	**
Other bank (%)	4.5	3.7		4.3	0.6	***
Moneylender or pawn shop (%)	24.7	36.9	***	30.8	33.9	
Microfinance institution (%)	8.4	13.4	***	11.1	7.4	
Relatives, friends (%)	0.8	4.3	***	2.5	4.2	
Required collateral (%)	3.7	8.0	***	5.9	4.8	
Loans (number)	942	1,023		1,891	74	

Source: Authors' calculations using MPLCS 2015.

Note: MADB = Myanmar Agricultural Development Bank. Asterisks indicate statistically significant difference of means of men and women or youth and non-youth, based on t-test: * $p < .10$; ** $p < .05$; *** $p < .01$.

Gendered livelihoods during a triple crisis

The crises that hit Myanmar in recent years have affected the livelihoods of nearly everyone, regardless of gender or age (NRM 2022). Nevertheless, such shocks and crises, including the relevant ensuing policy responses, can influence existing gender and generational discrepancies (Ragasa and Lambrecht 2020). Even though information is limited, and recent data are scarce, it is important to reflect on such gender- and age-differential impacts of

Myanmar's current troubled setting and the extent to which they may be sustained in the future.

The global economic downturn during and after the COVID-19 pandemic, as well as economic sanctions imposed after the military takeover, have meant that many manufacturing businesses have been forced to reduce operations or close entirely. It is estimated that, at the start of the pandemic, a similar share of working men and women were employed in COVID-19-sensitive economic sectors (Diao et al. 2020). The crisis had significant impacts on Myanmar's garment industry, which employs mainly young women, and, thus, many young women were left jobless. Yet sectors that employ a larger share of men, such as construction and transport, also had strong declines in operations (Lambrecht et al. 2020).

Many civil servants, particularly those holding middle- and lower-level civil service positions prior to the coup, have ceased their work to express disagreement with the military takeover. Prior to the crises, these positions, including many salaried jobs in the education and health sectors, were filled more often by women than by men (NRM 2022). However, this situation also arose in the banking sector and on the railways, where positions are more often held by male workers (Al Jazeera 2021).

Individuals at the lower end of the income scale, including those who must travel to pursue livelihood opportunities as temporary migrants or traders, but also farmers with plots located farther away from their homestead, are less able to pursue their usual work in the current context of security and economic crisis (NRM 2022). Roughly one year after the military coup, about 1 percent of rural adults in the labor force were unable to go to work because of ongoing violence or related movement restrictions. This share was significantly higher among women (1.2 percent) than men (0.8 percent), based on the MHWS Round 1.

Conclusions

Our assessments show a nuanced picture of the role of women and youth in Myanmar's agriculture sector. Women and youth's labor contributions to agricultural work are large. Gender and age patterns in employment are apparent and follow somewhat stereotypical expectations—but also tend to be relatively modest.

A large proportion of rural women in Myanmar are employed in agriculture, either in household agricultural activities (35 percent) or as agricultural wage workers (19 percent). Women in farm households account for 39 percent of household farm labor days on average, and 43 percent of agricultural wage workers are women. Youth, too, are prominent in agricultural employment: they account for 22 percent of adult agricultural wage workers and 27 percent of adult household agricultural workers.

Nevertheless, there are clear gender discrepancies in rural employment. In general, women are less often employed in agriculture than men, and youth and women earn significantly lower wages than non-youth adult men. A significant share of women drop out of agriculture when the load of childcare is highest; this is particularly the case among parents of young children. Mothers of children under five years old are much more often unemployed than are women without young children, whereas this is not the case for men. This pattern is mainly observed for agricultural and nonagricultural wage employment but not for work in household agricultural or nonagricultural enterprise activities. This is similar to patterns observed globally, where women prioritize unpaid care work at home, whereas men focus on generating a household income (Heckert et al. 2021).

Compared with the high share of rural adults engaged in agricultural employment, a relatively low share of rural adults are documented landowners and have the right to sell land or make parcel management decisions. Moreover, a clear gender gap appears when considering land rights and parcel decision-making. Almost three times as many adult men as adult women are documented landowners, though, to a large extent, this is a consequence of the common practice of putting only the household head's name on land documents. The gap is narrower when considering the right to sell a parcel, where this ratio of men compared with women drops to 1.27. Men are more often parcel decision-makers than women, at a ratio of 1.77.

Youth rarely have documented ownership rights or rights to sell land and are seldom parcel decision-makers. Unlike in many other cultures, in Myanmar, marriage is not an event that results in access to land for a substantial share of rural young people. Rather, the share of adults obtaining land rights increases gradually with age.

When considering agricultural activities, we do not find any major activities that are solely performed by men or women across Myanmar. However, some activities, such as land preparation, are more often done by men, while women more often plant crops. Regardless of the activity, women and youth are paid significantly less than men for their work.

Women are less often loan recipients than men, and youth rarely receive loans. Moreover, loans that women and youth receive are significantly smaller in value. Motivations for taking loans are consistent with gender stereotypes—women's loans are more often focused on alleviating health or food expenditure shortfalls. Such loans often require collateral, with the associated risk of asset loss. In contrast, men's loans are more often aimed at investments in farm or nonfarm enterprise activities.

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Chapter 18

REGIONAL VARIATIONS IN RURAL LIVELIHOODS: CHALLENGES AND OPPORTUNITIES

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Rural livelihoods in Myanmar are embedded in regional contexts that vary widely in terms of physical geography, climate and agroecology, local resource base, agrarian structure, infrastructure provision, proximity to urban areas and neighboring countries, social networks, institutions, and ethnicities. The composition of livelihoods in each administrative and geographic zone of the country reflects these diverse contexts. Marked variations in livelihood patterns are evident at multiple scales, from the zone or region down to township and village level, so that the composition of livelihoods in villages close to one another sometimes varies widely (Phyo 2022).

Despite the high level of place-based specificity in the composition of livelihoods, many broad similarities and common trends shape livelihoods at subnational and national levels. These include generally low levels of agricultural productivity relative to other countries in the region in terms of both land and labor (World Bank 2016b); high rates of landlessness, legacies of land confiscation, and unresolved struggles over land rights and access (Mark and Belton 2020); and generally poor public infrastructure and services—including electricity, roads, schools, health services, and rural credit—though these were improving rapidly in many places before 2020 (Belton et al. 2017; Lambrecht and Belton 2019); relatively low levels of diversification and capital in the rural nonfarm economy; high rates of international and domestic outmigration (CHIME 2019; World Bank 2016a); and histories of ethnopolitical conflict and insecurity (South 2009).

This chapter synthesizes analyses from four large household surveys, each covering a major agroecological zone, to evaluate interregional variations in the composition of livelihoods and the rural economy. The four agroecological zones examined are the Delta (Ayeyarwady and Yangon), the Dry Zone (Mandalay, Magway, and Sagaing), the Hills and Mountains (represented by southern Shan State), and the Coastal Zone (represented by Mon State). We also synthesize recent secondary sources that offer additional context and insights on regional livelihood dynamics from these and other areas of

Myanmar, including the impacts of the “triple crisis”—COVID-19, the coup, and price inflation—beginning in 2020.

The chapter first examines and compares the status of infrastructure and public services and the composition of rural livelihood activities and incomes across the four zones. More details on the geography of these zones and the surveys deployed in each can be found in a report by Belton and colleagues (2021). We then supplement primary data from surveys with a synthesis of contemporary research on livelihoods and the rural economy in Myanmar, focusing on two areas: (1) agricultural commercialization and (2) nonfarm employment and migration. We next evaluate changes in livelihood vulnerability and resilience occurring since the triple crisis. The final section synthesizes these findings and discusses possible future trajectories.

Synthesis of results from livelihoods surveys

This section presents a comparative summary of key trends across zones, based on surveys conducted in 839 communities between 2015 and 2018, with respect to (1) recent changes in access to infrastructure, transport, and public services; (2) the composition of livelihood activities; and (3) the composition of rural incomes.

Infrastructure and services

The provision of most infrastructure and services is uneven across zones, reflecting variations in physical geography and legacies of settlement and conflict (Table 18.1).[1] Access to paved roads is lowest in southern Shan (54 percent of villages), perhaps reflecting the hilly terrain and history of conflict in some areas, followed by the Delta (59 percent), where water-based transport is still the primary means of access to many villages. Mon has the highest rate of access by paved road (95 percent). As a result, Mon has the shortest transport times to nearby urban areas among the four zones, which has implications for how easily individuals can commute for nonfarm work, access inputs, or sell products. Travel times in the monsoon season are roughly 20 to 40 percent longer than in the dry season across zones, indicating that even paved roads may be poorly constructed.

1 Surveys conducted in these four zones were representative of subsets of townships or village tracts, not the entire zone, except for in Mon, where the survey represented the entire rural population of the state. See Belton and colleagues (2021) for details.

TABLE 18.1 Community-level access to infrastructure and public services, by zone

Village characteristic	Mon 2015	Delta 2016	Dry Zone 2017	Shan 2018
With paved road (%)	95	59	80	54
Accessible by car in monsoon (%)	87	32	99	79
Dry season travel time to closest urban center (average minutes)	33	47	46	51
Monsoon travel time to closest urban center (average minutes)	40	57	66	60
Primary school (%)	80	—	79	80
Post-primary school (%)	37	—	31	15
Public electricity supply (%)	51	12	34	25
Access to at least one cell phone provider (%)	97	—	—	97
Communities surveyed, number	143	73	300	323

Source: Authors' survey datasets.
Note: — = missing.

Primary schools are the public service with the highest levels of provision and access, being present in about 80 percent of villages in the zones surveyed (Table 18.1). (No data were collected on this indicator in the Delta.) The share of villages with a post-primary school is lower and much more variable across zones, being lowest in southern Shan and highest in Mon. Nevertheless, access to post-primary education improved significantly in some areas from 2010 to 2020. For example, the share of 17-year-olds in the Dry Zone who had completed eighth grade jumped from 35 percent in 2010 to 60 percent in 2017 (Belton and Filipski 2019).

Access to publicly provided electricity is also variable across regions but generally low, with the highest levels of provision in Mon, at 51 percent, and the lowest in the Delta, at just 12 percent. Many villages access electricity through private transformers, often purchased with pooled community resources. However, even in villages with public electricity, not all households can afford an electricity connection, and power outages are frequent in some areas. For example, in Shan, only three out of four households in villages with access to publicly provided electricity are connected to the network, and these households reported facing power cuts lasting an average of five hours about two times per week. Solar cells are now a widely used source of power, mainly for lighting and charging mobile phones. Access to mobile phone providers became almost universal following the extremely rapid expansion of services that started in 2014, although mobile internet access has been partially hampered since the coup in 2021.

Despite often starting from a low baseline, the rapid acceleration of infrastructure provision and the geographic diffusion of public and private services were key features of the reform period from 2011 to 2020. The construction of rural roads and post-primary schools; the establishment of public electricity supply; and, to a lesser extent, the provision of health services increased sharply during this time across all zones surveyed. This dynamic is illustrated in Figures 18.1 and 18.2.

Figure 18.1 shows the cumulative share of primary and lower secondary schools, roads, and electricity connections established in surveyed villages in the Dry Zone by year over the past century. Figure 18.2 shows the share of villages in southern Shan with schools, paved roads, electricity connections, rural health centers, and mobile internet access by year from 1978 to 2018. Road construction and provision of electricity and post-primary schools accelerated dramatically from 2011 in the Dry Zone. The share of villages with access to schools, electricity, and paved roads also increased sharply in southern Shan over the period, and the share of villages with mobile internet access jumped from 9 percent in 2011 to 87 percent in 2018.

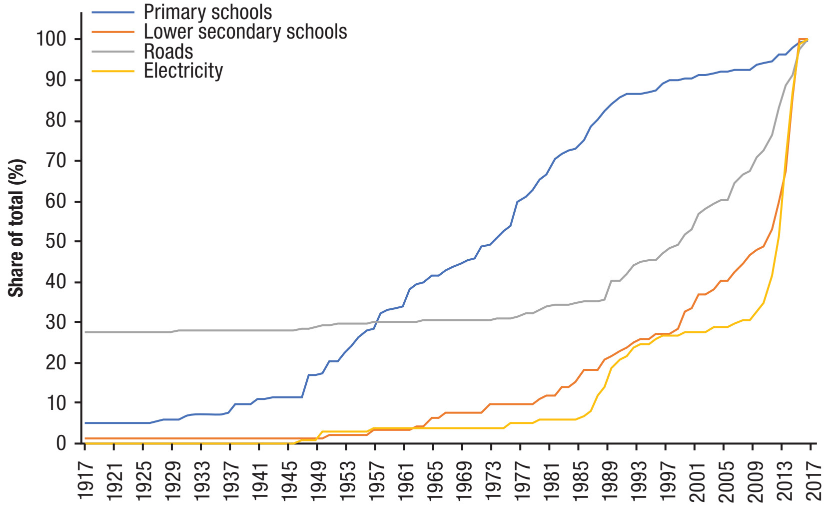
Collectively, these changes in access to infrastructure and services had extremely significant implications for livelihood opportunities. In combination with the liberalization of vehicle imports and financial services, they contributed to improvements in mobility and communication, with sharp reductions in costs and travel time. For example, in Shan, average transport times from surveyed villages to the nearest urban area fell by around 40 percent between 2013 and 2018, an average reduction of 38 minutes, while motorbikes became the most common mode of transport in 87 percent of villages, up from 41 percent in 2013.

Greater mobility has expanded the economic opportunities available to many rural inhabitants. For example, having access to a wide choice of buyers means that markets for agricultural products, such as maize in Shan, tend to be competitive (Cho and Belton 2019). Ease of mobility has also increased the variety of employment that villagers can pursue. For instance, in the Delta, 44 percent of those who reported being engaged in salaried employment commuted to nearby urban areas or other townships or regions for their work (Htoo and Zu 2016).

Livelihood composition

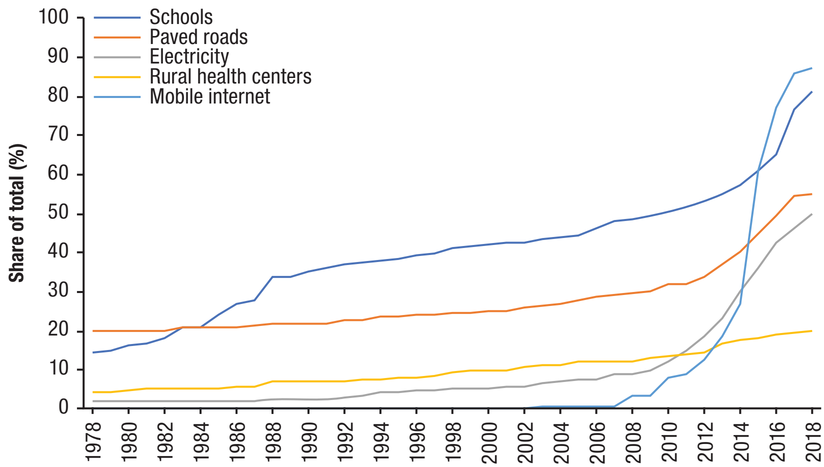
In this section, we review livelihood profiles by zone in terms of the share of households participating in a range of farm and nonfarm livelihood activities. Agriculture is the major livelihood activity in terms of the number of

FIGURE 18.1 Cumulative share of schools, roads, and electricity connections established in surveyed communities in the Dry Zone by year, 1917–2017, conditional on community having access



Source: Authors' survey.

FIGURE 18.2 Share of villages in southern Shan with schools, paved roads, electricity connections, rural health centers, and mobile internet access by year, 1978–2018



Source: Authors' survey.

households participating directly in all four survey zones, except for in the Delta, where a higher proportion of surveyed households engage in wage labor than in crop farming (56 vs. 42 percent), reflecting very high levels of landlessness there (Chapter 6). However, even among farm households, complete dependence on agriculture is relatively uncommon. Most households and individuals pursue diversified livelihoods that combine multiple forms of employment and sources of income. High levels of diversification into off-farm activities reflect the uneven distribution and low average size of agricultural landholdings in all zones (Chapter 6) and the relatively low productivity and profitability of most crops (Chapter 8). These factors mean that many farm households are unable to meet their subsistence needs through farming alone. For instance, among the wealthiest 20 percent of the population in the Delta, only 29 percent of households depended exclusively on agriculture for income in 2015. Among the poorest 20 percent, this figure was just 8 percent (Htun 2016).

Uneven distribution of land makes off-farm employment important for all households except those with the largest landholdings. However, most casual wage employment remains closely linked to agriculture (Chapter 2). Agricultural day labor remains the most important source of income in terms of participation in all zones except Mon. Such employment is of particular importance for landless households and operators of marginal farms (Table 18.2). Agricultural wage work is fairly gender balanced in levels of participation, though often with significant levels of gender differentiation by task and significant gender wage gaps. Casual nonfarm work skews heavily male and is composed largely of manual work, such as construction, carpentry, and hauling loads, or employment in nonfarm enterprises.

Self-employment in own nonfarm enterprises is common across the survey zones. Numbers of nonfarm businesses grew rapidly from 2010 to 2020 (Chapter 16), reflecting factors such as increasing levels of mobility, rising real incomes, and reduced credit constraints. Levels of self-employment in nonfarm businesses are lowest in Shan (16 percent of households) and highest in Mon (29 percent), reflecting regional differences in the degree of the rural economy's transformation (Table 18.2).

Men and women operate nonfarm businesses in equal numbers. However, men are more likely to own more remunerative businesses with higher capital costs, such as machinery rental services. In contrast, women are more likely to own smaller businesses, such as food retail (Aung et al. 2019). The likelihood of a household operating a nonfarm enterprise is not closely correlated with land ownership. However, the type and scale of a business may be linked to the

TABLE 18.2 Livelihoods and income composition, by zone

Composition	Mon 2015	Delta 2016	Dry Zone 2017	Shan 2018
Share of households engaged in activity (%)				
Crop production	51	42	57	82
Daily wage labor, of which:	42	56	55	61
Agriculture	22	42	48	53
Nonagriculture	28	17	14	20
Salaried work	8	6	8	7
Own nonfarm business	29	21	21	16
Remittances	33	15	31	14
Livestock sales	25	22	21	52
Aquaculture	0	6	0	0
Natural resources	10	6	3	5
Share of total household income from activity (%)				
Crop production	24	20	37	47
Daily wage labor, of which:	15	15	21	12
Agriculture	6	11	16	7
Nonagriculture	9	4	5	5
Salaried work	5	3	5	8
Own nonfarm business	18	34	18	13
Remittances	25	3	13	8
Livestock sales	1	1	5	10
Aquaculture	0	19	0	0
Natural resources	12	6	1	1

Source: Authors' surveys.

resource base of the household. Most rural nonfarm enterprises are very small and operate using only family labor. For instance, only 21 percent of such businesses surveyed in the Dry Zone reported hiring labor (Zu et al. 2017).

Remittances from migrant household members are a significant source of income in Mon and the Dry Zone, received by more than 30 percent of households. Remittances are less common in southern Shan and the Delta, where smaller shares of households have migrant members. Salaried employment provides work for a similar share of households across zones, at around 7 percent, with a gender balance that skews toward women. Women account for a large majority of schoolteachers, which is by far the largest category of salaried employment for rural households. The importance of raising and selling livestock is highest in Shan, where 52 percent of households raise animals for sale. In the other three areas, a little more than 20 percent of households do so.

Finally, participation in natural resource extraction, such as collecting firewood, cutting bamboo, harvesting non-timber forest products, or fishing, is quite common, except in the Dry Zone. However, these activities are practiced mainly for home use, with few households doing so commercially. The major exception to this is Mon, where 11 percent of households are involved in marine fishing on a commercial basis (Table 18.2).[2] Most people involved in commercial natural resource extraction are men—representing, for example, 72 percent in the Dry Zone (Zu et al. 2017).

Income composition and wages

The composition and size of rural incomes vary widely by zone, reflecting geographic differences in access to agricultural land, agricultural potential, the degree of development of the rural nonfarm economy, and the extent of migration. In very broad terms, Shan is the zone that is most highly agrarian and Mon the least: crop farming accounts for about twice the share of rural income (46 percent) in surveyed areas of southern Shan than it does in Mon (24 percent). The share of crop farming income in the Dry Zone falls between these figures (35 percent). In the Delta, the share of crop income in total income is just 20 percent, reflecting both high levels of landlessness and the deliberate inclusion in the survey sample frame of village tracts with high concentrations of fish farming. As a result, aquaculture accounts for 19 percent of rural income in the sampled village tracts in the Delta, but this figure is not representative of the entire Delta.

Conversely, the combined share of income contributed by remittances and self-employment in nonfarm enterprises is relatively low in Shan (totaling 21 percent) but high in Mon (43 percent) and also substantial in the Dry Zone (31 percent). The contribution of agricultural wage labor to income is largest in the Delta and the Dry Zone, where there are high levels of landlessness relative to Shan but fewer lucrative nonfarm opportunities, such as international migration, than in Mon.

The extent of participation in nonfarm activities, including migration, accounts for significant differences in average incomes across zones. For example, mean income from crop farming was similar in southern Shan in 2018

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2 Our survey in the Delta did not include any coastal areas, so it likely underrepresents the importance of commercial fishing in the zone as a whole.

TABLE 18.3 Mean and median total crop and non-crop rural incomes in southern Shan and the Dry Zone, kyat per capita

	Shan (2018)			Dry Zone (2017)		
Income	Median	Mean	Mean (%)	Median	Mean	Mean (%)
Crop income	69,646	205,445	46	11,250	213,133	35
Non-crop income	97,500	236,417	54	262,064	395,637	65
Total income	260,037	441,862	100	406,667	608,771	100

Source: Authors' calculations using survey datasets.
Note: Unconditional averages—that is, including all households whether or not earning crop or non-crop income.

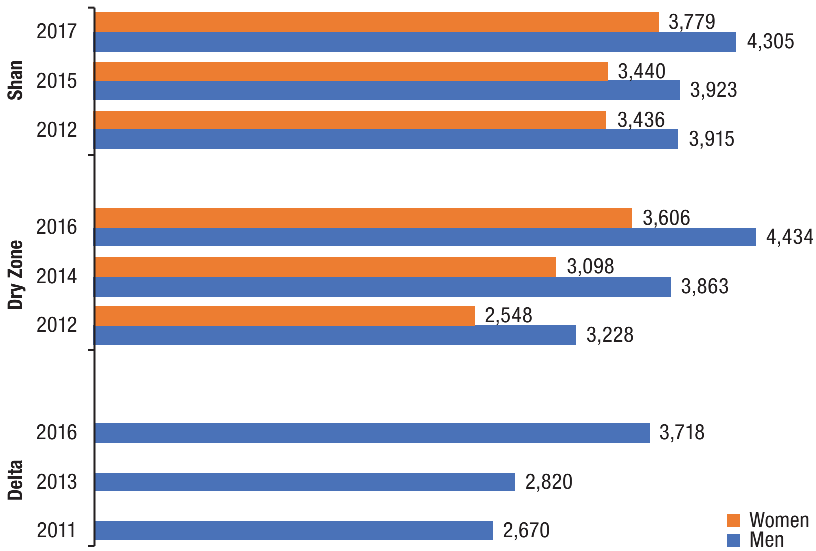
and the Dry Zone in 2017. However, average earnings from non-crop sources in the Dry Zone were 67 percent higher than in southern Shan, resulting in average Dry Zone incomes per capita being 38 percent higher than in southern Shan (Table 18.3).

High levels of participation in off-farm work mean that rural wage rates play an important role in determining incomes, particularly for members of landless and land-poor households that are particularly dependent on casual employment. Wage rates are also important in relation to the profitability of agriculture, as wages account for a significant share of production costs. Our surveys show that average real rural wages (adjusted for inflation) jumped sharply in the post-2010 economic reform period, rising by 39 and 37 percent, respectively, between 2011/2012 and 2016 in the Delta and the Dry Zone (Figure 18.3). Average wages in Shan were higher in 2012 than in either the Delta or the Dry Zone but changed little until 2017, when they rose 9 percent to reach a level similar to that in the Dry Zone.

Significant increases in real rural wages between 2011 and 2020 were linked to accelerating out-migration over the same period. This trend drove labor shortages around periods of peak local demand for agricultural workers. The expansion of post-primary education likely also played a role by delaying entry into the workforce and producing a more educated workforce with higher wage-earning potential, similar to Viet Nam (Liu et al. 2020).

Rising wage rates appear to have contributed to rapid agricultural mechanization prior to 2020 (Chapter 7). However, mechanization in the Dry Zone has not generated sufficient savings to fully offset the costs of rising agricultural wages to farm households. Belton and Filipski (2019) suggest that this implies a shift in the underlying "terms of trade" between agriculture and nonfarm segments of the economy, consistent with a process of structural transformation wherein the competitiveness of agriculture is eroding relative to more productive sectors. The authors contend that this pattern of

FIGURE 18.3 Average real daily wage rates for casual agricultural workers in the Delta (2011–2016), Dry Zone (2012–2016), and Shan (2012–2017), kyat per capita



Source: Authors' analysis using survey datasets.

Note: Delta and Dry Zone calculated at constant 2016 prices, for all seasons; Shan at constant 2017 prices, for monsoon season.

development has resulted in a partial shift in the relative economic status of landholders and the landless, favoring the latter.

This outcome, while seemingly troubling from the point of view of the future viability of agriculture, is positive in that it suggests improvements in the relative economic status and mobility of at least some households with limited resources. Thus, the median income of landless households is only 13 percent less than the all-household average for the rural Dry Zone (Belton and Filipski 2019). Similarly, in southern Shan, the average per capita incomes of rural nonfarm households are only 16 percent lower than those of households farming maize. Both these findings suggest that rural income-earning potential has become partially delinked from land ownership.

However, in all zones there is a significant gender wage gap in agriculture. In Shan, women farmworkers hired for the cultivation of maize and pigeon pea earn, on average, 89 percent of the male daily wage. In the Dry Zone, the gap is larger still. Women can expect to earn only 81 percent of what men earn for agricultural wage work of equivalent duration. The reasons for these differences are not clear, though part of the explanation appears related to the gender division of labor across farming tasks, which vary from crop to crop.

This gender gap appears persistent, having changed little even as men's and women's real wages have increased rapidly.

Meta-conditioners of livelihood trends

This section draws on secondary sources to further assess regional differences and trends in livelihoods during the decade leading up to 2020. We expand on the implications of and relationships between (1) agricultural commercialization and (2) nonfarm employment and migration for the composition and outcomes of livelihoods in Myanmar. Both sets of processes accelerated during this period in response to policy reforms that contributed to greater economic openness and growth.

Agricultural commercialization

Links between agricultural commercialization, crop productivity, and trade policy are examined in Chapter 10. In this section, we evaluate evidence for the effects of agricultural commercialization on the composition and outcomes of livelihoods in Myanmar. Evidence across studies is mixed, reflecting differences in the cases evaluated, as well as the research perspectives and methodologies applied.

Woods (2020) and Borras, Franco, and Nam (2020) contend that agricultural commercialization associated with the introduction of hybrid maize to upland Shan State by the Thai agro-industrial company CP and the crop's subsequent widespread uptake by smallholders has resulted in almost exclusively negative impacts on rural livelihoods. These authors frame hybrid maize as undermining customary systems of shifting cultivation and subsistence food production, resulting in smallholder farmers' indebtedness to maize traders and leading to rapid and widespread differentiation and dispossession.

However, based on detailed survey-based research on the impacts of hybrid maize on farmer livelihoods in southern Shan, Belton and Fang (2022) find these claims to be exaggerated. They contend that the widespread adoption of hybrid maize reflects its low risk profile relative to other cash crops and the generally positive contributions that maize makes to farm incomes in a rural setting where earning cash income is increasingly imperative to pay for expenses, such as schooling and consumer goods. They also find no evidence that growing maize for sale reduces subsistence food production, in part because nearly all rural households purchase the bulk of the food they consume, irrespective of whether they grow maize (Pritchard, Rammohan, and Vicol 2019).

Belton and Fang (2022) do find some evidence, however, to support Woods's (2020) conclusion that the smallest farmers benefit less from planting hybrid maize than do cultivators with more resources. This tendency is similar to the pattern, documented by Okamoto (2008, 199), that resulted from the widespread uptake of green gram cultivation for export in the 1990s by farmers close to Yangon, where "farmers of all sorts adopted the new crop, and since green gram provided a higher income per acre than paddy, it increased their incomes significantly." Okamoto concluded, "It may be true that income disparities among farmers increased when green gram was cultivated to the fullest extent, but this change was not entirely negative since it improved the economic circumstances of all classes of farmer."

In other settings, agricultural commercialization has been driven by external investors rather than smallholders. Investments in the central Dry Zone by Chinese citizens and wealthy Myanmar farmers growing watermelon—a capital-intensive commercial crop grown for export to China—have been facilitated by short-term leasing of land from smallholder farmers. These leases provide stable incomes to smallholders at rates above those typically earned from crop cultivation but leave soil degraded following heavy application of agrochemicals and polluted with plastic residues from mulching film (Kubo, Pritchard, and Phyo 2021).

Similar tendencies are reported in association with cross-border investments in banana cultivation in Kachin State, where Chinese companies and investors have leased cumulatively large areas of land to establish banana plantations for export to China. Intensive use of fertilizers and pesticides on these plantations has been linked to soil degradation, chemical runoff, and biodiversity loss. Some smallholders benefit by earning rental income, but some rental agreements have been obtained through coercion or deception, and many smallholders, particularly internally displaced persons, have lost land (Hayward et al. 2020).

Myanmar has a long history of land confiscation by the military and allied companies and individuals, for reallocation to agricultural concessions that were established with the stated intent of modernizing agriculture to increase productivity and raise export revenues. Thein and colleagues (2018) estimated that only 15 percent of the 3.9 million acres of land granted to agricultural concessions in Myanmar has been cultivated, with the remainder left idle, often after having been cleared of valuable timber. Using remote sensing techniques, Nomura and colleagues (2019) found similar results for oil palm concessions in southern Myanmar.

Land confiscation has displaced large numbers of smallholder farmers throughout Myanmar, with often devastating impacts on their livelihoods and welfare. For instance, in the Delta, the allocation of large tracts of paddy land formerly cultivated by smallholders and wetlands used for fishing to industrial-scale rice farming concessions and aquaculture companies led to dramatic reductions in the welfare of the affected households. These impacts included much lower incomes, high levels of food insecurity, withdrawal of children from school, and the permanent migration of entire households to Yangon (Mark and Belton 2020).

Thus, top-down forms of agricultural commercialization, whether imposed in response to policy decisions or initiated spontaneously in response to emerging economic opportunities, have tended to result in impacts on livelihoods that range from mixed at best to highly negative at worst. Bottom-up forms of agricultural commercialization instituted by smallholder farming households themselves in response to market opportunities for new crops that potentially offer higher earnings than traditional ones have also resulted in varied livelihood outcomes, but with a general tendency toward more positive results than the top-down forms of commercialization.

Even so, participation in the nonfarm economy may prove more decisive than agricultural commercialization in determining household welfare for smallholders. We expand on this point below.

Nonfarm employment and migration

Returning to the case of maize cultivation in Shan, Belton and Fang (2022) found that participation in some forms of nonfarm work by maize cultivators—particularly own nonfarm enterprises and salaried work—were much more strongly associated with higher household incomes than crop farming. Similarly, Vicol, Pritchard, and Htay (2018) found that a small boom in export-led production of elephant yam in upland Chin State resulted in relatively minor changes to the overall status of livelihoods, with economic benefits accruing primarily to better-off households. Migration played a much more significant role in determining livelihood trajectories than did participation in yam cultivation. Kmoch and colleagues (2018) also found that households in Chin engaging in remittance and wage-oriented livelihood strategies realized higher incomes than those primarily involved in activities linked to agriculture and natural resources.

In some cases, participation in nonfarm work and migration may facilitate investments that improve agricultural productivity and support agricultural commercialization. For instance, Faxon's (2020) detailed study of land and livelihoods in Kalay—a lowland district in Sagaing region, bordering Chin State—found that "[f]or many Chin families and a rising number of Burmans, labor migration provided an essential way to earn money that was reinvested in transforming the agrarian landscape" (64). This transformation included investments in commercially managed fishponds constructed on former rice paddy, as well as in rearing pigs and poultry, using remittances received from abroad. Remittances also supported the purchase and rental of agricultural machinery, which reduced demand for labor in a context of increasing labor scarcity precipitated by migration (Faxon 2020).

Land ownership (and, thereby, participation in agriculture) and welfare outcomes are increasingly becoming delinked in Myanmar. This tendency reflects high levels of participation in nonfarm activities by both landless and smallholder households and the difficulty of generating substantial returns from small areas of land. As noted above, Belton and Filipski (2019) found that average incomes earned by landless households in the Dry Zone were only marginally lower than those with small landholdings. Pritchard and colleagues (2019) reached similar results with respect to the relationship between land ownership, nonfarm employment, and food security—a key indicator of welfare—based on surveys in the Delta and the Dry Zone. Although they found that landowning households were more likely than landless households to be food-secure and have higher dietary diversity, crucially, they found no statistically significant relationship between land ownership and food security and diet diversity for households with landholdings less than 5 acres—around the median landholding for farms in both zones (Chapter 10).

Moreover, the same authors found that households participating in the nonfarm economy had superior food and nutrition security outcomes to those dependent exclusively on farming or agricultural labor, regardless of whether they were landed or landless (Pritchard, Rammohan, and Vicol 2019). Hence, while access to land remains an important factor in shaping food security, household participation in the nonfarm economy appears to be of greater importance. This is in large part because, as Pritchard and colleagues show, most food consumed by rural households is purchased, not self-produced. They also observe that the highly seasonal character of much agricultural work means that connections to the nonfarm economy become particularly important for household welfare during "lean periods," when little agricultural work or produce is available.

Considering the implications of the skewed distribution of land ownership for the composition of livelihoods in the Delta, Vicol and Pritchard

(2021) contend that strategies to address rural poverty and food insecurity that hinge on fostering smallholder-led agricultural development, productivity improvements, and commercialization are unlikely to catalyze significant change. The Delta's agrarian history has led to extremely high levels of landlessness, exceeding 50 percent and rising to 80 percent in some villages. Moreover, distribution of land is highly unequal, even among those who own it (Vicol and Pritchard 2021). This scenario means that "policies that prioritize smallholder-led market development will not generate the type of pro-poor outcomes required to address the Delta's pervasive rates of food insecurity and poverty" (Vicol and Pritchard 2021, 1). Rather, the authors contend that rural livelihoods are increasingly characterized by hybridity, diversity, and mobility. Rural development policies, to be effective, must be designed accordingly.

However, in the regional context of highly conflict-affected Kachin State, Forsyth and Springate-Baginski (2022) argue that neither agricultural commercialization nor livelihood diversification into nonfarm work currently offers significant opportunities to smallholders or the landless. Rather, they suggest that the main local beneficiaries of agricultural commercialization in Kachin State to date have been local landowners with access to large areas of forest land, which is customarily used for swidden but can be converted into cropland or plantations. Outside investors also have benefited through leasing land or obtaining agricultural concessions. Forsyth and Springate-Baginski (2022) contend that the nonfarm economy in Kachin offers few employment opportunities beyond dangerous work in jade or gold mining. Potentially lucrative nonfarm occupations, such as trading and fishing, tend to be controlled by migrants with strong ethnic and social ties that exclude locals. These observations underline the regional specificity of livelihoods, reflecting the influence of historical path dependence and the present-day incidence of constraining factors, including conflict.

Climate change also generates regionally specific shocks and stresses to livelihoods that may also induce income diversification. In the central Dry Zone—a region subject to very high climate risk—Phyo (2022) found that farm households have adapted to climate change by altering their agricultural practices and diversifying their livelihoods through nonfarm employment and migration. However, although climate change is an important factor influencing farmers' decision-making, other factors, such as crop price instability and nonfarm business and employment opportunities, are often prioritized over climate risks. Phyo concludes "in many cases, although farmers may be aware of the effects of climate change, their livelihood adaptations are motivated by a wider array of concerns, which mitigate or even subvert their capacities to respond to climate challenges" (v).

Vulnerability and resilience since 2020

This section draws on a mix of sources to evaluate trends in livelihood vulnerability and resilience since the onset of the triple crisis in 2020. Ferreira, Salvucci, and Tarp (2021) used a regional analysis of poverty dynamics in Myanmar during the period from 2015 to 2017 to infer likely impacts on welfare in the wake of the COVID-19 crisis. Analyzing nationally representative household survey datasets, the 2015 Myanmar Living Conditions Survey and the 2017 Myanmar Poverty and Living Conditions Survey, they found that poorer households were less integrated into the formal economy and more likely to be working solely in agriculture. The total number of poor people in rural areas was 6.7 times higher than in urban areas (10.2 million vs. 1.5 million), and rural poverty rates remained higher than urban ones (30 percent vs. 11 percent) in 2017.

The same authors found significant movement out of poverty between the two surveys, indicative of the high level of economic dynamism of this period. The probability that people who were poor in 2015 would exit poverty in 2017 was high, at above 40 percent, while the chance that individuals who were nonpoor in 2015 would become poor in 2017 was low, at about 6 percent. Only 20 percent of the population was poor in both 2015 and 2017, whereas more than 60 percent was nonpoor in both years. However, a large part of the population remained close to the poverty line in 2017: 14 percent of the population had consumption expenditure levels within 20 percent of the poverty line and 30 percent were within 50 percent of the poverty line. A large share of the population, thus, remained highly vulnerable to shocks, despite the rapid improvements in welfare that occurred during the reform period.

Consequently, the triple crisis of COVID-19, the coup, and subsequent price spikes has had devastating effects, rapidly reversing more than a decade's worth of gains in living standards. The economy contracted by 18 percent in 2021, following very weak growth in 2020, making the economy around 30 percent smaller than it would have been in the absence of COVID-19 and the coup (World Bank 2024). The estimated national poverty rate increased to about 50 percent (Diao and Mahrt 2020; MAPSA 2022), double that in 2017 and similar to 2005 levels. Headey and colleagues (2022) report even larger estimated increases in poverty rates, with two-thirds of sampled rural households and just under two-thirds of sampled urban households estimated to fall below the poverty line by September/October 2020. In contrast, only 8 percent of sampled urban households had been poor in January 2020. More than 80 percent of households surveyed in September/October 2020 reported a drop in income since the beginning of the year (Headey et al. 2022). Loss of employment was one of the main channels of impact, with households relying on informal jobs and remittances being most heavily affected (Diao and Mahrt 2020).

Prior to the onset of COVID-19, migration offered a means for migrants and their households to manage shocks and risks and seek upward mobility (Okamoto 2020). The crisis rendered households heavily dependent on remittances especially vulnerable to losses of income. The pandemic severely curtailed the ability of domestic and international migrants to send remittances. Job losses were very common, with the informal nature of most migrant work meaning that few migrants had access to any employment protection or safety nets (Suhardiman et al. 2021). Reportedly, 43 percent of women and 47 percent of men migrants returning to Myanmar during the COVID-19 pandemic had lost their jobs prior to their return, with significant impacts experienced in all sectors of work populated by migrants (IOM 2020). Eighty-three percent of returned internal migrants and 67 percent of returned international migrants reported that they had no savings, and 50 percent reported being in debt, compounding economic challenges for their households. Nevertheless, more than half of returnees (55 percent) planned to re-migrate, with most of these intending to do so as soon as possible (IOM 2020).

Internal and international migration—whether forced for political and security reasons or voluntary for economic ones—has accelerated sharply since the coup (Tun 2022). This new pattern of migration reflects how the economic shock associated with COVID-19 has been compounded by the even more profound shock of widespread political repression and conflict.

As discussed in Chapter 1, conflict increased across Myanmar throughout 2022, affecting states and regions including Bago, Chin, Kayah, Kayin, Magway, Mandalay, Rakhine, and Sagaing (Figure 1.6). The most heavily conflict-affected areas are on Myanmar's periphery and are also among those least touched by the economic dynamism of the decade preceding the crisis. Households in these areas were considerably more likely to remain poor between 2015 and 2017 than households in other areas of the country and, correspondingly, remained more vulnerable to falling below the poverty line (Ferreira, Salvucci, and Tarp 2021). Thus, the most conflict-affected areas of Myanmar at present are also those with the most persistent poverty and the highest levels of vulnerability. They are also among those with the most limited access to infrastructure and services and the most limited scope for livelihood diversification prior to the crisis (Forsyth and Springate-Baginski 2022; Vicol, Pritchard, and Htay 2018), underlining how histories of conflict have compounded and entrenched regional inequalities.

Conclusions

Since 2010, Myanmar has undergone two political and economic sea changes in quick succession, with the negative effects of the latter compounded by the global COVID-19 pandemic and inflationary crises. These changes gave rise to an extremely tumultuous period, during which rapid but uneven growth, development, and rural transformation were followed by a violent reversal of fortunes that elevated poverty rates and intensified underlying vulnerabilities. These upheavals are reflected in the shifting livelihood patterns described above. Many rural households benefited from new possibilities and economic opportunities in the period of reform and economic growth, only to face acute challenges and correspondingly large declines in welfare subsequently.

The trends outlined above suggest that longstanding geographic inequalities in opportunity and welfare will continue to widen over at least the medium term in the face of conflict and repression, with internal displacement and economic imperatives expanding migration flows (Chapter 15). Such a scenario will leave the rural economy much diminished relative to the pre-crisis period, increasing the importance of migration for sustaining the welfare of rural households. However, it will also leave households that are heavily reliant on migrant remittances vulnerable to any future shocks that curtail the movement of people or their ability to find work.

Prior to the triple crisis, the nonfarm economy was a major driver of growth in rural incomes and key to lowering poverty. Households with both agricultural and nonfarm income were generally less poor and more food-secure than households dependent solely on farm income. The economic contraction outlined above is likely to have narrowed this advantage, as many households that benefited from nonfarm business activities or employment pre-crisis have experienced substantially reduced income-earning opportunities.

As the nonfarm economy falters in response to depressed demand for goods and services, agriculture will likely continue to provide inadequate levels of food and income for most smallholders. However, the sector may attain greater significance among the range of livelihood strategies rural households pursue than in the recent past, given the paucity of other options. Smallholder agriculture can provide a buffer against shocks affecting nonfarm activities, such as migration. Agricultural livelihoods appear likely to remain more resilient than those in the rural nonfarm economy during the current crisis despite the constraints that farming households face. Agriculture is worthy of continued attention and support to help maintain its role in underpinning rural livelihoods.

Moreover, as difficult as the situation in Myanmar currently is, evidence from the dynamic period prior to 2020 indicates that many rural people will respond to new economic opportunities where these arise, whether on-farm or off-farm. Both sectors are critical to current survival and offer a basis for future recovery if political circumstances improve.

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Chapter 19

CONCLUSION: FROM RECOVERY TO RENEWAL OF THE AGRIFOOD SYSTEM

Duncan Boughton and Bart Minten

Myanmar's agrifood system is of critical importance for the near-term survival and longer-term flourishing of its diverse population. Prior to the recent crises, the food system accounted for almost half (47 percent) of Myanmar's GDP and almost two-thirds (64 percent) of employment, while primary agriculture accounted for 22 percent of GDP and 49 percent of employment (Chapter 2). Recovery from the multiple crises Myanmar has faced since 2020 will require a combination of effective humanitarian assistance and sustained policy reforms and investment to resolve infrastructure limitations and constraints to sustainable productivity growth. These efforts are necessary to enable the agrifood system to fulfill its potential to improve food and nutrition security and reduce poverty.

Our concluding chapter first reviews the trajectory of the agrifood system through multiple economic shocks, from the onset of COVID-19 in early 2020 through to the end of 2023; and the types of assistance needed to mitigate widespread food and nutrition insecurity. It then turns to longer-term investments and policies required to enable the agrifood system to drive long-term recovery and sustainable economic growth. While many of the shocks experienced by Myanmar since the onset of COVID-19 have also been experienced by other low-income countries, the consequences have been magnified and prolonged due to the military coup of February 1, 2021.

From transient shocks to humanitarian crisis

This section reviews the trajectory and outcomes of successive economic shocks for three overlapping groups of agrifood system stakeholders: consumers, farmers, and intermediary value chain actors.[1]

1 Examples of overlap include farmers who are also consumers and undertake off-farm value chain activities such as trading.

Beginning in March 2020, transportation restrictions to curb the spread of COVID-19 caused significant disruptions throughout Myanmar's food supply chain. During the first wave of the pandemic, these restrictions were often uncoordinated at the local level, hindering deliveries of agricultural inputs ahead of the monsoon planting period. Input retailers reported longer lags in the delivery of fertilizer orders, and mechanization service providers reduced the areas they serviced. Importantly, both sectors recovered quickly through a combination of business adaptations and less stringent travel restrictions. Monsoon crop production declined in some areas, partly because of irregular rainfall and pests, but, in aggregate, there were no clear signs of severe production declines for important crops. National production estimates for rice and pulses had declined by less than 4 percent in 2020 compared with 2019, and maize production had increased by 2 percent (USDA 2021).

Although COVID-19 policy responses had a minimal effect on production, there were widespread disruptions in crop trading (Boughton et al. 2021). Farmers faced challenges in marketing their harvests because crop traders had to contend with closed commodity exchange centers and border crossings. Supply chains adjusted, however, and bottlenecks diminished over time as domestic and international trade resumed. While commodity exchange centers were closed, crop traders relied on mobile phones to coordinate transactions and avoid violating curfews. Additionally, border gates were temporarily reopened for exports, particularly for rice and maize. Ultimately, the prices for most commodities remained largely stable during the 2020 monsoon harvest period relative to previous years. Rice prices increased by 2 percent on average relative to 2019, while farmers benefited from a 5 percent average increase in prices for their monsoon paddy (Goeb et al. 2022). Lockdowns in urban areas were accompanied by only a modest increase of 3 percent in food prices for traditional food retailers in the major cities (Goeb et al. 2022). Rural food vendors also reported relatively small changes in food prices over that period (Boughton et al. 2021).

Shocks to the agrifood system since the February 2021 coup have been larger and longer-lasting than those posed by the first two waves of COVID-19. Initially, disruptions to the banking system related to an internet shutdown and widespread strikes to protest the military coup hindered transactions for all stakeholders, but especially for agribusinesses. Regular agrifood system monitoring surveys set up during COVID-19 and continued following the military coup found that 86 percent of rice millers, 57 percent of crop traders, and 41 percent of input retailers cited the banking sector disruption as the largest they faced in the months following the military coup (MAPSA

2021a; 2021b; 2021c). Even more persistent and damaging for all agrifood system actors were high rates of inflation driven by the depreciation of the Myanmar kyat and compounded by increases in international prices for fuel and fertilizer.

Meanwhile, more than 60 percent of crop traders, agricultural input retailers, and rice millers reported increased transportation costs in March and April 2021. For crop traders, transportation costs increased by an average of 22 percent within their state or region and by 39 percent outside of their state or region. International commodity price increases, especially for fuel and fertilizer, following the Russian invasion of Ukraine drove inflation even higher (Diao et al. 2022). Ultimately, as we show below, inflation hit consumers the hardest.

Poverty and food and nutrition insecurity

This section examines in more depth the status and drivers of food and nutrition insecurity through the lenses of geography, income, and demographic factors. Finally, it examines the role of food price inflation as a key driver of recent increases in poverty.

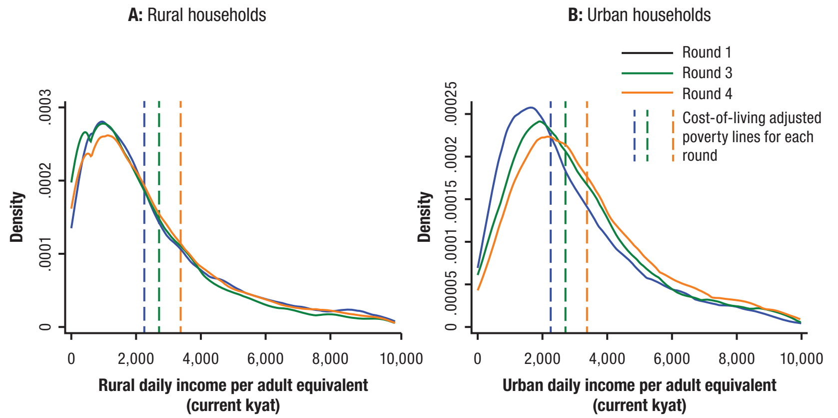
POVERTY, EMPLOYMENT, HOUSEHOLD ASSETS, AND RESILIENCE INDICATORS

By December 2022, two out of every three people in Myanmar were estimated to be poor, based on income poverty estimates, up from one out of every two households at the beginning of the year (MAPSA 2023e). High rates of inflation—19.5 percent year-on-year in July 2022, according to the Central Statistical Organization (CSO and MOPF 2022)—have a powerful impact on poverty rates in the presence of stagnant nominal incomes.

Panel A of Figure 19.1 shows the income distribution and poverty lines for rural households over three MHWS survey rounds between December 2021 and December 2022; while panel B shows the same information for urban households. Poverty lines are adjusted for cost of living using quarterly food vendor survey data for periods when CSO data are not available. The area under the income distribution to the left of the poverty lines represents the share of the population that is poor in each survey round.

Panel A shows that in rural areas the distribution of nominal income changed very little between December 2021 and December 2022. Rather, changes in the share of the population that is poor were linked almost entirely to inflation, that is, the poverty line shifting to the right. In contrast, in urban areas (panel B), both the income distribution and the poverty line shift to the right in each round. Rising income initially tempered rising costs between

FIGURE 19.1 Changes in urban and rural nominal income distributions and poverty lines in 2022



Source: MAPSA (2023e).

Note: MHWS Round 1 = December 2021 to February 2022; Round 3 = July to August 2022; and Round 4 = October to December 2022. Round 2 is not included to simplify figure, as income distribution is similar for all four rounds in rural areas, and poverty increased little between Rounds 1 and 3 in urban areas.

Rounds 1 and 3, resulting in only small changes in urban poverty of about 3 percent. However, between Rounds 3 and 4, the rightward shift in the urban income distribution does not keep pace with the 24.7 percent increase in the poverty line. Consequently, we see the largest increase in urban poverty of 12.5 percent between Rounds 3 and 4.

In terms of socioeconomic characteristics, households dependent on casual wages and asset-poor households were the most vulnerable. More than four out of five households used at least one coping strategy to meet daily needs during the month prior to being interviewed (MAPSA 2023e). The most common coping strategies were spending savings and reducing food and non-food expenditures (Chapter 5). Households in Kayah, Chin, and Sagaing—the states and regions most severely affected by recent conflicts with the military regime—were most vulnerable. Perhaps unsurprisingly in view of the prolonged conflicts there, nearly 80 percent of households in Rakhine were income-poor and mortgaged or sold assets as a coping strategy.

SPATIAL, INCOME, AND DEMOGRAPHIC DIMENSIONS OF FOOD AND NUTRITION INSECURITY

Food and nutrition security deteriorated markedly in 2022 (MAPSA 2023d). The share of households with a low food consumption score increased from

9.4 percent to 15.7 percent during the year. Rural households were much more likely to have a low food consumption score compared with urban households (18 percent vs. 10 percent). Low income and few assets are positively correlated with food insecurity and poor diet quality, with daily wage workers particularly vulnerable (MAPSA 2023a; Chapter 16), while receiving remittances is inversely correlated with dietary inadequacy (MAPSA 2023e). As panel A of Figure 19.2 shows, low food consumption was most prevalent in Chin (48 percent), Kayin (23 percent), and Magway (23 percent), all highly conflict-affected areas.

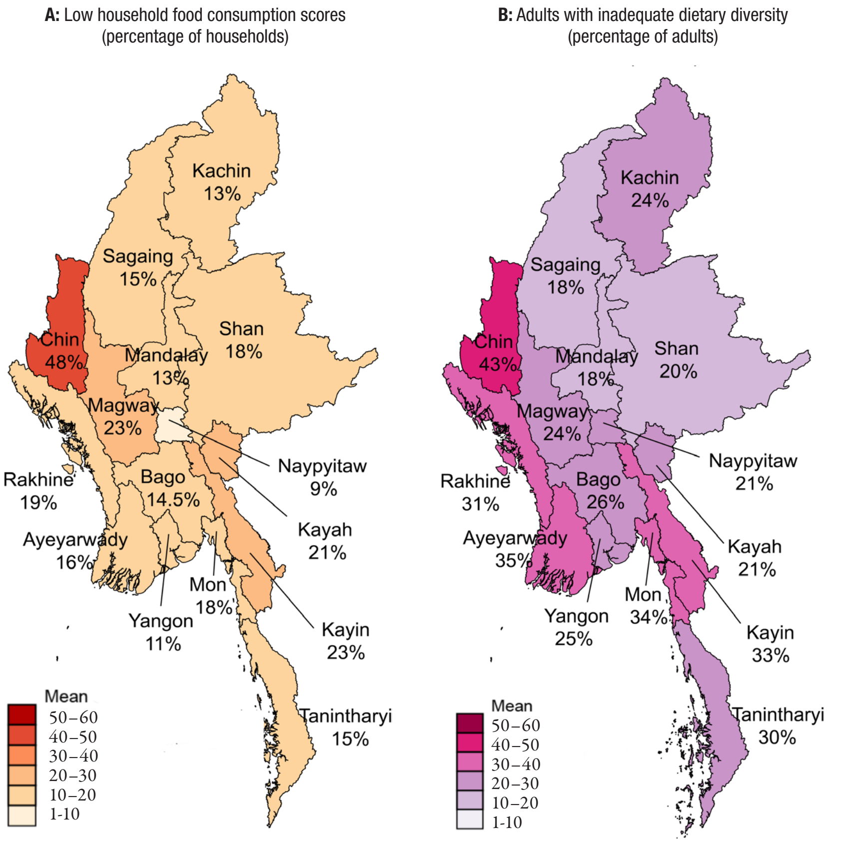
Inadequate diet diversity among adults increased from 21 percent to 25 percent during 2022. Rates were higher for women than men and in rural than in urban areas. As panel B of Figure 19.2 shows, the highest rates of inadequate diversity were reported in Chin (43 percent), Ayeyarwady (35 percent), Mon (34 percent), and Kayin (33 percent). Decreases in diet quality among adults were the result of lower consumption of milk and dairy products, vitamin A-rich fruits and vegetables, meat, fish, and eggs. More than a third of children ages 6 to 23 months and 15.9 percent of children ages 24 to 59 months have inadequate diet quality.

The prevalence of hunger remained relatively constant during 2022; at 4 percent of households, with higher levels in Chin (10 percent), Mon (7 percent), and Rakhine (6 percent). Asset- and income-poor households were more likely to experience moderate to severe hunger.

CONFLICT, DISPLACEMENT, AND MIGRATION

The number of internally displaced persons (IDPs) increased by almost 1.4 million in the two years following the coup of February 2021 (UNHCR 2023). More than half of this number came from the Sagaing Region. While migration was already high before the coup (Chapter 15), the number of migrants during the 18 months between December 2021 and June 2022 was estimated to be almost 3.6 million, according to the Myanmar Household Welfare Survey (MHWS) (MAPSA 2022d). Approximately one in six Myanmar households saw a member leave over this period, and 7.3 percent of households migrated as an entire unit (accounting for approximately half of all migrants). Two-thirds of those who migrated sought better employment opportunities. However, only about half were able to improve their income, implying that their vulnerability may have increased (at least temporarily) as a result. While conflict is also an important driver of migration (along with poverty), it is difficult to estimate the overlap between the number of IDPs and the number of migrants owing to missing panel data observations in the

FIGURE 19.2 Prevalence of low household food consumption and inadequate adult dietary diversity scores, fourth quarter, 2022



Source: MAPSA (2023a).

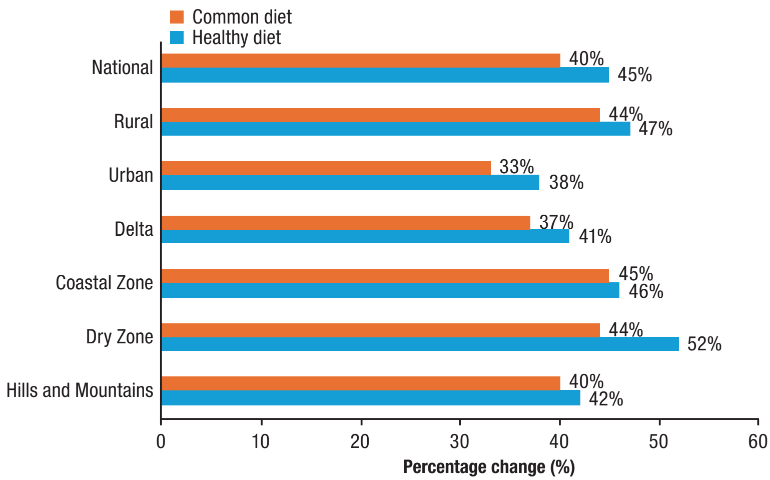
Note: High values represent high prevalence of dietary inadequacy.

MHWS. The widening conflict also affected productivity and retail distribution margins in the rice sector (MAPSA 2023a; Minten et al. 2023).

FOOD VENDORS AND FOOD PRICE INFLATION

While the incidence of hunger and degradation of diet quality is an area of concern, especially for women and young children, it is surprising that the situation at the end of 2022 was not even worse, given the level of food price inflation. The cost of both common and healthy diets (the latter comprising higher calorie shares of protein-rich foods, fruits, and vegetables relative to rice and vegetable oils) rose 45 and 40 percent, respectively, over the 12-month

FIGURE 19.3 Change in cost of common and healthy diets between March 2022 and February 2023, by area



Source: MAPSA (2023c).

period ending February 2023, while the price of rice increased by 62 percent (MAPSA 2023c). Protein-rich dietary components also increased in price over this period: eggs by 67 percent, chicken by 50 percent, and pork by 20 percent. Figure 19.3 shows the spatial pattern of dietary cost changes. Increases were higher in rural and in conflict areas, consistent with spatial patterns of dietary degradation.

Increases in food costs outpaced changes in wages. The food purchasing power of daily wages received by construction and agricultural wage laborers declined by 25 percent and 28 percent, respectively, over 2022 (MAPSA 2023c; Chapter 16). As food grew increasingly unaffordable for wage earners, especially in rural areas where dietary cost inflation was higher, households dependent on daily wages as their main income source became one of the most vulnerable household groups. While the relative decline in purchasing power is the same for male and female workers, the significantly lower wages paid to women further compromise food purchasing power for their families.

Farm production

This section examines the trajectory of the supply side of the agrifood system. We first look at farm-level production and follow this with off-farm components. The depreciation of the Myanmar kyat and increases in international prices for fertilizer and other chemical inputs have had a major impact on farm input costs. For export-oriented crops such as rice and pulses, higher costs have been offset by higher farm output prices, albeit with a time lag. The transmission of price increases to the farm level has nevertheless been dampened by widening marketing margins and distorted by unpredictable exchange rate regulations for crop exporters. These regulations in 2023 had an effect similar to an export tax of between 19 and 30 percent. The market situation for farmers producing crop and livestock products for the domestic market has also been depressed by the reduction in consumer purchasing power. The rapid expansion of conflict and insecurity in rural areas, especially in the Dry Zone, has further undermined the ability of farmers and traders to adapt to a complex market environment.

CROP PRODUCTION

Rice is a key crop, given its large share of agrifood system GDP (25.8 percent), its role in domestic consumption (half of all urban and 62 percent of rural calories consumed), its importance for employment generation on-farm and downstream in rice milling, and export earnings (Minten et al. 2023). For rice, we consider the response of farmer decisions to changes in input and output prices separately for the monsoon and post-monsoon seasons: improved water control and higher sunshine hours during the post-monsoon allow for the cultivation of higher-yielding varieties, with greater control in crop management operations compared with in the monsoon season.

Input and output prices changed dramatically between the 2021 and 2022 post-monsoon rice production seasons (MAPSA 2022a; 2022b). (Also see Chapter 3.) Urea fertilizer prices increased by 50 percent and tractor plowing services by 29 percent. Farmers adapted to these higher costs by increasing average total farm expenditure on inputs, which rose by 15 percent, and reducing urea application by 10 percent. Despite the reduction in fertilizer use, yields were very similar in both years. In contrast with 2021, when monsoon paddy prices were almost unchanged relative to the previous year, farmgate paddy prices increased by 42 percent in 2022. Overall, the profitability of post-monsoon rice production had improved in 2022 compared with the previous year.

A similar pattern is observed for pulse crops, which are also grown primarily in the post-monsoon season and for which there is strong export demand. Compared with 2021, averaged across all pulse types, farmers increased input expenditures by 11.5 percent, yields were similar, and output prices increased by 34 percent and gross margins by 44 percent.

The outlook among paddy farmers for the 2022 monsoon season was less optimistic relative to the preceding post-monsoon crop. Most farmers anticipated lower production because of substantially lower fertilizer use. Urea prices in July 2022 were almost twice as high as in the previous monsoon season. This was coupled with worse weather conditions (especially higher flood incidence). The surge in paddy prices following the 2022 monsoon harvest, which outpaced increases in the price of rice on international markets, indicates that farmers' predictions of lower harvests were likely correct.

The impact of the widening conflict on rice production is difficult to observe directly. Farmers in communities experiencing conflict are often unable to respond to phone surveys. Nevertheless, spillover effects on nearby communities are likely (e.g., reduction in transportation services or access to hired labor from neighboring villages). Increases in fatal violent events between 2020 and 2021 are correlated with a small reduction in total factor productivity—a measure of the overall efficiency of all inputs used to produce rice—by about 4 percent on average in the short run (MAPSA 2023a).

LIVESTOCK AND FISHERIES

Prior to the COVID-19 pandemic and the coup, Myanmar's poultry, pig, and aquaculture sectors were growing rapidly, particularly in the peri-urban zones around major cities (Chapters 9 and 12). The dynamism evident in these sectors corresponded with a period of rapid economic development that spurred rising real incomes and domestic urban demand for animal-source foods. Production growth was also supported by large foreign and domestic investments in sectors like feed milling, as well as by the investments of small and medium enterprises, such as traders, which also grew rapidly during this period (Fang et al. 2021; Chapter 9).

Movement restrictions during the earliest stages of the COVID-19 pandemic disrupted supplies of production inputs and the distribution of livestock and fish products to market. However, similar to crop farming, these logistical issues were overcome relatively quickly. Longer-lasting impacts were felt in the form of depressed consumer demand caused by the economic downturn associated with the pandemic (Chapters 5 and 13). This trend was intensified by the coup and inflationary pressures, which contributed to substantial reductions in demand for and consumption of nutrient-rich foods, including fish and livestock products (Chapter 4). Reduced demand was transmitted upstream along livestock and fish supply chains, resulting in high levels of temporary or permanent closure among operations such as peri-urban broiler farms (Fang et al. 2021; Chapter 9). However, the income elasticity of demand for animal-source foods means that demand could rebound quite quickly if economic conditions improve in the future, prompting remaining producers to scale up production or stimulating investment by new entrants.

Capture fishing activities are very important for livelihoods in coastal areas of Myanmar and the Ayeyarwady Delta. However, they face serious governance challenges and unsustainable levels of resource exploitation that require a shift from strategies that favor resource extraction in the short term to those promoting long-term stewardship.

Post-farm processing and distribution

Rice milling is the largest agrifood processing sector in Myanmar, with an essential role in enabling consumers to access the major source of their calories. The widespread disruption of the banking system following the coup for online and in-person transactions was the most important source of business difficulties for 90 percent of millers (Minten et al. 2023). Although milling margins—the wedge between the paddy purchase price and ex-mill rice sales price after accounting for byproduct value—remained stable, the rising costs of transportation as a result of increasing international prices for fuel and depreciation of the Myanmar kyat resulted in a widening gap between mill and retail vendor prices over time. Incidents of violence increased the gap still further. The economic welfare cost of market disruptions to farmers and consumers was approximately $500 million over a year (Minten et al. 2023). Introduced in 2022, the mandatory conversion of a (varying) share of foreign currency earnings from rice exports at the overvalued official exchange rate has had the same effect as a tax on paddy prices estimated at 19 to 30 percent depending on the parallel market exchange rate, thereby imposing additional welfare costs on farmers.

The disruptions in the banking sector, rising transportation costs (up 63 percent in August 2022 compared with a year earlier), and exchange rate regulations inevitably affected crop traders broadly (MAPSA 2022a).[2] Trader margins increased due to higher transport costs but fell as a percentage of (higher) crop buying prices, indicative of competitive market conditions. Rice millers faced additional challenges from frequent and prolonged energy shortages, resulting in higher milling costs for mills using diesel generators and

2 The requirement to convert a share of export proceeds applies to official exports of all crops, including pulses and beans, maize, and sesame. In addition to being an indirect tax on farmers, the requirement creates additional incentives for informal border trade.

contributing to a 20 percent reduction in throughput in August 2022 compared with a year earlier; milling margins increased 40 percent over the year (MAPSA 2022c).

As discussed in Chapter 13, for lower-middle-income countries like Myanmar, expenditures on convenience foods and food consumed away from home typically have high price and income elasticities relative to unprocessed or minimally processed staple foods. Such expenditures rise quickly with urbanization and income growth but can also contract sharply if real incomes fall, as was the case in 2022.

To conclude this section, we note that, for consumers, rapid inflation has been the most important factor driving recent increases in poverty and food insecurity. For farmers, sharp increases in the cost of fertilizer and other chemical inputs have made it difficult to maintain crop yields. At the same time, conflict and rising costs for mechanization services may have resulted in reductions in the areas they cultivate. However, recent increases in farm output prices will have offset, to an extent, increases in input costs. Unfortunately, high levels of inequality in land access dampen the impact of output price increases on poverty. The combination of rising transport costs, widening conflict and insecurity, and electricity shortages has increased the marketing margins between farmers and consumers or buyers. Exporters have had to contend with frequently changing central bank regulations concerning which currencies can be used for trading and what share of earnings must be converted at the overvalued official rate. In terms of ability to adapt, traders and processors in export-oriented sectors appear most resilient to these shocks, at least in the short run, while consumers are the most seriously affected. Farmers have also borne significant welfare losses due to higher marketing costs and increased price uncertainty because of unpredictable export and foreign currency regulations.

Short-term interventions to mitigate food and nutrition insecurity

Given that markets for food in Myanmar are accessible and functioning for most consumers, increasing the purchasing power of poor households through cash transfers is likely to be the most effective way to mitigate food and nutrition insecurity in the near term. Because of limited resources, however, it will be important to carefully target the most vulnerable groups, such as households with pregnant or nursing women, those with several young children or with adolescent girls, or those dependent on daily labor (MAPSA 2023c). Nutrition education for pregnant and nursing mothers and mothers with young children could be provided either in combination with cash transfers (preferably) or as a separate intervention. Rice fortification in collaboration with the private sector, whether using commercial channels or food assistance, could help address micronutrient deficiencies in the diets of poor people (Chapter 4).

Given the important role of remittances in household resilience, support to legal migration and wraparound services in receiving countries could also help mobilize resource flows. These services could include ensuring correct documentation and access to microfinance for small businesses, along with the provision of tools or equipment, upgrading of vocational skills, and health and childcare facilities.

Support for primary agriculture will also help mitigate food and nutrition insecurity, especially for smaller farmers who depend on their farming activities for a significant share of the food consumption of their household, whether through direct consumption or market exchange. Examples of potential support include finance for local small and medium seed multiplication enterprises to expand farmer access to quality planting material that is foundational for achieving higher crop yields. Strengthening access to extension information through community extension workers (linked to subject matter specialists or service providers using mobile phone services) could help farmers use chemical inputs more effectively in combination with biological options, as well as reduce losses through improved postharvest management practices. The promotion of homestead gardens and small livestock could improve the quality of diets (Chapter 4).

Reducing transportation costs, including reducing conflict-related risks to vehicles and their cargo and rent-seeking at checkpoints, will improve the effectiveness of these interventions.

Longer-term investments and policies to drive long-term recovery and economic growth

Prior to the military coup, the process of structural transformation of the agrifood system was constrained by a lack of investment in drivers of productivity growth, such as infrastructure and agricultural research (Chapter 3). The surge in poverty and food insecurity since the coup has highlighted additional vulnerabilities to economic shocks that may have been masked by the rapid decline in poverty headcounts during the two decades preceding 2020. For example, close to 40 percent of households in the main farming areas are landless. At the same time, the distribution of land among landowning farm households is highly skewed, with the smallest 70 percent of farm holdings averaging just 2 acres (Chapter 6). A high proportion of rural households are, therefore, dependent on daily wages to meet their needs and, like urban casual laborers, are among the most severely affected by the economic turbulence that has followed the coup (Chapter 16). It is important to identify ways in which livelihoods can be made more resilient if a resolution of the current political crisis is to allow economic recovery to begin. This section highlights key investments and policies to ensure that the potential contribution of Myanmar's agrifood system to economic recovery and broad-based, sustainable growth over the longer term is realized.

Agricultural value chain competitiveness

Competitiveness, a key driver of growth, refers to the ability of actors in a specific value chain to deliver products in the desired form with required quality attributes to domestic and international consumers at lower costs than those at which the products could be obtained from alternative sources. Investments in productivity, quality, and logistics (wholesale markets, cold chains, transport infrastructure) can all improve competitiveness. Given limited investment resources, however, it is important to identify those value chains with the most potential for future growth and improved poverty, food security, and nutrition outcomes. This section first recalls the value chains identified in Chapter 2 and then proceeds to identify necessary investments and policies to resolve constraints to competitiveness discussed in Chapter 3.

Chapter 2 ranked value chains according to their potential contribution to poverty reduction, hunger reduction, diet quality, employment creation, and GDP. The top five are:

- Horticulture (scores highly on all five development outcome criteria)
- Livestock (dietary quality, growth, and poverty reduction)
- Oilseeds (diet quality and poverty reduction)
- Rice (growth)
- Fish (dietary quality, growth, and poverty reduction)

These five value chains accounted for 84 percent of agricultural GDP in 2019, indicating their potential for broad-based impacts on the agrifood system. Improvement in these value chains, especially through promoting higher productivity on farm and expanding value-added processing, can spur agrifood system growth and poverty reduction in all major agroecological zones of Myanmar. This is an important consideration given the large numbers of IDPs and returning migrants to be resettled once the current crisis is resolved. Improvements to these value chains would also enable the agrifood system to respond to consumer preferences for more diversified diets at lower cost. The ranking confirms that the shift in agricultural development strategy prior to the coup from a rice-centric to a more diversified agriculture sector was correct (MOALI 2018).

Agricultural productivity

Slow growth in primary agriculture productivity has been a drag on overall agrifood system growth and farm incomes (Chapter 8). As Chapter 3 shows, crop yields in Myanmar are among the lowest in the region and showed no improvement in the decade prior to the coup. Investment in agricultural research was minimal compared with that of regional peers, and adoption of improved varieties and access to quality seed are low. Poor genetic material, in turn, limits the returns to improved crop management and chemical input use. Investment in an upgraded and decentralized agricultural research and extension system and increased access to quality seed through local small and medium seed multiplication enterprises are essential to providing a foundation for farm productivity growth across all crop subsectors. As noted in Chapter 8, systems for collecting objective agricultural statistics will also be necessary to measure progress in technology adoption and productivity growth.

Upgrading of irrigation infrastructure is also important for productivity gains and diversification into higher-value crops. Existing public irrigation services focused on rice were designed to flood large plots, giving individual farmers very little control over water management and no incentive to conserve it. Private irrigation systems designed to exploit groundwater reserves have been promoted without regard for recharge capacity, resulting in overexploitation in some areas while others are underutilized. A comprehensive irrigation water management policy and investment strategy will be necessary to facilitate diversification into higher-value and more productive cropping systems, allowing farmers more autonomy in water management and providing incentives for its conservation.

Expanded access to mechanization services over the decade prior to the coup was a game changer for farmers. Access to mechanical land preparation and combine harvesting dramatically reduced labor requirements and allowed greater timeliness in planting and harvesting, thereby increasing yields and avoiding harvest losses. As Chapter 7 notes, the mechanization revolution was also largely scale neutral, as smallholder farmers could access services from private service providers. Recent evidence indicates that the farm equipment stock of these providers is eroding because of a lack of investment, making it harder for smallholders to obtain timely service (MAPSA 2023b). Early re-capitalization of the small and medium machinery enterprise sector through finance guarantees will be necessary to facilitate rapid recovery.

In addition to investment in irrigation and mechanization services, expanded and modernized private financial services will be needed to facilitate diversification into high-value enterprises, such as horticulture. Doing so will also require investment in grading, processing, packaging, and cold chain facilities to enable the horticulture sector to expand its production beyond the absorption capacity of the fresh produce market.

TRANSPORT INFRASTRUCTURE

The lack of an extensive and high-quality road infrastructure is a major constraint to the competitiveness of Myanmar products and reduces the share of the terminal market value for their produce that is earned by farmers. As Chapter 3 states, 40 percent of the rural population lacks access to all-season roads (World Bank 2024), and more than 9 million people live in villages with only tracks to connect them to a road of any quality (World Bank 2017). Transport costs for farm inputs and products soar under these conditions, farm commercialization is limited, and diversification into higher-value perishable products is often infeasible (Chapter 10). Myanmar ranks 137 out of 160 countries in logistics performance, while peer countries in the region rank between 26 and 44 (Arvis et al. 2018). Reducing the high costs of market access will benefit farmers and consumers by encouraging diversification and reducing the wedge between farmgate and retail prices.

BILATERAL AND REGIONAL TRADE POLICIES

Export markets are important for agricultural value chains that can drive growth and poverty reduction. In the past, unpredictable trade policies implemented by Myanmar's large neighbors have resulted in uncertain market access, large swings in prices, and limited opportunities to add value (Chapter 14). Pulse exports to India epitomize such challenges, with India imposing a variable quota regime according to its domestic supply situation and capturing all added value beyond basic sorting and grading. Consequently, pulses are a gamble for Myanmar farmers, but one many take on because of their low costs of production and lack of alternatives. Exports of rice, maize, and melons to China have also faced frequent disruptions because of unpredictable border delays or closures and exporter registration requirements (Chapter 14). Export market diversification could reduce risks for exporters, especially for perishable crops, with investment in product traceability and sanitary and phytosanitary systems.

LAND TENURE AND LAND USE SUSTAINABILITY

Inequality of access means that many rural households are highly dependent on casual labor and self-employment in small nonfarm businesses. Furthermore, as Chapter 6 shows, the current system of laws concerning land remains multilayered, ambiguous, and unevenly enforced. This results in weak tenure security for farmers, particularly those working land without land use certificates, including land held under customary tenure. In addition, restrictions on the conversion of land designated for paddy cultivation to alternative uses such as aquaculture or permanent horticulture hinder diversification. The process for obtaining permission to change land use is complex, time-consuming, and fraught with rent-seeking by local officials.

Improved land tenure security should ensure that women and youth are appropriately included in those changes. Land titling efforts should allow for and encourage the recording of both spouses' names. This will also ensure that, when land titles are used as collateral for loans, both spouses give their consent. A revision of land policies should also facilitate young landless aspirant farmers becoming landowners (Chapter 17).

The national land use policy framework developed with extensive participation by civil society under the Thein Sein administration (2011–2016) provides useful principles for correcting many of the flaws in the current system. Implementation of the framework stalled under the National League for Democracy-led government, and an amendment to the law concerning access to vacant land effectively disenfranchised users who did not register their rights within a short window of time. The translation of equitable and sustainable land use policy principles into legal frameworks backed by decentralized and predictable land administration services will require deep consultation with communities and de facto authorities in different regions of the country. These consultations should also cover the identification of land where formerly or newly landless IDPs and returning migrants can resettle. Provision should also be made for communities to benefit from carbon markets in return for natural resource preservation or management improvements on land over which they have use rights.

Climate change adaptation

Myanmar's agrifood system is under threat from the effects of climate change (Chapter 8) and ranks globally among the three countries most vulnerable to extreme weather events (UNDRR 2015). Climate change is expected to bring increased difficulty and unpredictability to agricultural production in Myanmar. Its increasing effects will be reflected in higher temperatures, changing precipitation patterns, sea level rise, soil and water salinity, and increased risks of pests and diseases. In the absence of a strong national agricultural research system, climate change will result in even higher risks and losses for Myanmar's farmers. Beyond the farm, storage and logistics will be affected, and price volatility is expected to increase.

Climate change adaptation will require ramped-up application of geographic information system tools for spatial monitoring of land use, water tables, land suitability, and precision farming systems. Moreover, in the face of more frequent shocks, flexibility in land use decisions will be essential to ensure the sustainability of agricultural production in Myanmar. Priority areas for investment in climate adaptation and mitigation include research and development of climate-resilient, resource-efficient, and sustainable innovations in food systems, such as new crop varieties that better withstand droughts and floods, solar energy solutions for product storage, and improved digital technologies; holistic, inclusive governance and management of water, land, forests, and energy resources, including no-till farming, agroforestry, and landscape management; the promotion of healthy diets and increased sustainability of food production; and improved value chain efficiency and reduced food losses to help the agriculture sector adapt to some of the worst effects of climate change (IFPRI 2022).

Conclusion

Myanmar's agrifood system has proven surprisingly resilient in the face of multiple crises—COVID-19, the military coup, economic mismanagement, global price instability, and widespread conflict—with respect to production and exports. Household welfare has not been resilient, however. Approximately 3 million people have been internally displaced in three years following the military coup. High rates of inflation, especially food price inflation, have resulted in dietary degradation across all household groups, especially those dependent on casual wage labor. Among household members, young children experience the highest rates of inadequate dietary quality. Expanded social protection to improve access to better-quality diets for vulnerable households and individuals is clearly very much needed.

Turning to the longer term, while much is known about strategies to leverage public and private investment in more efficient and dynamic agrifood systems for poverty reduction and improved nutritional outcomes in low-income countries, these will not be straightforward to implement in the fragmented governance systems that are likely to evolve from the current situation of political conflict. For example, while new decentralized political administrations will likely want to exploit their regional comparative advantages (Chapter 18), they will often need more administrative capacity and trained personnel to pursue them. Furthermore, there will still be a need for supportive federal policies that address infrastructure, trade, and standards. In sum, the institutions and human capacity supporting Myanmar's regionally diverse agrifood system will need to be rebuilt in the context of a negotiated federal polity. This, in turn, will require a supportive political disposition on the part of Myanmar's neighbors as well as well-designed investment programs from external development financial institutions. The population of Myanmar deserves nothing less.

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APPENDIX: MAIN DATA SOURCES USED IN THE ANALYSES

This book presents research developed under two agricultural and food security policy research projects involving the International Food Policy Research Institute (IFPRI), Michigan State University, and research partners in Myanmar. Several surveys of households or agricultural value chain agents—including agricultural households, crop-specific producers, and agricultural input suppliers—were conducted under the projects. Appendix 1 describes the surveys from the first project, the Myanmar Food Security Policy Project (MFSPP). Appendix 2 describes surveys from the second project, the Myanmar Agriculture Policy Support Activity (MAPSA). These research efforts also involved analyses of secondary data, including those from national household surveys conducted by the Central Statistical Organization (CSO), described in Appendix 3.

TABLE A1 Myanmar Food Security Policy Project (MFSPP) Surveys

Aquaculture Survey	
Content	Household demographics; land ownership and tenure; employment; migration; aquaculture production; agricultural production; agricultural mechanization; credit; consumption
Survey year	2016, one round
Survey mode	In person, household
Sample size	1,102 households, representing 73 villages in 4 townships
States/regions	Ayeyarwady and Yangon
Public availability of data	Food Security Policy Project. 2020. "Myanmar Aquaculture Agriculture Survey: Household Component, April–May 2016." https://doi.org/10.7910/DVN/JKXZXA. Harvard Dataverse, V1, UNF:6:SYEvYWjv+y5Uqd+K7dBQIA==.
Relevant publication	Belton, B., M.J. Filipski, and C. Hu. 2017. *Aquaculture in Myanmar: Fish Farm Technology, Production Economics and Management*. Feed the Future Innovation Lab for Food Security Policy Research Paper 52. East Lansing: Michigan State University.
Pulses and Oilseeds Survey	
Content	Household demographics; land ownership and tenure; employment; migration; agricultural production; agricultural mechanization; credit
Survey year	2017, one round
Survey mode	In person, household
Sample size	1,578 households, representing the rural population of 4 townships
States/regions	Magway, Mandalay, and Sagaing
Public availability of data	Food Security Policy Project. 2020. "Rural Economy & Agriculture Dry Zone Community Survey." https://doi.org/10.7910/DVN/DFEVNK. Harvard Dataverse, V1, UNF:6:LBL6x4Y1DoJP7Qb6cOy8LQ==.
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Maize Survey	
Content	Household demographics; land ownership and tenure; employment; migration; agricultural production; agricultural mechanization; credit; consumption
Survey year	2018, one round
Survey mode	In person, household
Sample size	1,562 households, representing 323 maize-growing villages in 12 townships
States/regions	Shan (South)
Public availability of data	Food Security Policy Project. 2020. "Shan Household, Agriculture and Rural Economy: Household Survey–May–October 2018." https://doi.org/10.7910/DVN/HLJRHJ. Harvard Dataverse, V1, UNF:6:7s2BEIMmkd8ysi7ht1iCaw==.
Relevant publication	Fang, P., and B. Belton. 2020. "Maize Production, Farm Size, and Tied Credit in Southern Shan State, Myanmar." IFPRI Discussion Paper 1961. IFPRI, Washington, DC. https://doi.org/10.2499/p15738coll2.133972

(continued)

TABLE A1 (Continued)

Poultry and Pigs Survey	
Content	Household demographics; land ownership and tenure; livestock production; disease; credit; marketing
Survey year	2019
Survey mode	In person
Sample size	513 farms
States/regions	Peri-urban Yangon periphery (Yangon, Ayeyarwady, Bago)
Public availability of data	Not publicly available
Relevant publication	Belton, B., A. Cho, E. Payongayong, K. Mahrt, and E. Abaidoo. 2020. *Commercial Poultry and Pig Farming in Yangon's Peri-Urban Zone*. Feed the Future Innovation Lab for Food Security Policy Research Paper 174. East Lansing: Michigan State University.

TABLE A2 Myanmar Agriculture Policy Support Activity (MAPSA) Surveys

Myanmar Household Welfare Survey (MHWS)	
Content	Respondent characteristics; household composition; recent migration; assets; employment, livelihoods, and income; livelihood disruptions and shocks; coping strategies; diets and food security; access to essential services
Survey years	2022–2023; seven rounds
Survey mode	Phone
Sample size	Approximately 12,100 households
States/regions	All
Public availability of data	Round 1: IFPRI. 2022. "Myanmar Household Welfare Survey (MHWS), Round 1." https://doi.org/10.7910/DVN/1R3F3U. Harvard Dataverse, V1, UNF:6:KQuVWy-M3lsSkZ4DWfa1VbA==. Round 2: IFPRI. 2022. "Myanmar Household Welfare Survey (MHWS), Round 2." https://doi.org/10.7910/DVN/LPNMTK. Harvard Dataverse, V1, UNF:6:zCZ5sPqC-qx/QGxFJCVh7Bw==. Round 3: IFPRI. 2023. "Myanmar Household Welfare Survey (MHWS), Round 3." https://doi.org/10.7910/DVN/GVJKAI, Harvard Dataverse, V1, UNF:6:Txyk-7mYAU3+1UMI/T70Hkg==. Round 4: IFPRI. 2023. "Myanmar Household Welfare Survey (MHWS), Round 4." https://doi.org/10.7910/DVN/IKGJWF, Harvard Dataverse, V2, UNF:6:5p7U71k-OUPnmIHg88KSISQ==. Round 5: IFPRI. 2024. "Myanmar Household Welfare Survey (MHWS), Round 5." https://doi.org/10.7910/DVN/H75AJW, Harvard Dataverse, V1, UNF:6:Ji97jUz8tX-sUSUwVeuxNbg==.
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(continued)

TABLE A2 (Continued)

Myanmar Agricultural Performance Survey (MAPS)	
Content	Background farm; area cultivated and crops grown; rice production and sales; non-rice crops; input use; natural shocks; crop marketing; farm and livestock assets; farm services
Survey year	2022–2023; four rounds
Survey mode	Phone
Sample size	Approximately 5,000 households
States/regions	All
Public availability of data	Round 1: IFPRI. 2023. "Myanmar Agricultural Performance Survey (MAPS), Round 1." https://doi.org/10.7910/DVN/SPMYR4, Harvard Dataverse, V1, UNF:6:A-JGtQ4N7nI/leWu8XIggmQ==. Round 2: IFPRI. 2023. "Myanmar Agricultural Performance Survey (MAPS), Round 2." https://doi.org/10.7910/DVN/IUCGVE, Harvard Dataverse, V1, UNF:6:lqUjtSI-RudgFbnPrRzffag==. Round 3: IFPRI. 2023. "Myanmar Agricultural Performance Survey (MAPS), Round 3." https://doi.org/10.7910/DVN/SFX6ME, Harvard Dataverse, V1, UNF:6:Xvo-K5uMDw+DXy2MUPQjQiA==.
Relevant publication	MAPSA. 2023. *Myanmar Agricultural Performance Survey Round Two: Note on Sample Characteristics and Weighting*. Data paper. MAPSA, IFPRI, Washington, DC. https://ebrary.ifpri.org/utils/getfile/collection/p15738coll2/id/136782/file-name/136995.pdf

Agricultural Input Retailer Survey	
Content	Background input retailer; business disruptions; prospects; finances; product prices; turnover; credit (provided to farmers and taken in)
Survey years	2020–2023; 10 rounds
Survey mode	Phone
Sample size	Approximately 250 retailers. The sample was expanded from 2022 onward.
States/regions	12 states and regions, but mainly Shan, Bago, Mandalay, Ayeyarwady, Sagaing, and Magway
Public availability of data	Not publicly available
Relevant publication	MAPSA. 2021. *Monitoring the Agri-Food System in Myanmar: Agricultural Input Retailers – March 2021 Survey Round*. Myanmar Strategy Support Program Research Note 49. Washington, DC: MAPSA, IFPRI. https://doi.org/10.2499/p15738coll2.134379

(continued)

TABLE A2 (Continued)

Mechanization Service Providers Survey	
Content	Background mechanization service provider; business operations and disruptions; demand for services; input costs and availability; finances and access to credit; labor availability; policies and impacts; financial outlook
Survey years	2020–2023; 10 rounds
Survey mode	Phone
Sample size	Approximately 350 providers
States/regions	Ayeyarwady, Bago, Kayin, Magway, Mandalay, and Sagaing
Public availability of data	Not publicly available
Relevant publication	MAPSA. 2022. *Monitoring the Agri-Food System in Myanmar: Mechanization Service Providers – July 2022 Survey Round*. Myanmar Strategy Support Program Research Note 82. Washington, DC: MAPSA, IFPRI. https://doi.org/10.2499/p15738coll2.136352
Agricultural Equipment Retailers Survey	
Content	Background agricultural equipment retailers; business operations and disruptions; demand for equipment; input costs and availability; finances and access to credit; labor availability; policies and impacts; financial outlook
Survey years	2020–2021; five rounds
Survey mode	Phone
Sample size	Approximately 120 retailers
States/regions	Ayeyarwady, Bago, Magway, Mandalay, and Sagaing
Public availability of data	Not publicly available
Relevant publication	MAPSA. 2021. *Monitoring the Impact of COVID-19 in Myanmar: Agricultural Equipment Retailers - January 2021 Survey Round*. Myanmar Strategy Support Program Policy Note 45. Washington, DC: MAPSA, IFPRI. https://doi.org/10.2499/p15738coll2.134281
Agricultural Crop Trader Survey	
Content	Background commodity trader; business disruptions; prospects; finances; farmers covered; crop prices; credit (provided to farmers and taken in)
Survey years	2020–2023; 10 rounds
Survey mode	Phone
Sample size	Approximately 350. The sample was expanded from 2022 onward.
States/regions	14 states and regions, but mainly Shan State, Magway, Sagaing, and Mandalay
Public availability of data	Not publicly available
Relevant publication	MAPSA. 2022. *Monitoring the Agri-Food System in Myanmar: Agricultural Crop Traders – August 2022 Survey*. Myanmar Strategy Support Program Research Note 86. Washington, DC: MAPSA, IFPRI. https://doi.org/10.2499/p15738coll2.136430

(continued)

TABLE A2 (Continued)

Rice Miller Survey	
Content	Background mill; business disruptions; prices of paddy, rice, and byproducts; turnover; credit (provided to farmers and taken in)
Survey years	2020–2023; 14 rounds
Survey mode	Phone
Sample size	Approximately 540 millers. The sample was expanded from 2022 onward.
States/regions	Most, but mainly Ayeyarwady, Bago, and Yangon
Public availability of data	Not publicly available
Relevant publication	MAPSA. 2021. *Monitoring the Agrif-Food System in Myanmar: Rice Millers – April 2021 Survey Round*. Myanmar Strategy Support Program Research Note 53. Washington, DC: MAPSA, IFPRI. https://doi.org/10.2499/p15738coll2.134420

Food Vendor Survey	
Content	Background food vendor; business disruptions; product prices; status markets
Survey years	2020–2023; 15 rounds
Survey mode	Phone
Sample size	Approximately 900 food vendors. Sample was expanded from 2022 onward (200 before).
States/regions	National
Public availability of data	Not publicly available
Relevant publication	MAPSA. 2022. *Monitoring the Agri-Food System in Myanmar: Food Vendors - March 2022*. Myanmar Strategy Support Program Research Note 78. Washington, DC: MAPSA, IFPRI. https://doi.org/10.2499/p15738coll2.135903

TABLE A3 Central Statistical Organization (CSO) Surveys

Myanmar Poverty and Living Conditions Survey (MPLCS)	
Content	Household composition and demographics; education, literacy, and training; health; labor and employment; migration and remittances; housing; household assets/durables; household consumption expenditure; nonfarm businesses; agricultural activities; loans and credit; finance; food security and subjective assessment of well-being; shocks and coping strategies
Survey year	2015
Survey mode	In person
Sample size	3,648 households
States/regions	National
Public availability of data	https://microdata.worldbank.org/index.php/catalog/4036
Relevant publication	MOPF (Ministry of Planning and Finance) and World Bank. 2017. *Survey Conduct and Quality Control Report: Myanmar Poverty and Living Conditions Survey 2015*. Nay Pyi Taw.

Myanmar Living Conditions Survey (MLCS)	
Content	Household composition and demographics; education, literacy, and training; health; housing; household consumption expenditure; household durables; labor and employment; agricultural activities; nonfarm businesses; finance; shocks and coping strategies; migration and remittances; other income
Survey year	2017
Survey mode	In person
Sample size	13,730 households
States/regions	National
Public availability of data	Not publicly available
Relevant publication	CSO, UNDP (United Nations Development Programme), and World Bank. 2020. *Myanmar Living Conditions Survey 2017: Technical Report*. Nay Pyi Taw and Yangon, Myanmar: Ministry of Planning, Finance and Industry, CSO; UNDP; and World Bank.

Myanmar has endured multiple crises in recent years — including COVID-19, global price instability, the 2021 coup, and widespread conflict — that have disrupted and even reversed a decade of economic development. Household welfare has declined severely, with more than 3 million people displaced and many more affected by high food price inflation and worsening diets. Yet Myanmar's agrifood production and exports have proved surprisingly resilient.

Myanmar's Agrifood System: Historical Development, Recent Shocks, Future Opportunities provides critical analyses and insights into the agrifood system's evolution, current state, and future potential. This work fills an important knowledge gap for one of Southeast Asia's major agricultural economies — one largely closed to empirical research for many years. It is the culmination of a decade of rigorous empirical research on Myanmar's agrifood system, including through the recent crises. Written by IFPRI researchers and colleagues from Michigan State University, the book's insights can serve as a to guide immediate humanitarian assistance and inform future growth strategies, once a sustainable resolution to the current crisis is found that ensures lasting peace and good governance.

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