Chapter 10

FARM COMMERCIALIZATION: A TRANSFORMATION ON HOLD OR IN REVERSE?

Bart Minten, Peixun Fang, Phyo Thandar Naing, Zin Wai Aung, and Hnin Ei Win

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).

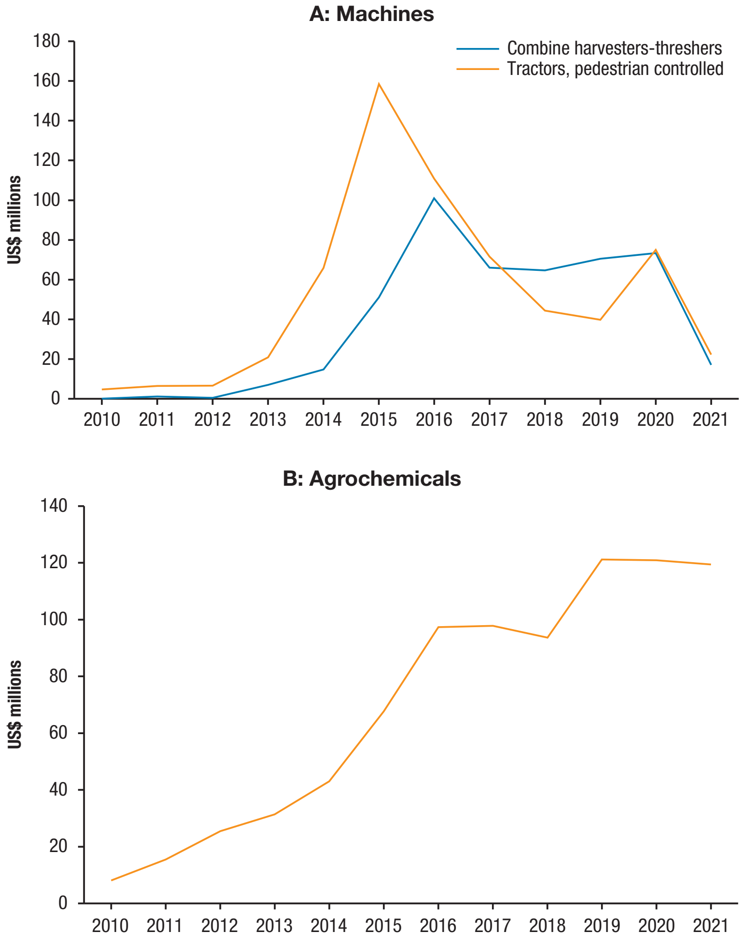
Large changes have occurred in chemical fertilizer imports as well. Local inorganic fertilizer production makes up a relatively small share of total inorganic fertilizer use in Myanmar (IFDC 2017), with most imported from abroad.[3] Figure 10.2 shows levels of imports of chemical fertilizers between 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

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).

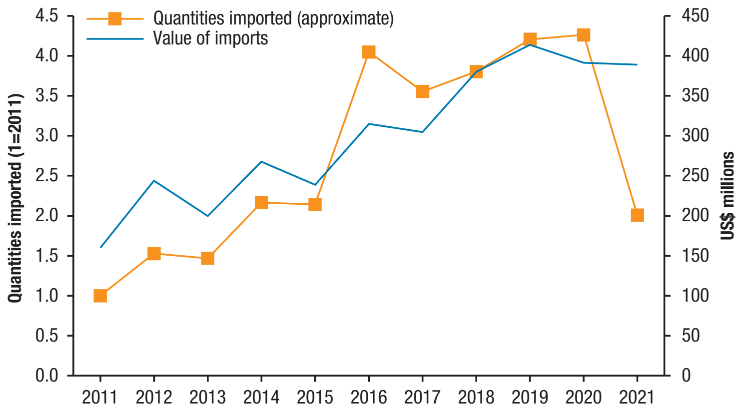
FIGURE 10.1 Imports of machines and agrochemicals, 2010–2021



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 (2,581)	1,682 (4,093)	700 (2,570)	592 (1,275)	488 (1,045)
Paddy sales	574 (1,974)	1,278 (3,123)	375 (1,747)	328 (1,001)	164 (780)
Other cereals production	112 (618)	26 (169)	2 (26)	28 (391)	354 (1,060)
Other cereals sales	99 (506)	23 (161)	1 (15)	22 (387)	318 (817)
Pulses production	324 (1,252)	634 (1,278)	5 (64)	342 (1,671)	34 (163)
Pulses sales	276 (1,175)	525 (1,091)	4 (60)	301 (1,641)	31 (157)
Oilseeds production	173 (585)	46 (387)	31 (140)	408 (837)	35 (203)
Oilseeds sales	117 (441)	38 (333)	24 (118)	270 (627)	23 (134)
Vegetables production	127 (1,268)	155 (2,083)	89 (611)	133 (792)	97 (424)
Vegetables sales	118 (1,253)	154 (2,082)	81 (600)	120 (748)	82 (358)
Fruits production	57 (613)	42 (270)	96 (1,086)	76 (827)	39 (287)
Fruits sales	52 (528)	41 (268)	59 (457)	72 (783)	38 (272)
Cash crops production	208 (1,916)	247 (2,203)	344 (1,187)	173 (2,302	175 (841)
Cash crops sales	198 (1,894)	233 (2,170)	321 (1,129)	164 (2,284)	171 (837)
All crops production	1,942 (3,885)	2,873 (5,361)	1,330 (3,065)	1,774 (3,511)	1,278 (1,830)
All crops sales	1,467 (3,384)	2,331 (4,524)	898 (2,167)	1,292 (3,309)	878 (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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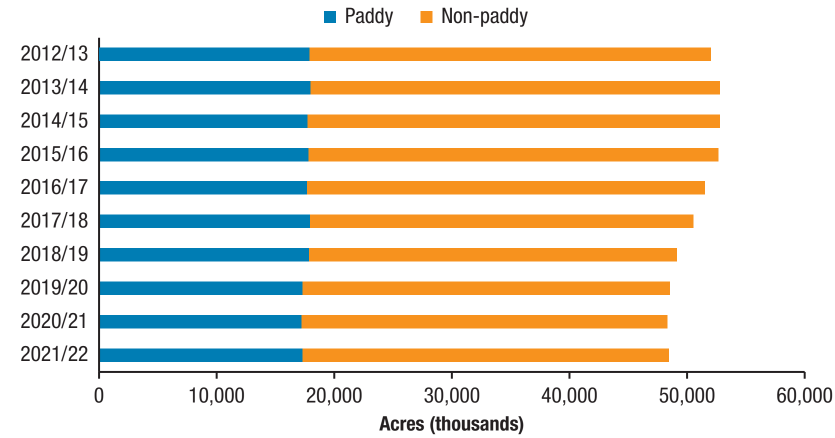
7 Households with only small garden parcels—growing vegetables or fruits on land smaller than 0.1 ha—are not considered farm households, so they are not included in this analysis. These households are likely high-income nonagricultural households or landless workers and, thus, tend to grow vegetables 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.

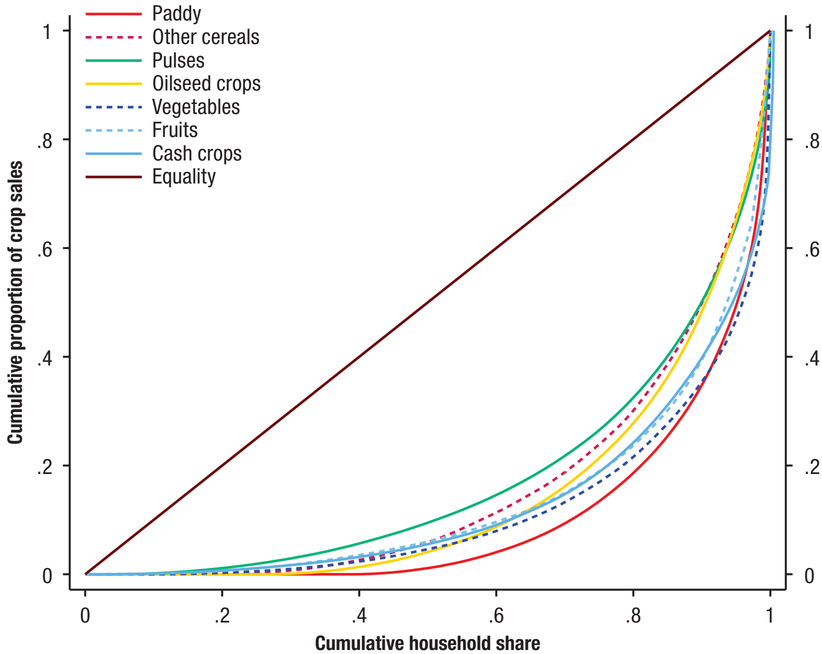
Larger land area and more intensive use of land are associated with greater commercialization. Farmers with larger cultivated land area are less likely to engage in subsistence production—that is, they have sufficient land to produce the crops their household requires and can produce some surplus for 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.

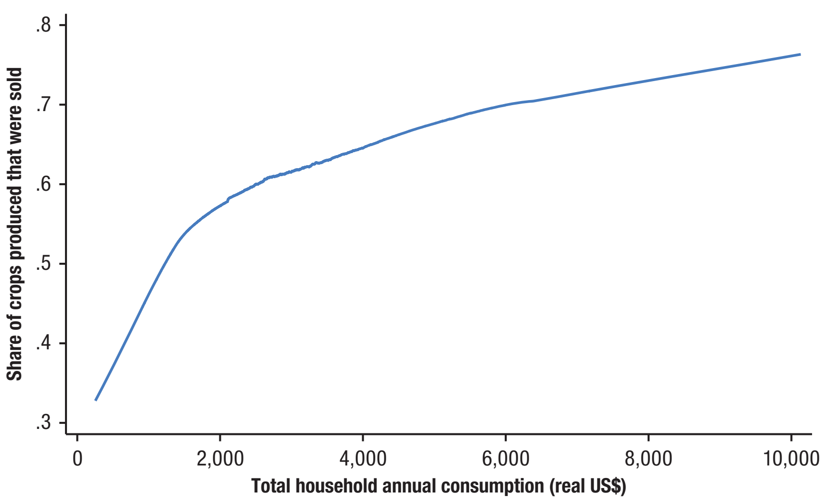
We further assess the link between crop commercialization and welfare. Figure 10.5 shows that the overall agricultural commercialization rate is positively associated with household income. Households with a commercialization rate of 60 percent have an annual consumption level of approximately $3,000, 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.

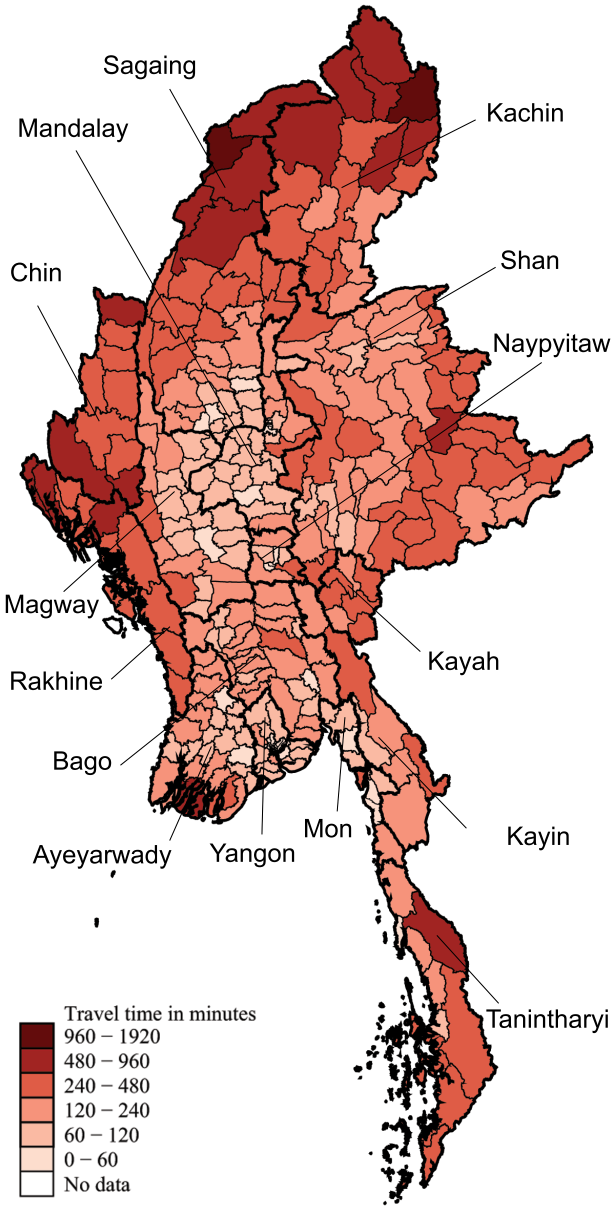
The role of market access

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,

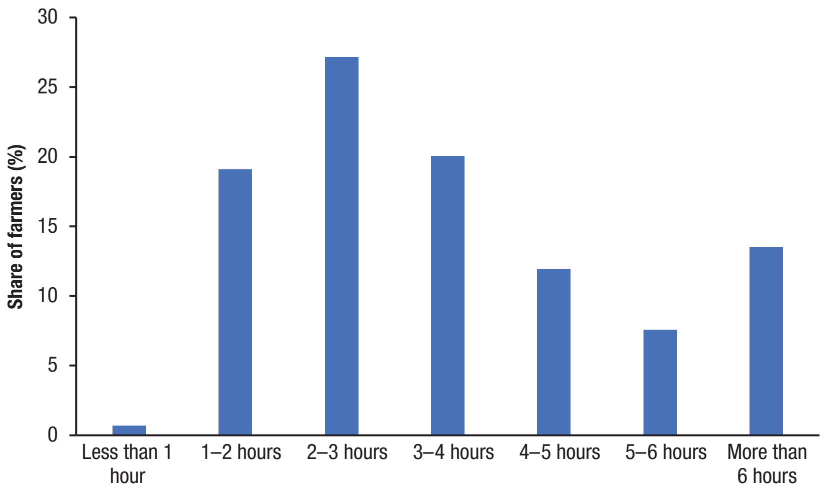
9 Travel times are estimated from the center of the township using transport infrastructure and landscape features (land use, rivers, lakes, and slope obtained from the Myanmar Information Management Unit [MIMU 2022]). We assigned a travel speed to each of the road types (major, secondary, tertiary, 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



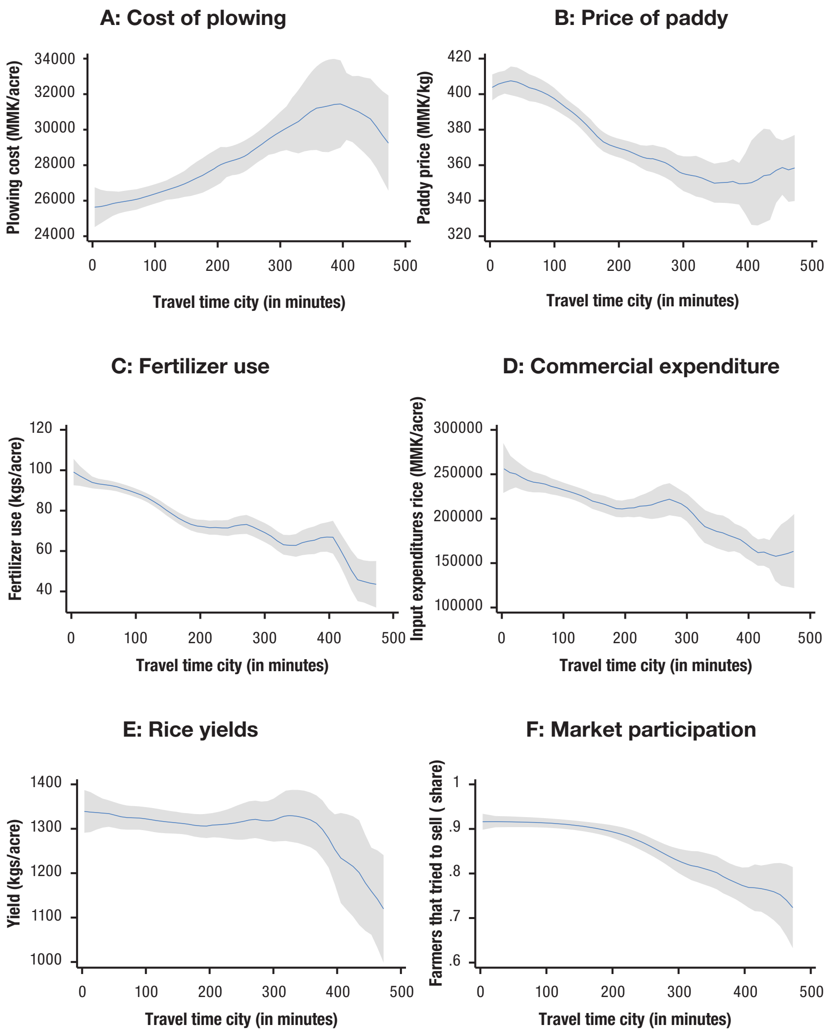
Source: Authors' analysis using MAPS data.

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

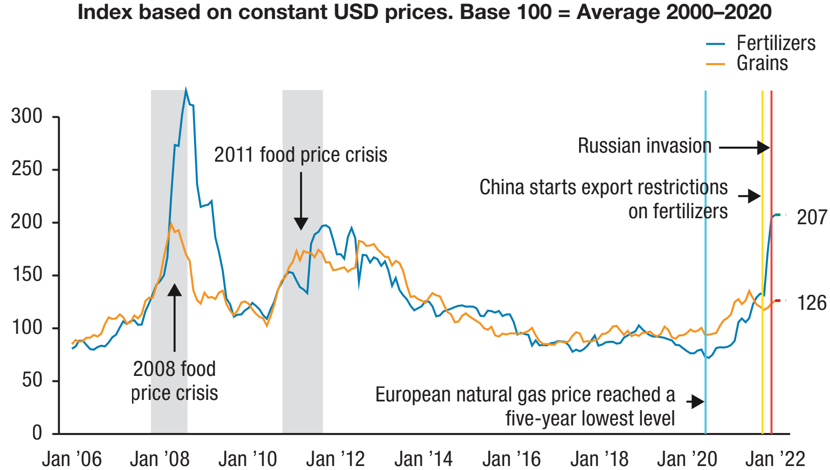
Large changes in international commodity markets combined with local crises—COVID-19 and political problems resulting from the military takeover—have hit the agrifood sector hard and have raised doubts about the performance of the agriculture sector overall (Boughton et al. 2021; Goeb et al. 2022; MAPSA 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

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

Crop/challenge	2020 National	2021 National	2021 Delta	2021 Coastal Zone	2021 Dry Zone	2021 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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