

AGRICULTURAL VALUE CHAINS: EXAMPLES OF QUIET TRANSFORMATION

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Myanmar’s agricultural value chains¹ 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 agri-food 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 Phyto 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.

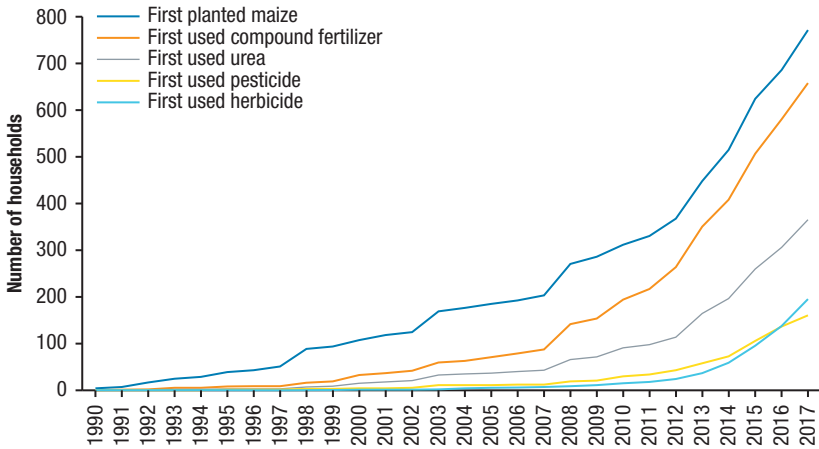
Changes in the upstream and midstream of the maize value chain

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.

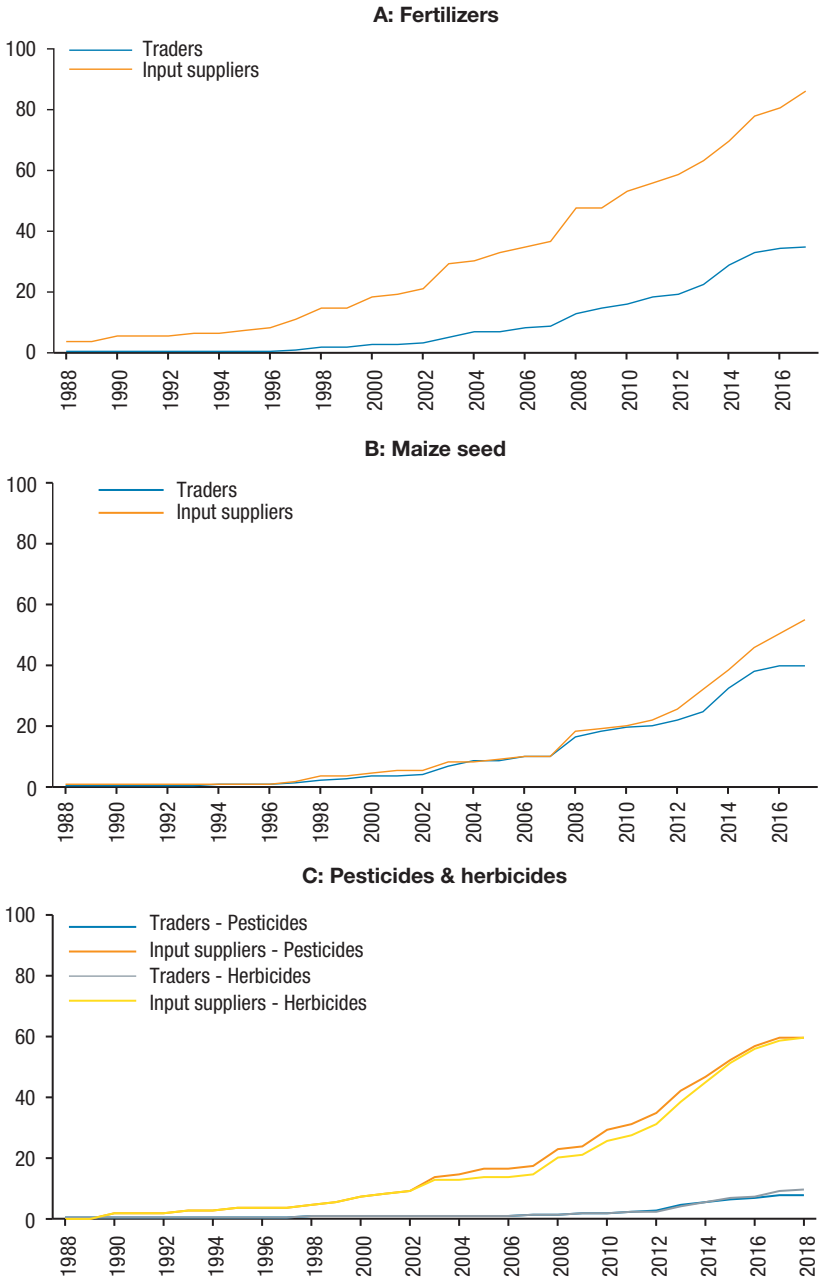
differentiate themselves from their competition through the seed varieties they offer (Table 12.2).

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

Characteristic	Input suppliers		Traders	
	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.

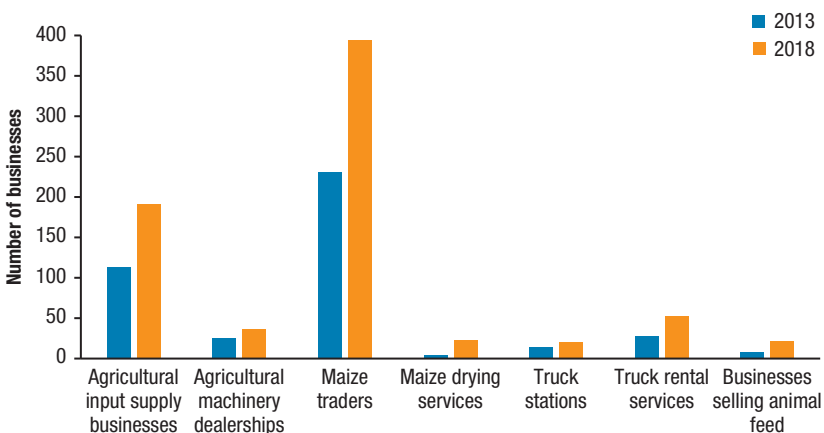
Note: Landholding terciles are obtained by ranking maize-farming households by the area of agricultural land that they operate and dividing the households into three equal groups. Output-tied credit is credit that obliges the borrower to sell production outputs (in this case maize) to the lender.

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.

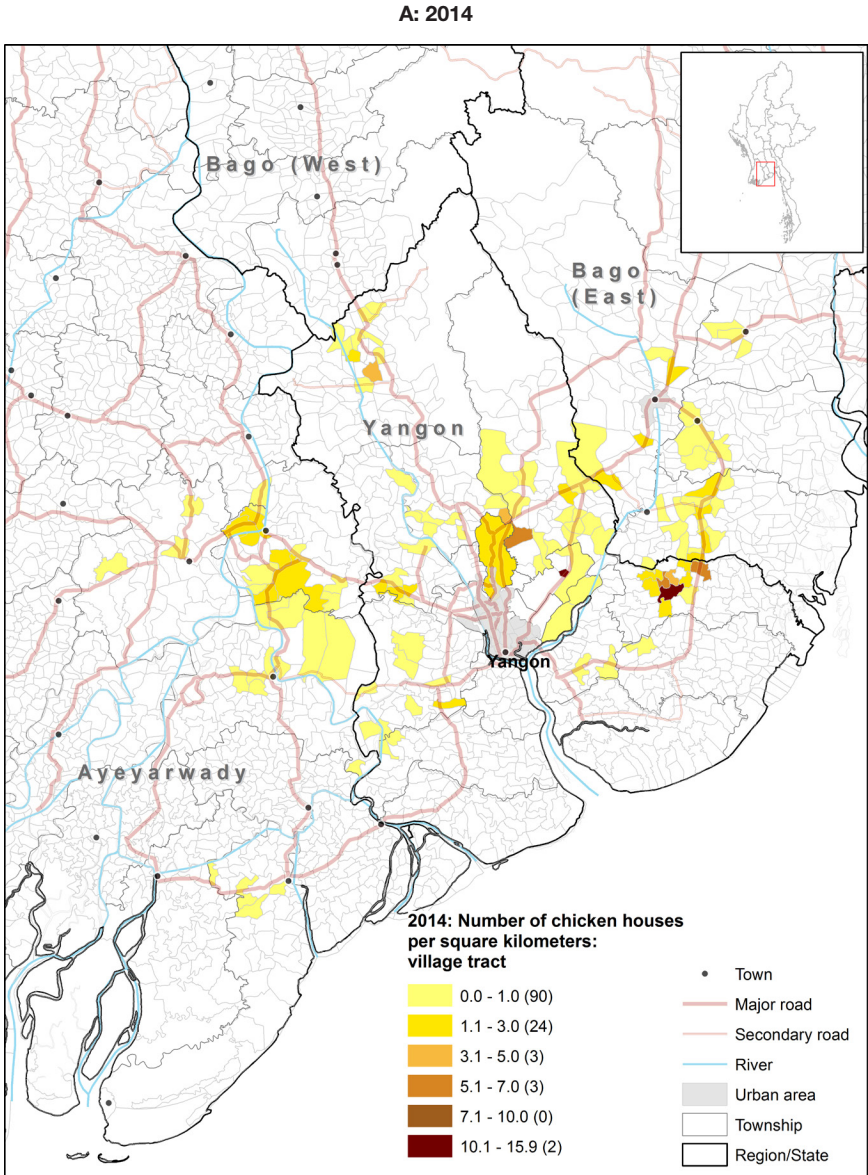
In the mid-1990s, CP established poultry farming with high-yielding broiler and layer chicken breeds raised in intensive feedlots using commercially milled formulated feeds. CP initially established vertically integrated feed milling and farming operations but later diversified into contract farming 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).

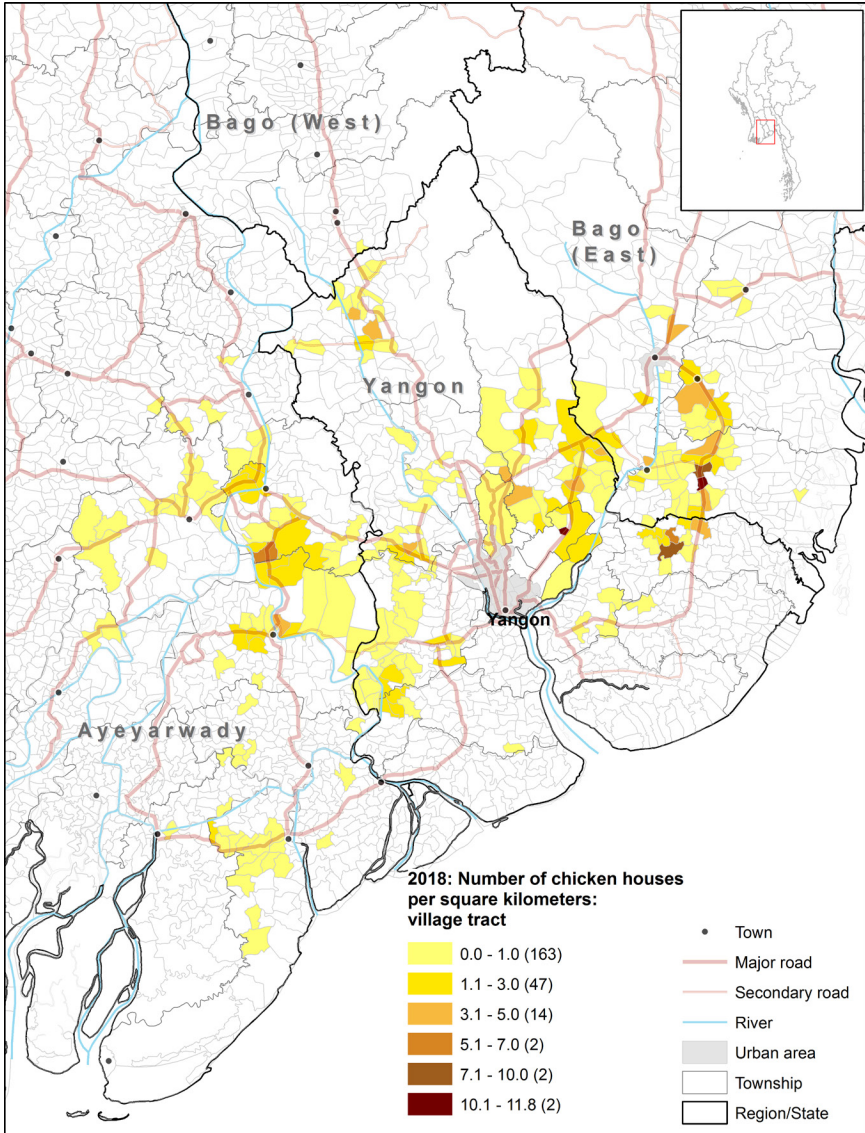
Analysis of satellite images indicates that the total number of chicken houses on integrated chicken–fish farms within 100 km of Yangon doubled in the five years from 2014 to 2018, up from about 1,900 to about 3,900. The number of village tracts with integrated chicken–fish farms in this zone also rose, 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).

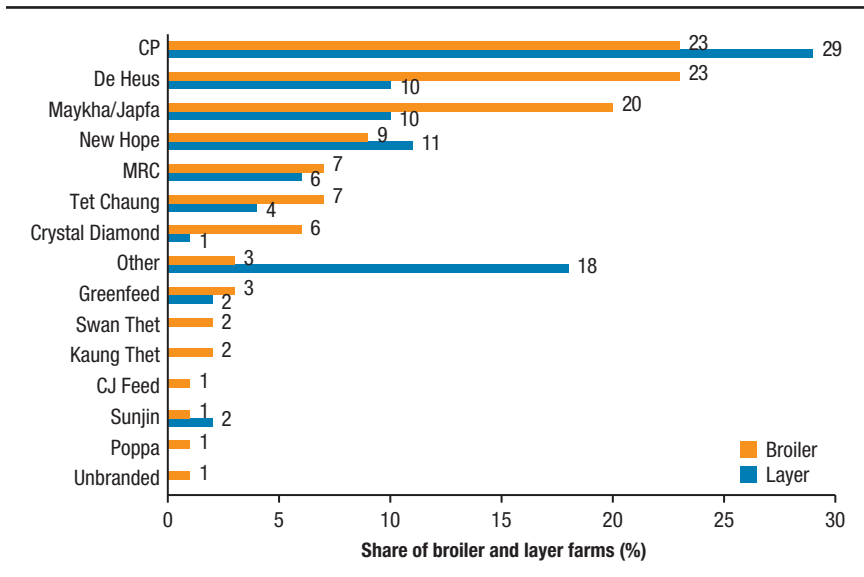
FIGURE 12.4 Density of poultry houses per village tract from integrated chicken–fish farms within a 100 km radius of Central Yangon, 2014 and 2018



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

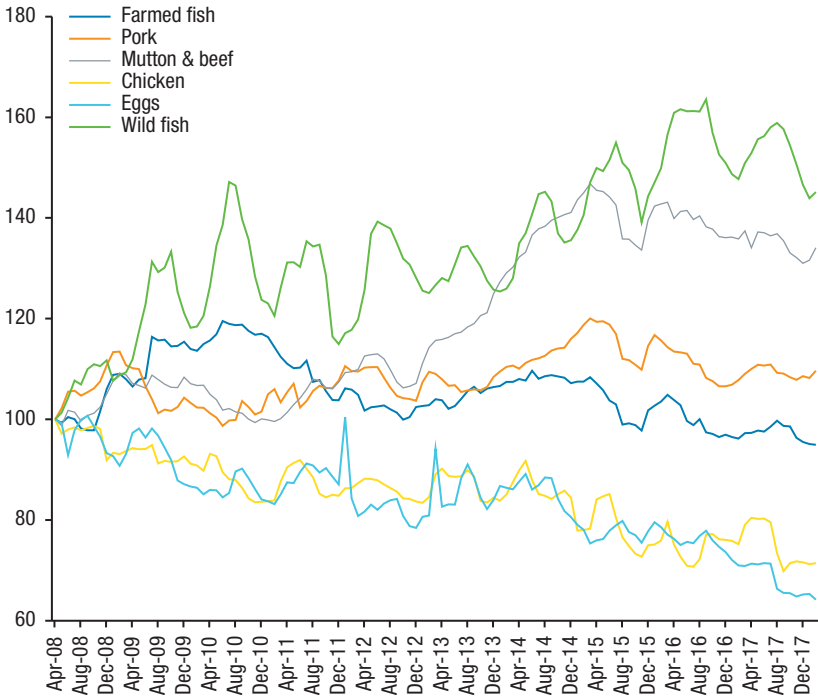
pond area. This transformation has facilitated farm growth and the adoption of productivity-enhancing innovations, such as the use of commercially manufactured feeds and the stocking of large fish seed to reduce the duration of production cycles.

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

Year	Groundnut			Sesame			Green gram		
	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.

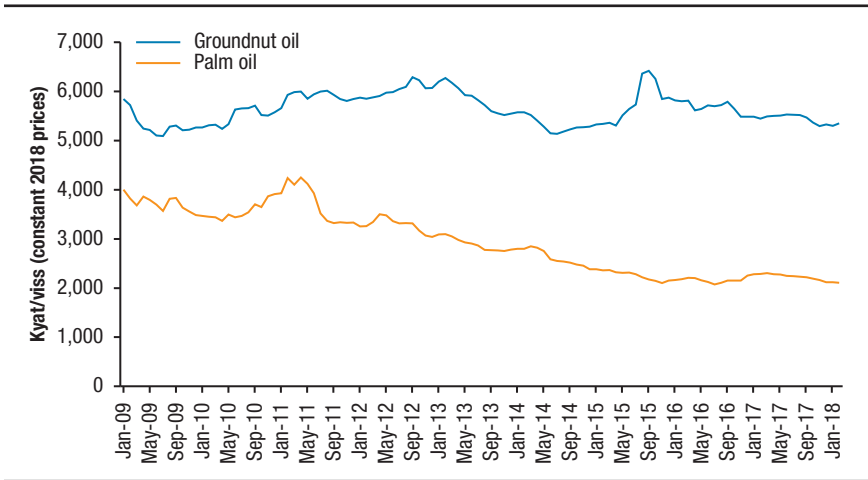
The shrinking number of operational mills and the falling volume of oilseeds processed by remaining mills are largely the result of imports of cheaper palm oil, which has partially displaced consumer demand for groundnut and sesame oil. A long-run decline in the price of palm oil corresponded with the 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.

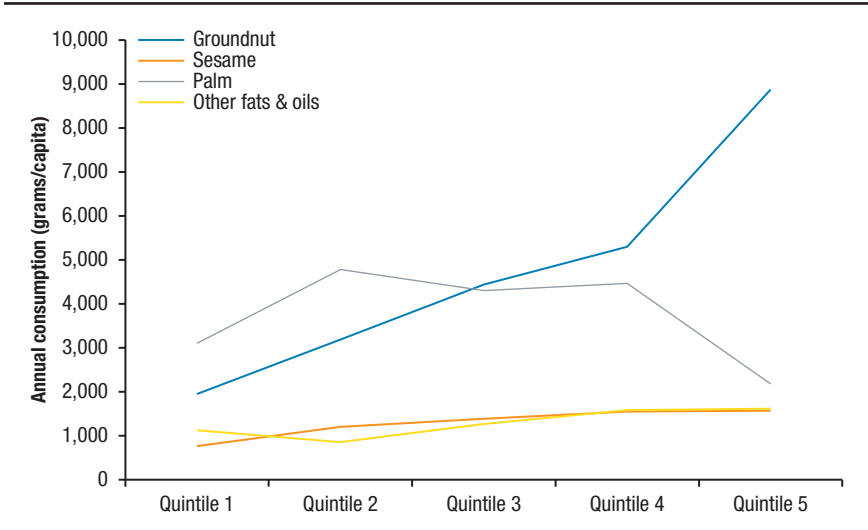
FIGURE 12.7 Real monthly retail prices of groundnut and palm oil, January 2009–February 2018



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 supermarkets³), 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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