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Food Security Policy Project (FSPP)

GROWTH AND TRANSFORMATION IN OFF-FARM SEGMENTS OF THE MAIZE VALUE CHAIN IN SHAN STATE

By

Ame Cho & Ben Belton



Food Security Policy *Research Papers*

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Executive summary

This report details results from the first representative sample-based study of maize traders and agricultural input suppliers conducted in Myanmar. We interviewed 109 input suppliers and 218 traders in twelve of the major maize growing and trading townships of southern Shan State, and the cities of Lashio and Muse in northern Shan. The following results stand out:

The supply of agricultural inputs in South Shan is increasing extremely rapidly. The average quantity of maize seed sold by individual trading and input supply businesses grew by around 50% since 2013. Fertilizer sales have also increased sharply. The number of agricultural input suppliers selling pesticides and herbicides has grown quickly since the mid-2000s. In contrast to input suppliers, however, comparatively few traders sell pesticides or herbicides.

The maize seed market is diversifying as it grows. CP dominates supply, but its market share is shrinking. Input providers are not restricted to selling inputs supplied by any single company and the number of brands and varieties of seed stocked is increasing. The market for fertilizer is relatively mature, with suppliers stocking more brands and types of fertilizer than maize seed.

Less than 40% of maize seed and fertilizer is supplied in the form of in-kind credit. Sixty-one percent of maize seed and 63% of fertilizer was paid for in cash. Cash sales accounted for around half the volume of maize seed and fertilizer sold by traders and three-quarters of the maize and fertilizer sold by input suppliers.

Interest rates paid by farmers on in-kind credit have fallen sharply since 2013, from 4.5% per month in 2013 to 3.0% per month in 2018. The interest paid on a seed pack purchased using an average duration in-kind loan would amount less than one-quarter of its value. Less than half of maize seed suppliers report charging any form of interest on maize seed provided as credit in-kind.

Traders and input suppliers receive most of their information about agriculture via word of mouth and private sector marketing activities. Facebook and government extension agents are also important sources of information for traders and input suppliers, respectively. NGOs and traditional media provide very little business information to these enterprises.

The number of enterprises in the maize value chain has grown quickly since 2013. The estimated number of maize traders operating in surveyed townships grew 71%, from 231 to 395, and numbers of agricultural input suppliers grew 69%, from 113 to 191. Numbers of businesses providing logistics (transport), maize drying services, agricultural machinery and animal feed supply also increased.

Ownership of business assets has increased dramatically since 2013. In 2018, the vast majority of traders ($\geq 85\%$) owned mobile phones, motorbikes, bagging machines and manual scales. Around half of traders owned generators, electronic scales, or 4 to 6-wheel trucks.

The volume of maize procured by traders in our sample nearly doubled in the past five years. The total volume of maize purchased annually jumped from 486,364 t to 943,530 t (94%). The degree of concentration among traders (measured as the Gini coefficient of total maize procured) decreased from 0.72 in 2013, to 0.62 in 2018, apparently driven by growing sales from medium sized traders.

Traders procure most maize directly from farmers. Farmer sales contributed 78% of the maize procured, indicating relatively low levels of intermediation and low dependence on small village level collectors. Three-quarters of maize traders are wholesalers (obtaining profit from arbitrage). The average markup earned by wholesalers after deducting operating costs is 4.3% of the purchase price.

Traders are taking increasing measures to improve the quality of maize traded. Between 2013 and 2018 the share of traders drying maize in the open air or drying maize using a machine increased from 69% to 73% and from 5% to 11%, respectively. The share of traders using digital moisture meters or maize cleaning machines increased from 28% to 47% and 9% to 19%, respectively.

Most traders utilize formal financial institutions. Over two-thirds of traders received payment from buyers by bank transfer. Banks are an increasingly important source of credit for traders. One-third of traders reported having borrowed working capital in the past year. Of these, almost half took bank loans. Yoma Bank, which offers a loan scheme designed specifically for traders, is the most popular of these, providing loans to 30% of traders who borrowed from any source. The average value of loans taken by traders within the past 12 months was MMK 110 million (\$73,600).

The average size of vehicles used to transport maize has increased over the past five years. The share of deliveries made using 22 to 24-wheel trucks grew from 9% to 36% of all deliveries over the period 2013 to 2018. These have taken the place of deliveries by 10 to 18-wheel trucks.

There is very little loss of maize between time of procurement and time of sale. Losses of maize during trading amounted to just 0.18% of the total volume procured.

CP factories procure twice as much maize as all other feed factories combined. Sales of maize to CP account for 13% of total sales by traders, while other factories only account for 7%. The share of maize sold to feed factories is higher in South Shan (29%) than North Shan (3%). CP factories have higher quality standards than other buyers.

Closure of the China border to maize exports impacted 82% of traders. Nearly all-overland trade in maize from North Shan to China is informal, and is subject to periodic closure due to anti-smuggling campaigns. The most recent of these was particularly severe, beginning a few weeks prior to the survey in October 2019, and continuing for several months afterward.

Implications for policy and programming. In sum, these findings indicate that upstream and midstream segments of the maize value chain in Shan State are growing and transforming rapidly. They are becoming more competitive and more inclusive, and show early signs of modernization, formalization and the emergence of forms of conduct intended to produce higher quality goods. As such, there are relatively few areas where intervention is necessary or desirable, but the following stand out:

- Formal imports of maize from Myanmar into China are subject to high tariffs, leading to informal cross border trade to evade them. Periodic crack-downs on informal trade are a major cause of price volatility and unpredictability for traders and farmers in Myanmar. Securing a bilateral agreement on export quotas could help to address this issue, and government efforts to do so should be prioritized. Investment in technologies that facilitate long term storage of maize grain by traders or farmer groups could also help to smooth out troughs in demand.
- Rapid increases in pesticide and herbicide use have potentially negative implications for environmental and human health. Strengthening existing regulation and regulatory enforcement of the sale and use of these products, and supporting and expanding ongoing efforts by government and development partners to provide safety training and information for farmers should be a priority.
- The marketing activities of agricultural input companies are important conduits for delivering information to traders and agricultural input supply businesses, who pass information to their customers. Forging closer partnerships between government, development partners and input suppliers can provide opportunities to disseminate extension messages and materials to large numbers of end users.
- The terms of informal credit provision by traders and input suppliers are not exploitative, but the cost of borrowing informally remains several times higher than subsidized borrowing from Myanmar Agricultural Development Bank (MADB). Relatively few Shan farmers are able to access loans from MADB. Innovative approaches to delivering formal agricultural credit to farmers at scale are therefore required.
- The success Yoma Bank's efforts to provide working capital loans to traders, and high levels of trader enrolment in the formal banking sector, indicate that there is considerable potential to expand delivery of formal financial services to enterprises in agricultural supply chains.

Table of contents

Executive summary	iv
1 Introduction	1
2 Sample and Survey Methodology.....	1
3 Agricultural Input Supply.....	4
3.1 Characteristics of businesses selling agricultural inputs.....	4
3.2 Maize seed sales.....	6
3.3 Credit for maize seed.....	8
3.4 Fertilizer sales.....	9
3.5 Credit for fertilizer.....	11
3.6 Information.....	11
4 Maize Trading.....	14
4.1 Characteristics of crop trading enterprises.....	14
4.2 Assets, access to finance, and numbers of enterprises.....	19
4.3 Buying maize.....	23
4.4 Processing, storage and value addition.....	26
4.5 Selling maize.....	27
4.6 Shocks.....	32
Conclusions	34
References	36

1 Introduction

Hybrid maize was introduced to Myanmar around 1998, by Thai agro-industrial conglomerate Charoen Pokphand (CP). Maize production has boomed since this time, increasing by 540%, from 298,000 t to 1.91 million t (FAO, 2019) to supply a burgeoning export market to China and a rapidly growing domestic animal feed industry. This growth has made maize Myanmar's second most important cereal crop after rice. Most maize production is concentrated in upland areas of Myanmar. Shan State is the most important of these, accounting for approximately half of the country's total planted maize area (USDA, 2019).

Agricultural input supply businesses provide seed, fertilizer and credit to maize farmers. Crop traders purchase maize from farmers, and act as intermediaries between maize producers, domestic feed manufacturers and exporters. Many traders also supply inputs to maize producers. No rigorous quantitative survey of maize traders and agricultural input suppliers has been conducted in Myanmar previously.

This study was designed elicit information on the characteristics of the input supplier and trader segments of the maize value chain in Shan State, and recent changes in value chain structure and actor behavior. A total of 327 enterprises - 109 input suppliers and 218 traders - were interviewed in twelve of the major maize growing and trading townships of southern Shan State¹, and around the cities of Lashio and Muse - the two largest trading centers in northern Shan. This sample covered approximately three-quarters of maize traders and one-quarter of agricultural input suppliers known to operate in surveyed townships at the outset of the survey.

Survey findings presented in this report are organized as follows: Section 2 outlines the sampling strategy and survey methodology. Section 3 presents data on the agricultural input supply functions of trading enterprises and agricultural input supply businesses in surveyed areas. Section 4 presents results on the conduct and structure of the wholesale trader segment of the maize value chain, and changes occurring over the preceding five years. Section 5 concludes by summarizing key findings, and implications for policy and programming.

2 Sample and Survey Methodology

Maize trader and input supplier surveys were designed to complement a larger survey of rural households; the Shan Agriculture and Rural Economy Survey (SHARES). SHARES was implemented with 1562 households in nine townships in southern Shan State in May-September 2018. The survey was designed to collect information on the rural economy in southern Shan, with a particular focus on maize cultivation. Townships included in SHARES were selected purposively based on the area of maize cultivated.

Prior to the design and implementation of the trader and input supplier surveys, we conducted in depth qualitative scoping interviews with farmers, maize traders, agricultural input providers, and other actors throughout southern and northern Shan. Scoping interviews were designed to: (1)

¹ Hopong, Hsihseng, Kalaw, Langkho, Lawksawk, Mongnai, Namsang, Nyaungshwe, Pekon, Pindaya, Pinlaung, Taungyi.

Identify areas with high concentrations of farms and businesses involved in the production and trade of maize. (2) Identify locations where the security situation prevent survey implementation. (3) Compile lists of enterprises in the maize value chain as the basis for a sample frame. (4) Facilitate the design of effective survey instruments.

Meetings were held with representatives of the Muse Chamber of Commerce and Industry, Lashio Commodity Exchange Center (CEC)², and Aung Ban crop wholesale market (Kalaw) to obtain lists of traders registered as members. Additional trader details were obtained through snowballing interviews with trading businesses in all nine townships where SHARES was implemented. Agricultural input suppliers are obliged to register the Department of Agriculture (DOA). Details of registered input suppliers were collected from township level offices DOA.

Agricultural input suppliers were selected for interview by simple random sampling, with 25% probability. Traders were selected with 100% probability, except in Lashio, Muse and Kalaw, where large numbers of traders were listed. In these locations, 50% of listed businesses were selected at random for interview. No replacement businesses were selected for interview if respondents declined to be interviewed, were no longer operating a trading business, or were unavailable for interview during the survey period. Unlisted trading businesses discovered during the course of survey implementation were not interviewed.

Due to security concerns, trader and input supplier interviews were only conducted in townships in southern Shan, and in the vicinity Lashio and Muse in Northern Shan. Towns and rural areas outside these two cities in northern Shan were deemed unsafe.

A total of 109 agricultural input supply businesses and 218 maize trading enterprises (of which, 45% also supplied agricultural inputs) were interviewed in December 2018 (Figure 1 and 2). The final sample of respondents included 73% of the known population of traders in surveyed locations at the time the listing work was done, and 27% of the known population of agricultural input suppliers. Surveyed traders accounted for 95% of known population of traders in surveyed townships of South Shan, and 35% of the known population of traders in Muse and Lashio in North Shan.

Owners or managers were surveyed at their business premises. Trader questionnaires included modules on assets and investments, procurement and marketing over the past year, storage, grading and value-adding activities, and details of the most recently completed transaction. The questionnaire included recall questions designed to capture changes in value chain structure and actor behavior between the year of the survey (2018) and five years earlier (2013). Input suppliers answered questions on the types and quantities of products stocked and sold in 2018 and 2013.

This report presents results in two sections, detailing: (1) the agricultural input supply activities of maize traders and specialized agricultural input supply businesses; (2) the structure and conduct of the trader segment of the maize chain.

² CEC offer a space for buyers and sellers to meet, display their wares, interact and agree transactions. Purchased goods are delivered to traders' private premises, located outside the CEC.

Figure 1 Locations of surveyed businesses (actual)

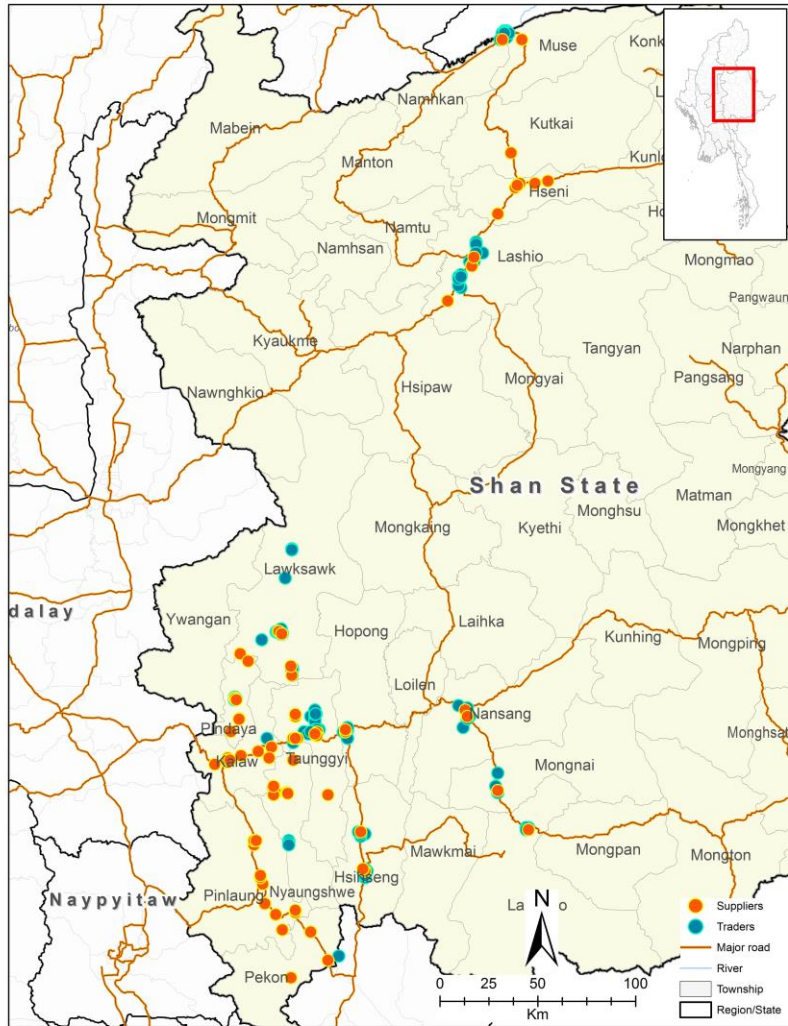
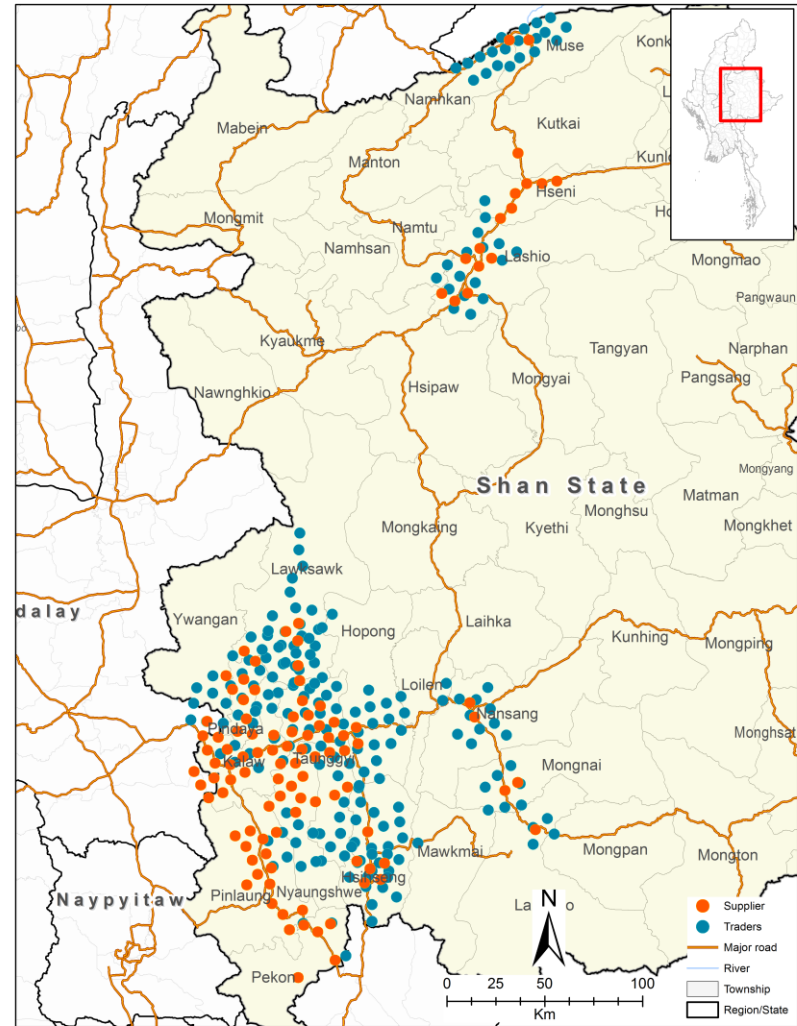


Figure 2 Locations of surveyed businesses (disbursed)



3 Agricultural Input Supply

Input supply businesses sell a range of agricultural inputs to farmers, but do not trade crops. Many, crop traders also supply agricultural inputs to complement their trading activities. This section of the report analyzes and compares the input supply activities of both sets of businesses, including their role in credit provision.

3.1 Characteristics of businesses selling agricultural inputs

Around half of crop traders supply agricultural inputs. Forty-five percent of crop traders supply inputs of any kind. Seed (supplied by 43% of traders) and fertilizer (36%) are the most common inputs sold (Table 1). This contrasts strongly with the Dry Zone, where less than 1% pulse and oilseed traders engage in any form of agricultural input supply (Belton and Mather, 2018). This difference is accounted for partly by limited use of hybrid seed in Dry Zone agriculture.

Input suppliers sell a wider range of inputs than crop traders. Fertilizers are the most common type of product stocked by input suppliers (89%), followed by pesticides and herbicides (62%), and seeds (58%). A small number of input suppliers (5%) also sell animal feeds (Table 1). Input suppliers sell a wider range of product types than crop traders, in part because of their business specialization, and in part because they serve a wider variety of farmers than traders, who mainly provide inputs for use in maize cultivation.

Most businesses selling agricultural inputs have a license to do so. Input suppliers are somewhat more likely to have a license to sell inputs than traders. Ninety-five percent of input suppliers who sell fertilizer report having a license to do so, reflecting their specialization in this area, as compared to 70% of crop traders. Input suppliers and traders are less likely to have licenses to sell seed than to sell other types of input (held by 81% and 60%, respectively) (Table 1).

Table 1 Percentage of traders and input suppliers selling different inputs and share of business having license

Item	Input Suppliers		Traders	
	Businesses selling (%)	Of which, businesses with license to sell (%)	Businesses selling (%)	Of which, businesses with license to sell (%)
Fertilizers	89	95	36	70
Pesticides	62	93	8	71
Herbicides	62	93	10	64
Seeds	58	81	43	60
Animal feeds	5	n/a	1	n/a
Any input	100	-	45%	-

Figure 3 Share of businesses selling maize seeds, by year (%)

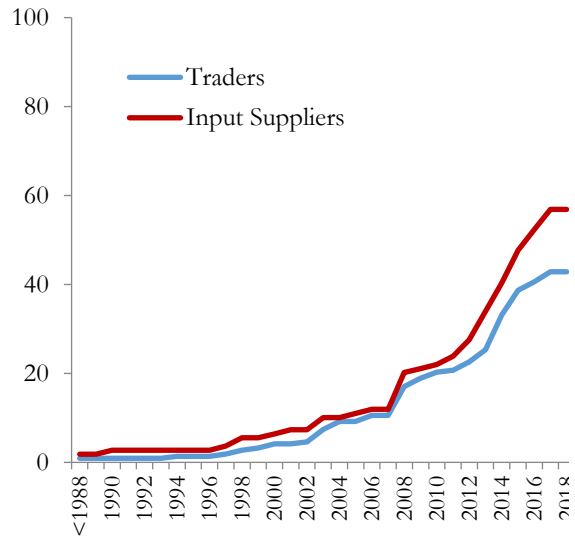


Figure 4 Share of businesses selling fertilizers, by year (%)

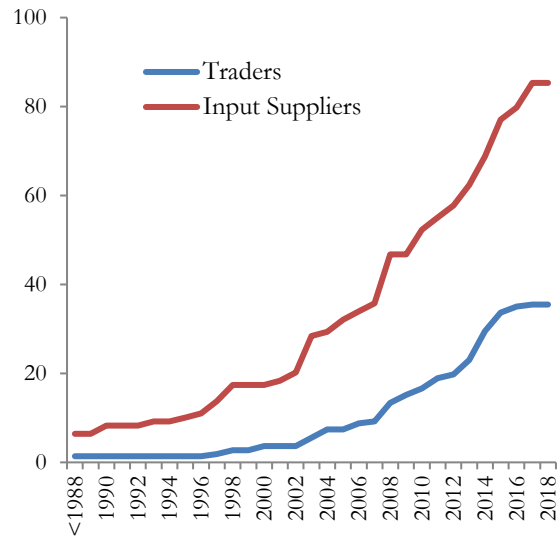
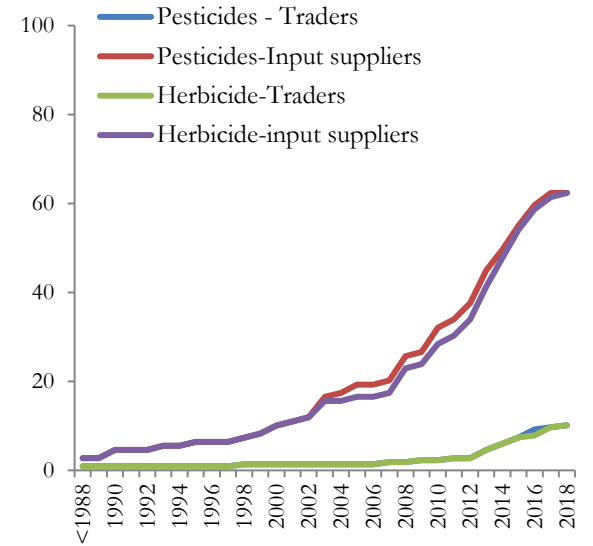


Figure 5 Share of businesses selling pesticides and herbicides by year (%)



The supply of agricultural inputs has increased extremely rapidly over the past decade. Figures 3-5 present the share of surveyed input suppliers and crop traders that commenced selling maize seed, fertilizer, herbicide and pesticide, by year. These results must be interpreted with caution as many businesses listed during scoping were discovered to be inoperational at the time of survey, indicating significant attrition, particularly among trading businesses. Nevertheless, the graphs show clearly that few businesses operational in 2018 sold any type of agricultural input prior to the mid-2000s.

Very few businesses sold maize seed prior to the introduction of hybrid seed by CP around 1998. Similar shares of traders and input suppliers stocked maize seed until 2015, when input suppliers began to outpace traders. The share of input suppliers stocking fertilizers has always been greater than the share of traders. Very few traders sold fertilizer prior to the introduction of hybrid maize around 1998. Input suppliers began to stock pesticides and herbicides in rapidly increasing numbers after 2002, whereas traders began to do so only after 2012, reflecting less widespread application in maize farming than in cultivation of rice and some other crops.

3.2 Maize seed sales

Maize seed is by far the most common type of seed sold. Almost all traders and input suppliers who reported selling seed in 2018 sold maize seed (96% and 89%, respectively). This represents a significant increase from 2013, when around two thirds of each type of business sold maize seed (Table 2). Input suppliers sell a wider assortment of seed than traders. Vegetable seed, hybrid rice seed, and pigeon pea seed are sold by 33%, 7% and 2% of seed-selling input suppliers, respectively. Among traders selling seed, only 5% sold vegetable seeds, 3% sold hybrid rice seed, and 5% sold pigeon pea seed.

Table 2 Maize seed sales by input suppliers and traders, 2013 and 2018

Item	Input Suppliers		Traders	
	2013	2018	2013	2018
Share of seed selling businesses selling maize seed (%)	65	89	68	96
Total quantity of maize seed sold (t)	676	1765	662	1599
Median quantity of maize seed sold (t)	4.0	3.0	5.5	8.3
Average number of company's seed sold	2.2	2.6	1.8	2.5
Average number of maize seed varieties sold	4.2	5.4	3.8	5.7
Share of businesses offering maize seed in-kind credit (%)	47	46	91	91
Share of maize seed purchased in cash (%)	74	77	38	42
Share of maize seed purchased as credit in-kind (%)	26	23	62	58

Total seed sales by surveyed businesses more than doubled from 2013 to 2018 from 1338 t to 3364 t. The average seeding rate for hybrid maize seed among farmers in southern Shan is 5.7 kg/acre, so this would equate to sufficient seed to plant 590,175 acres in 2018 (Table 2). Median annual sales per business increased markedly over this period for traders, from 5.5 to 8.3 t, but fell for input suppliers, from 4.0 t to 3.0 t (enough to plant 1447 and 526 acres, respectively).

Given an average area planted to maize of 4.6 acres per farm, the median sales of traders and input suppliers are sufficient seed to serve 315 and 114 maize farmers, respectively³.

The number of brands and varieties of maize seed is increasing. Input suppliers and traders each stocked a similar number of maize seed brands (around 2.5) and varieties (around 5.5) in 2018. The average number of brands stocked in 2018 increased by approximately one quarter from 2013, while the average number of varieties stocked increased by approximately one third. This indicates that the maize seed market is diversifying as it grows, and that input providers are not restricted to selling inputs supplied by any single company.

CP dominates the maize seed market, but its market share is shrinking. Input suppliers and traders were asked to name their best-selling maize variety in 2018 and 2013. Varieties produced by CP accounted for 83% and 95% of the varieties named by input suppliers and traders in 2013, respectively. These shares had fallen somewhat in 2018, to 66% and 86%. During this period, the original variety introduced by CP (CP 888) was largely replaced as a best seller by a newer variety (CP 808). The second and third best-selling varieties reported by inputs suppliers were Awba 621 (produced by multi-national Syngenta, and marketed by Myanmar’s largest agro input supply company), and Golden Tiger 029 (produced in Thailand and imported and marketed by a Myanmar company). These accounted for 14% and 9% of the best-selling varieties reported as sold by input suppliers, respectively.

Table 3 Best-selling maize seed varieties for input suppliers and traders, 2013 and 2018

	Input suppliers (%)		Traders (%)	
	2013	2018	2013	2018
CP 888	72	7	72	4
CP 808	8	55	21	79
Awba 621	8	14	2	2
Golden Tiger 029	0	9	0	3
CP (other variety)	3	4	2	3
Thai 333 (SD333)	3	2	2	0
Tharapu	0	0	0	2
Other	6	9	2	6

Some businesses serve as ‘representatives’ for maize seed companies. One quarter of input suppliers and one-third (35%) of traders selling maize seed acted as representatives for seed companies. Our scoping interviews indicated that companies usually appoint one representative per township, and that these businesses receive additional packs of seed as a ‘bonus’ when placing orders above a certain size, effectively reducing the unit cost. Maize seed is sometimes provided to company representatives on credit, usually repaid within 1 to 2 months. Serving as a representative for one company does not preclude representing another. Among input suppliers serving as company representatives, 67% represent CP, 41% Awba, and 30% Golden Tiger. A total 12 other companies were represented, each by small numbers of input suppliers. Among traders serving as representatives, 63% represent CP, 26% Awba, and 9% Tharapu (another Myanmar company). Eleven other companies are also represented, each by small numbers of traders.

³ Estimates of seeding rate and planted area calculated using SHARES household survey data

Some businesses sell maize seed through intermediaries. One third (32%) of input suppliers and 18% of traders selling maize seed used intermediaries, referred to as ‘distributers’, to sell maize seed. These businesses work with nine and eight distributers each on average, respectively, selling 39% and 48% of their maize seed through distributers, on average. The majority of input suppliers and traders who sell maize seed through distributers (81% and 72%, respectively) provide maize seed to the distributers on credit. Businesses may choose to work through distributers in order to increase the ease with which customers in remote areas can be reached, thereby expanding their market, while outsourcing some of the transaction costs and risks associated with doing so.

3.3 Credit for maize seed

Less than half of the maize seed sold is provided as in-kind credit. Sixty-one percent of all maize seed sold by businesses in our sample was paid for in cash. Input suppliers provide less maize seed as in-kind credit than traders. Three-quarters (74%) of the maize seed sold by input suppliers and, half (51%) of the maize seed distributed by traders is paid for in cash, with the remainder supplied as in-kind credit.

Most traders offer credit to maize farmers. Eighty five percent of traders reported providing credit to some of them. Among these, 67% provided credit in-kind and 62% provided credit in cash. Forty-six percent of input suppliers provided maize seed as credit in kind. Traders in northern Shan are more likely to offer credit in-kind than credit in cash (provided by 81% and 43%, respectively), whereas Southern Shan traders are equally likely to offer credit in cash or in-kind (both 65%). Most traders who provide credit to farmers expect recipients to sell harvested maize back to them (reported by 89% of traders offering in-kind credit, and 93% offering cash).

In-kind credit in the form of maize seed is usually ‘tied’ when provided by traders, but not when provided by input suppliers. Asked whether farmers who received maize seed as credit in-kind were expected to sell their harvest back to the provider, 88% of traders responded ‘yes’ and 10% responded ‘sometimes’. Conversely, 92% of input suppliers responded ‘no’ and 4% responded ‘sometimes’. The tendency to tie in-kind credit to crop sales appears to have increased slightly since 2013, when 83% of traders responded ‘yes’ and 100% of input suppliers responded ‘no’.

Less than half of maize seed suppliers report charging interest on maize supplied as in-kind credit. Only 62% of traders and 50% of input suppliers who offered maize seed as in-kind credit reported charging interest. These shares changed little from 2013. Interest is charged either at a flat monthly rate as a percentage of the value of the seed purchased, or as an explicit markup on each pack of seed. Usually the markup takes the form of a lump sum, but occasionally it accrues on a monthly basis. Among traders who reported charging interest on maize seed supplied in the form of in-kind credit, 61% charged a monthly interest rate and 37% charged a lump sum. In the case of input suppliers, 38% charged a monthly rate and 46% charged a lump sum.

The price of harvested maize is rarely set at the time farmers receive maize seed as in-kind credit. The sales price of harvested maize sold to traders by recipients of in-kind credit was agreed at the time of sale in 91% of cases, and in advance in only 8% of cases. This indicates that it is uncommon for farmers to agree in advance to sell harvested maize at below market value in order to access inputs.

Interest rates paid on in-kind credit have fallen sharply since 2013. The mean monthly rate of interest charged by traders fell from 4.5% in 2013 to 3.0% in 2018 – a drop equivalent to 17 percentage points per annum. The mean lump sum per seed pack fell from MMK 2,527 (\$1.68) to MMK 1,778 (\$1.19), at constant 2018 prices, equating to a real decline of 24%. These falling interest rates are broadly in line with the magnitude of reductions in informal interest rates in rural Shan over the same period (as reported by Lambrecht and Belton, 2019), and likely represent a response to the increasing availability of formal sources of credit over this period. The reduction in interest rates may also reflect increasing competition for customers among traders as numbers of trading businesses have grown rapidly.

Interest payments account for a moderate share of maize seed costs. The average price paid for a pack of hybrid seed in 2018 was MMK 26,550 (\$17.70). Based on the average duration of in-kind loans for maize seed (7.8 months), the interest charged on a seed pack would amount to MMK 6,213 (\$4.14), or 23.4% of the price of a seed pack. The total amount expended on interest by a maize farm planting an average area of 4.6 acres using hybrid seed obtained entirely as in-kind credit and seeding at an average rate of 5.7 kg/acre, would amount to MMK 32,580 (\$21.70) if interest were paid monthly, or MMK 9,324 (\$6.22) if paid on a lump sum basis⁴.

Relatively few traders give advances to other traders. Only 20% of traders who sourced maize from other traders reported providing cash advances to any of these suppliers. Three-quarters (76%) of traders who advanced cash loans to other traders expected recipients to sell maize to them.

3.4 Fertilizer sales

The share of enterprises selling fertilizers has grown over the past 5 years. For example, 95% of input suppliers operating in 2018 sold compound fertilizers, compared to 80% of those operating on 2013. Sales by traders followed a similar pattern (Table 4).

Compound fertilizer is the most widely sold type of fertilizer, followed by urea and T-super. For example, compound fertilizer (NPK), Urea, and T-super (phosphate) are stocked by 96%, 87% and 33% of traders, respectively (Table 4), reflecting the importance of NPK as the main fertilizer used in maize cultivation.

Sales of fertilizer by traders grew more quickly than those by input suppliers. In 2013 input suppliers and traders sold similar quantities of compound fertilizer, while average input suppliers' sales of urea and T-super fertilizer were approximately double those of traders. Average sales of all three types of fertilizer by input suppliers were only slightly higher in 2018 than in 2013. In contrast, average sales of compound fertilizer sales by traders grew 60% and sales of urea and T-super by more than 200%, raising the average volume of fertilizer sales by trader above that of input suppliers (Table 4). This result suggest that traders commanded a growing share of the fertilizer market, in part due to growing numbers of farmers cultivating maize. It is not known why traders' sales of urea and T-super grew more rapidly than sales of compound.

⁴ Data on average seed prices, seeding rates and area planted to maize obtained from the dataset of the SHARES household survey component. Exchange rate for 2018 estimated as \$1 = MMK 1500.

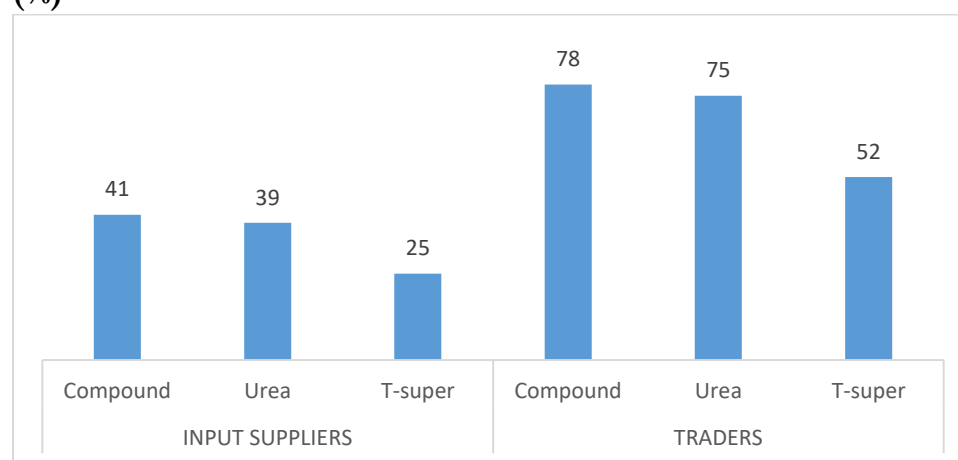
Table 4 Share of business selling fertilizers, average number of companies and sacks sold in 2013 and 2018

Business	Fertilizer	Businesses selling (%)		Average number of manufacturers		Average number of sacks sold		Change in number of sacks sold 2013-18 (%)
		2013	2018	2013	2018	2013	2018	
Input suppliers	Compound	80	95	2.8	2.8	3381	3931	16
	Urea	76	92	2.2	2.1	2809	2893	3
	T-super	41	46	1.9	1.9	1961	2480	26
Traders	Compound	77	96	2.0	2.3	3742	6119	63
	Urea	71	87	1.6	1.8	1200	4125	244
	T-super	24	33	1.5	1.7	856	2571	200

The number of brands and types of fertilizer stocked has not changed much in the past five years. This suggests that although the market is growing rapidly in terms of sales volumes, it is not developing as rapidly as the market for maize seed, in terms of numbers of new entrants and new products. This is partly the result of having been established for a longer period of time. Input suppliers sourced fertilizers from a slightly larger number of companies on average than traders (e.g. 2.8 companies vs 2.3 for compound fertilizer), and also sold a larger assortment of each type of fertilizer (e.g. 5.6 types of compound fertilizer vs 4.9 types), reflecting a higher level specialization and broader customer base than that of traders (Table 4).

Maize cultivation accounts for a large share of fertilizer demand in Shan. Informants were asked to estimate how much of the fertilizer they sold was utilized for maize cultivation. At least three quarters of the compound and urea, and half of the T-super sold by traders was utilized by maize growers. The respective shares for input suppliers were around half those of traders (Figure 6)

Figure 6 Utilization of fertilizer sold by input suppliers and traders for maize cultivation (%)



Some businesses act as representatives for fertilizer companies. 31% of input suppliers and 21% of traders act as a fertilizer company representatives. Traders were most likely to serve as representatives for CP (57%), followed by Awba (19%). Traders also served as representatives for a total 17 other companies (5% each). Diamond Star (Armo) (59%), Awba (Comet) (44%), CP

(21%), Golden Lion (12%), Wisara (12%) and Ngwe Zin Yar (9%) were the main companies represented by input supply businesses, with a total of 17 other companies also represented. With the exception of CP, all of these are Myanmar based companies. Our scoping research indicated that input suppliers and trader also sell large quantities of imported fertilizer (mainly, though not exclusively, of Chinese origin), but it appears that the manufacturers of these products do not run marketing operations in Myanmar. The high level of representation of CP by traders likely reflects the existence of established relationships between the company and maize seed suppliers.

Some businesses use distributors to sell fertilizer. A similar share of input suppliers (22%) and traders (19%) outsourced part of their fertilizer sales to distributors. These businesses made 35% and 45%, respectively, of their sales through these channels, advancing fertilizers to their distributors on credit in at least three-quarters of cases.

3.5 Credit for fertilizer

The majority of fertilizer is purchased without credit. Among businesses that stocking fertilizer, 91% of traders and 71% of input suppliers offer customers the option to avail fertilizer as credit in-kind. However, only a little over one-third (37%) fertilizer was supplied in the form of credit in-kind. More than half (55%) of the total quantity of fertilizer distributed by traders and one-quarter (25%) of the fertilizer provided by input suppliers was advanced on credit. These figures are very similar to the shares of maize seed advanced by traders and input suppliers in-kind credit. The portion of the fertilizer advanced on credit that is utilized by maize producers is not known.

Terms of credit for fertilizer are similar to those for maize seed. Sixty percent of traders and input suppliers who provided fertilizer as credit in-kind reported charging interest for doing so. Interest rates are similar to those for maize seed: Input suppliers charge monthly interest rates averaging 3.9% per month (48% of cases), or MMK 1,947 (\$1.30) per sack (also 48%). Traders charge monthly interest rates averaging 3.3% in 60% of cases, or a lump sum (38% of cases) of MMK 2,167 (\$1.45) per sack. Among traders who supply fertilizer as credit in-kind, 77% expect recipients to sell harvested maize to them. Nearly all (93%) of these traders agree the price of harvested maize at the time of delivery to the trader, and only 7% set the price in advance. In contrast, 96% of input suppliers do not make provision of fertilizer as credit in-kind provisional on tied crop sales.

3.6 Information

The types of information received by traders and input suppliers reflect their specializations. As expected, almost all traders (97%) reported receiving information on maize prices. Sixty-one percent received information on new maize seed varieties, and just over half (54%) received information on transportation issues. The majority of input suppliers (83%) reported having received information on fertilizer use, and well over half (62%) had received information on pesticide and/or herbicide use (Table 5).

Table 5 Percentage of traders and input suppliers obtaining information

Information on:	Traders	Input suppliers
Maize prices	97	22
New maize seed varieties	69	48
Transportation issues	54	17
Fertilizer use	44	83
Pesticide/herbicide use	28	62
Agronomic information	26	30

Traders and input suppliers receive most information relevant to their businesses informally or through private sector marketing activities. Most maize traders (91%) reported that they received from other traders, while around half received information from maize seed companies (55%). Other information sources for traders include transport service providers (42%), agricultural input companies (37%), Facebook (34%), and farmers (30%). Only 8% received information from the Department of Agricultural extension. More than two-thirds of input suppliers received information from agricultural input companies and 45% from maize seed companies. One-third of input suppliers reported that they got information from Department of Agricultural Extension, and about one-quarter obtained information from farmers and traders. A small share of traders and input suppliers had received information using an agricultural app (6% and 8%, respectively). Very few reported having received information from an NGO, TV or radio (Table 6).

Table 6 Sources of information obtained by traders and input

Information source	Traders	Input suppliers
Agricultural -input company	37	77
Other traders	91	22
Maize seed company	55	45
Farmers	30	25
Transport provider	42	11
Facebook	34	17
Dept. of Agricultural Extension	8	29
Trader association	16	3
Agricultural app	6	8
Demo plot	4	9
Other social media	6	6
TV	6	1
NGO	1	3
Radio	0	0

Both traders and input suppliers share information with their customers. Most traders (97%) and almost all input suppliers (99%) reported that they shared information they received with their customers.

Figure 7 Hybrid maize seed on sale at a trader's store



Figure 9 Delivering sacks of maize to a trader's warehouse



Figure 8 Crop trader at work



Figure 10 Casual workers bagging and loading maize for a trader



4 Maize Trading

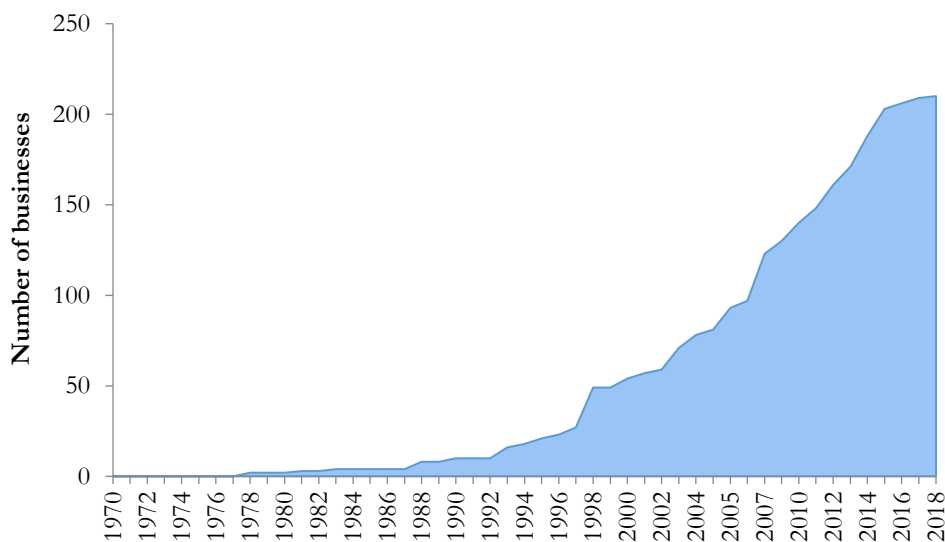
This section of the paper focusses on the trader segment of the maize value chain. We outline the general characteristics of surveyed crop trading enterprises, before analyzing micro-economic behavior associated with maize trading. To aid analysis, we ranked traders from smallest to largest in terms of volumes of maize traded and divided them into three groups (terciles) of equal size. Tercile 1 is the third of enterprises that trades the smallest volumes of maize. Tercile 3 is the third of enterprises that trades the largest volumes. Most surveyed traders were located in South Shan (83%), with the remaining 17% in North Shan. We present results separately for North and South Shan traders whenever there are notable differences between the two groups.

4.1 Characteristics of crop trading enterprises

Numbers of maize trading businesses have grown rapidly over the past two decades.

Private trading activities were severely restricted before 1989, and very few businesses trading in 2018 were established prior to this time. Few traders (4%) reported that their business had been founded for more than one generation. Business numbers grew slowly until 1998, when CP introduced hybrid maize. Growth from 1998 to 2007 was brisk, and accelerated further until 2015 in line with a growing supply of maize from increasing numbers of cultivators, but then slowed (Figure 11).

Figure 11 Cumulative number of businesses (1970-2018)



Most maize traders trade a variety of crops. Only 19% of traders trade maize exclusively. The average number of crops traded is four, with maximum of 13. A total of 29 crops were traded by surveyed traders in trading year 2017-18⁵. These included: four cereals (maize, paddy, wheat, sorghum); six oil crops (niger, groundnut, sunflower, sesame, mustard seed, jatropha); several pulses (pigeon pea, soybean, lablab bean, green gram, other peas and beans); six root crops (garlic, turmeric, ginger, gamone, onion, potato); and a mix of other crops including tea, coffee, cheroot leaf, chili, soap-pod, and chebulic myrobalan (Figure 8). There was little change in the share of traders trading each of these crops over the five years from 2012/13 to 2017/18. Traders in South

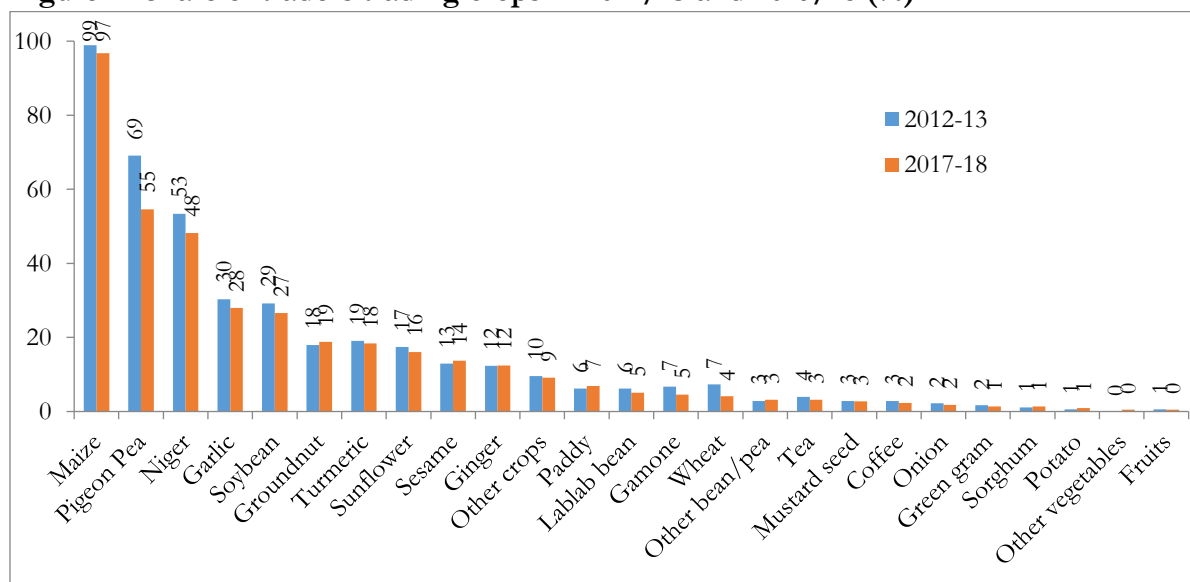
⁵ We define the trading year as running from the start of the harvesting period of monsoon crop to the end of the growing season for the following monsoon crop.

Shan sold a larger variety of crops than those in North Shan (mean 5, max 13, and mean 2, max 5, respectively). This is because traders in northern Shan are oriented toward export to China, with border trade focused on a relatively small number of crops, with maize, rice, sesame, groundnut and soy predominant.

Maize is the major crop traded, and accounts for a growing share of traded volume. The volume share of maize in crops traded grew from 71% to 79% between 2013 and 2018 – an increase of 8 percentage points. The scale of the increase was similar irrespective of trader size. Larger traders tend to specialize more in trading maize, which accounts for 83% of the volume of crops traded by traders in tercile 3, as compared to 74% among traders in tercile 1. Maize accounted for a similar share of crops traded by traders in North and South Shan in 2018 (83% and 78%, respectively). This represents a slight decline since 2013 for traders in northern Shan (when it accounted for 87%), and an increase from 2013 for traders in southern Shan (68%).

The mix of crops traded reflects the diversity of farming systems in Shan. The most highly traded crops after maize are pigeon pea (traded by 66% of crop traders) and niger (54%) (Figure 12). These crops are commonly grown in the same farming systems as maize, either as an intercrop (pigeon pea), or as a post-monsoon crop (niger). Other common crops such as garlic, soybean, and groundnut are also widely traded. Rice, fresh fruits and vegetables, coffee, tea, and cheroot leaf are widely grown in South Shan, but traded relatively rarely by traders in our sample, indicating the existence of specialized traders handling these crops.

Figure 12 Share of traders trading crops in 2012/13 and 2017/18 (%)



The typical maize trader is a relatively well-educated middle-aged man. Most trading business owners (80%) are reported to be men, with an average age of 47. This figure may underrepresent women’s involvement in maize trading as, based on observations in the field, family members of both genders are often involved in managing trading operations.⁶ One third

⁶ Women are slightly better represented in the ownership of agricultural input supply businesses (36%). The education levels of owners of agricultural input supply businesses are even higher than those of traders (40% completed university and 30% completed upper secondary school). The mix of ethnicities is similar to that of traders.

of traders (34%) completed university and 25% of traders attended upper secondary school. This is much higher than the population average (2% and 6%, respectively), but similar to levels of education among pulse and oilseed traders in the Dry Zone (Belton & Mather, 2018).

Trader ethnicities reflect the ethnic makeup of the population. The main ethnicities engaged in maize trading are Pa-O (33%) followed by Shan (17%), Burmese (12%) and Danu (9%), reflecting quite closely the ethnic makeup of surveyed townships in Southern Shan. People of Chinese ancestry and Kokang ethnicity⁷ account for a combined total of 12% of traders, which is much higher than the population average in southern Shan (<1%)⁸. Most of these traders are found in northern Shan, where 32% of traders are of Chinese ancestry and 18% are Kokang. Forty-one percent of traders who exported maize were from a Mandarin speaking ethnic groups (26% Chinese and 15% Kokang). This suggests that language skills and social capital play an important role in facilitating cross-border trade with China.

Crop trading is the primary livelihood activity of most traders. Apart from supplying agricultural inputs, the most common activity engaged in by crop traders is farming. One-third of surveyed traders (35%) farm maize. However, maize procured from traders’ own-farms accounts for a tiny share of the total volume traded (just 0.2%), so this should not be considered as vertical integration. Maize farming is more common among South Shan traders than for those in North Shan (practiced by 39% and 13%, respectively). One-quarter of traders (26%) practice some form of agriculture other than maize cultivation. Provision of truck rental services is the next most common activity, practiced by 13% of maize traders (Table 5). Nine percent of traders run dry goods shops, and 8% raise livestock. Few are involved in other off-farm activities.

Table 5 Trader livelihood activities prior to trading maize and in past 12 months

Activity	Past 12 months (%)	Before trading maize (%)	None of these (%)
Trading crops other than maize	78	16	19
Input supply	55	5	43
Maize farming	35	37	54
Other agriculture	26	27	66
Truck rental service	13	6	86
Dry goods shop	9	9	88
Livestock rearing	8	8	90
Non-agricultural trading business	7	7	90
Casual labor	6	7	93
Rice milling	4	12	91
Machinery sales	3	3	97
Agri-machinery rental services	2	1	97
Other non-farm business	2	1	97
Salaried/professional work	1	11	94
Oil milling	1	1	98

The most common activity among traders prior to taking up trading was farming. Most traders who farmed prior to taking up maize trading continued to do so afterward (e.g. 37% of

⁷ The Kokang are a Mandarin speaking ethnic minority.

⁸ Data on population averages for educational attainment and ethnicity is calculated using data from the SHARES household survey of nine townships in southern Shan.

traders farmed maize before they began to trade it, and 35% continue to do so at present). This route into trading was more common in South Shan than North Shan. Relatively few traders (16%) traded crops other than maize prior to taking up maize trading. This suggests that maize provided an entry point into trading, or that they began to trade maize and other crops simultaneously. This pattern was more common in North Shan (reported by 37% of traders), than in South (8% of traders). Significant shares of traders engaged in rice milling (12%) or professional or salaried work (11%) prior to trading maize, but relatively few continued with these occupations up to the present time (4% and 1%, respectively). This suggests that these activities provided a source of startup capital to invest in trading, but are incompatible with, and/or less remunerative than trading.

Few traders provided truck rental services or sold agricultural inputs prior to trading (6% and 5% respectively). These shares increase to 13% and 45%, during the most recent trading year, reflecting the complementarity of both activities to trading. Providing truck rental services allows traders to earn money from capital goods surplus to their own requirements, while input supply can attract customers, secure access to harvested crops (when inputs are supplied as tied credit in-kind), and provides an additional stream of income. There was little change in the shares of traders engaging other activities prior to and after taking up trading.

Most crop trading businesses operate a single branch, and are located ‘off-market’. Eighty percent of trading businesses operate a single branch. Nine percent of traders have maize collecting centers (sub-branches). Large traders are most likely to operate collecting centers (18% of traders in tercile 3), operating an average of three each. The vast majority of maize traders in Shan (93%) do not operate from established wholesale markets.⁹ Most have premises clustered in and around towns in rural areas, close to major sites of maize production.

Table 6 Share of traders by trader type, and size tercile (%)

Traders trading as:	Tercile	Tercile	Tercile	Total	North	South
	1	2	3			
Wholesalers	75	70	73	72	63	74
Brokers	4	4	2	4	3	4
Both wholesaler and broker	21	26	26	24	34	22
Export maize directly	4	4	29	12	58	3
Supply exclusively to another business	6	1	3	3	5	3
Supplied exclusively by other businesses	10	16	23	16	26	13

Most maize traders operate as wholesalers, not brokers. Wholesalers purchase maize from sellers, take possession of it, and resell to other buyers. Brokers earn a commission from arranging transactions between buyers and sellers. Seventy-two percent of maize traders operate exclusively as wholesalers, and this share varies very little by trader size. Only 4% of traders work exclusively as brokers, and about a quarter trade as both wholesalers and brokers. Interestingly, this is almost the inverse of the situation among pulse and oilseed traders in the Dry Zone, 71% of whom are brokers (Belton and Mather 2018). This difference may be linked to the spatial organization of grain markets in Shan and the Dry Zone. Dry Zone traders transact almost all their business at centralized commodity exchange centers, while Shan traders are more diffuse, and operate mainly

⁹ Most input suppliers (76%) operate a single branch, while 12% have two branches. Three out of ten input supply businesses are located in a market.

off-market. Very few traders (3%) reported that they supplied maize exclusively to any other trader, but 16% reported that one or more traders supplied maize exclusively to them (Table 6).

Few traders export maize. Only 12% of traders export maize directly, with larger traders more likely to export (29% of traders in tercile 3, as compared to 4% in terciles 1 and 2). Among exporting traders, 52% are based in Muse (the main border trading point between Myanmar and China) and 30% in Lashio.

Most crop trading businesses are formal enterprises. Eight out of ten maize trading businesses are reported to be formally registered, and about half (54%) have a trading name¹⁰. Few of these businesses (8%) have a license to export maize. Most of the businesses with export licenses are large (tercile 3), and located in Northern Shan.

Less than half of traders are members of a business association. Forty-one percent are members of any type of association, with large traders (tercile 3) somewhat more likely to be association members than small (53% and 29%, respectively). Membership of a commodity exchange center was most common (reported 61% of businesses with membership of an association), followed by membership of a maize traders' association (27%), or other traders' association (17%). Very few traders (2%) were members of the Union of Myanmar Federation of Chambers of Commerce and Industry (UMFCCI). Rates of association membership are much higher North Shan (97%) than South Shan (28%), likely due in part to the lack of a commodity exchange center in South Shan. Most organizations of which traders were members were reported to be active (87%).¹¹

Most traders employ hired workers. Seventy-two percent of traders hired workers on a temporary basis during the month preceding the survey, employing a median of six workers each, the vast majority of whom were male. Large traders (tercile 3) hired roughly twice as many casual workers as small traders (tercile 1). Just under half of traders (45%) employed full time staff, also employing a median of six individuals, most of whom were men. Roughly equal shares of traders in North and South Shan employed permanent and temporary workers, but northern traders employed more workers than southern traders (median ten vs. five permanent workers, and 14 vs. five temporary workers, respectively), reflecting the larger average size of trading businesses in North Shan.

Most trading businesses employ family members. More than two-thirds (68%) employ both the owner and one or more family members, with each employing an average of 1.1 women and 1.4 men. This pattern varies little, irrespective of whether the owner is reported to be a man or a woman. This indicates that most trading businesses are family enterprises that household members of both genders contribute to actively. Very few traders work alone, without support from either family members or hired workers.

¹⁰ Input supply businesses are even more likely to operate formally. Nine out of 10 are registered, and 85% have a trading name.

¹¹ Only 11% of input suppliers are members of any type of business association.

4.2 Assets, access to finance, and numbers of enterprises

More than half of traders own agricultural land. Fifty-six percent of traders report owning land. The average area of land owned by these individuals prior to taking up trading (23 acres) is around four times larger than the current average agricultural landholding in southern Shan (5.7 acres) (Win and Zu, 2019). This suggests that many traders were relatively wealthy farmers prior to taking up maize trading. Sixty-two percent of traders in South Shan owned land, as compared to 26% of traders in North Shan.

Traders have increased their landholdings. The area of land owned by landowning traders increased from 23 acres at the time of establish the trading business, to 31 acres at the time of interview: an average increase of 8 acres, or 35%. Forty-one percent of traders who already operated a trading business in 2013 and owned land in 2018 increased their landholdings between these two dates. Northern traders own larger areas of land on average than those from South Shan (60 acres and 29 acres, respectively). The area of land owned by traders in northern Shan totaled 595 acres, while that owned by traders in southern Shan totaled 3,176 acres. It is not known whether this accumulation of assets took place principally through reinvestment of profits from maize trading, foreclosure on loans granted to customers, other accumulation pathways, or some combination of these. The majority of agricultural land owned by traders (75%) is used for maize cultivation, but even among the tercile 1 traders, self-produced maize accounts for no more than 3% of total maize traded (Table 7).

Table 7 Share of traders owning agricultural land, area of land owned, area of maize cultivated, and own maize production as a share of total maize traded, by tercile

	Share of traders owning agricultural land (%)	Area of land owned when business established (acres)	Area of land owned now (acres)	Area of maize cultivated in 2018 (acres)	Share of own maize in total traded (%)
Tercile 1	64	31	37	27	2.8
Tercile 2	56	18	26	20	0.4
Tercile 3	51	19	32	22	0.1
Total	56	23	31	23	0.2
North	26	41	60	73	0.1
South	62	22	29	19	0.3

Ownership of business assets has increased dramatically since 2013. In 2018, the vast majority of traders owned mobile phones (96%), motorbikes (92%), bagging machines (85%) and manual scales (85%). Around half of traders owned generators (49%), electronic scales (46%) or 4 to 6-wheel trucks (51%). Smaller numbers of traders own small motor vehicles (29%), 10 to 12-wheel trucks (19%), or 18 to- -24-wheel trucks (10%). Ownership of bagging machines, electronic scales, 4 to 6-wheel trucks, maize cleaners, and maize shellers increased particularly sharply between 2013 and 2018 (Table 8).

The composition of business assets had changed over time. Figures 13-15 illustrate the timing of asset acquisition, showing the cumulative number of traders that acquired vehicles and other equipment, by year. Motorbikes, manual scales, landline phones, small vehicles (trawlerji/tuk-tuk) and generators were among the earliest items acquired. Ownership of mobile phones grew rapidly from the mid-2000s, as did ownership of locally manufactured maize cleaners

and maize shellers. Acquisition of large motor vehicles has increased in recent years, accelerating particularly after 2012 when import restrictions were lifted. Acquisition of electronics (bagging machines, digital scales, computers), maize driers, and 4-wheel tractors has also accelerated since 2012.

Table 8 Share of traders owning different assets and total numbers of assets owned in 2013 and 2018

	Percent of traders owning in 2013	Percent of traders owning in 2018	Total numbers owned in 2013	Total numbers owned in 2018	% change in number owned (2013-2018)
Mobile phone	82	96	372	518	39
Motorbike	91	92	332	410	23
Bagging machine	39	85	283	586	107
Manual scale	84	85	391	505	29
4 to 6- wheel truck	27	51	71	154	117
Generator	36	49	88	140	59
Electronic scale	14	46	81	207	156
Landline phone	46	40	104	115	11
Trawlerji/tuk tuk	26	29	74	92	24
Maize cleaner	12	22	26	62	138
10 to 12-wheel truck	14	19	53	72	36
Maize sheller	8	16	18	50	178
Computer	9	11	24	34	42
18 to 24-wheel truck	4	10	71	101	42
Maize dryer	4	10	19	37	59
4 wheel tractor	1	8	3	24	700
Maize seeder	0	1	0	2	-

Most owners of large vehicles hire them out to others. More than three-quarters (77%) of 18 to 24-wheel truck owners and 68% of 10 to 12-wheel truck owners rent out their vehicles to others, most likely at times when they are not needed for their own trading activities. It is not known whether these vehicles are hired out as equipment (i.e. vehicles only), or as services (vehicles plus drivers). Eighty-nine percent of four-wheel tractor owners rent out these machines. Small vehicles are rented out less frequently (reported by 31% of six-wheel truck owners, and 7% of four-wheel truck owners), suggesting that their capacity is fully utilized, or that there is limited demand for small vehicle rentals as these are owned by large numbers of traders. About one-third of maize dryer owners (35%) rent them out.

Figure 13 Cumulative number of traders owning vehicles by year of first ownership

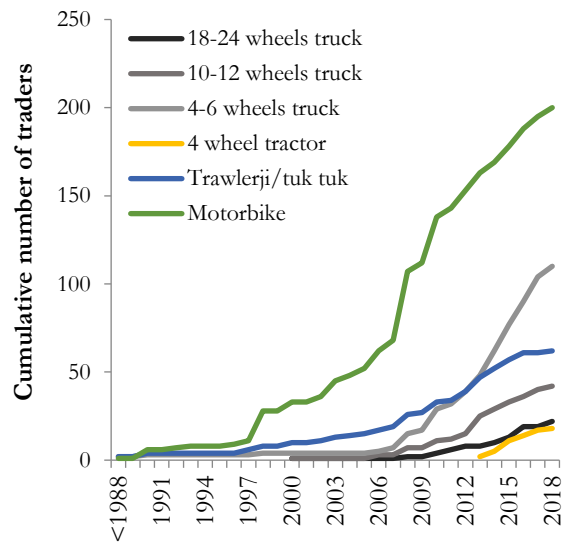


Figure 14 Cumulative number of traders owning equipment by year of first ownership

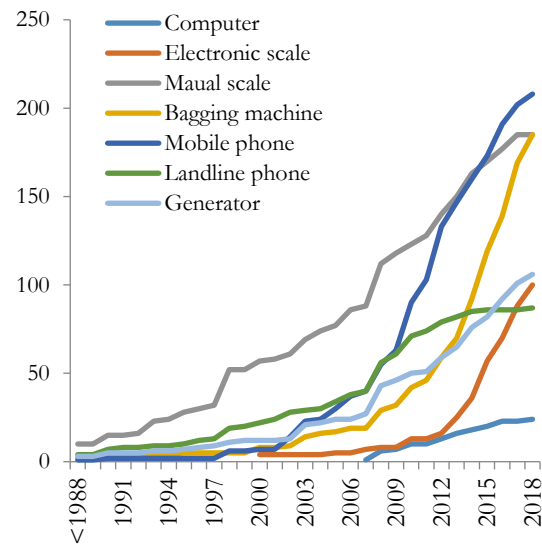
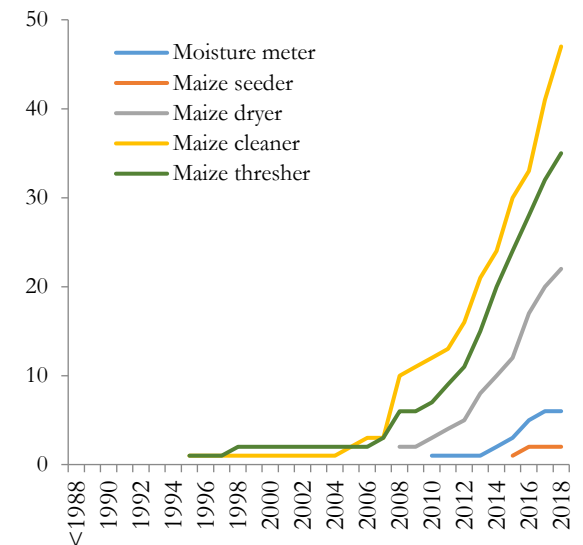


Figure 15 Cumulative number of traders owning equipment by year of first ownership

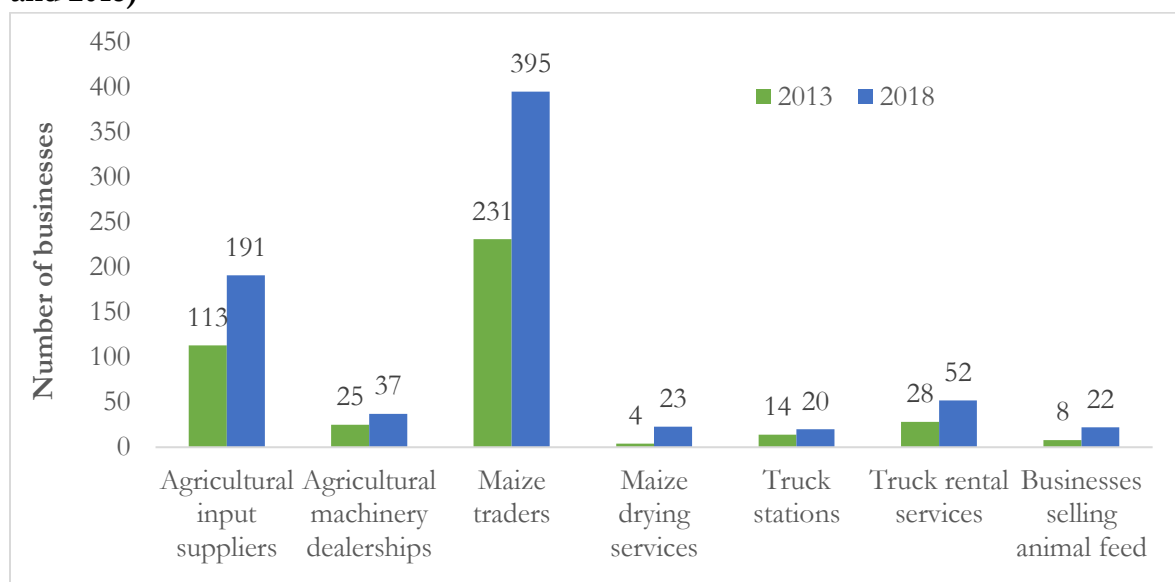


Banks are an increasingly important source of credit for traders. More than one-third of traders (37%) reported having borrowed working capital within the past trading year. Larger traders were most likely to borrow working capital (50% of tercile 3 traders, versus 29% of tercile 1 traders). Among these, almost half (48%) took bank loans. Relatives are also important source of credit, accounting for 42% of working capital loans. Very few loans were taken from private moneylenders or other actors in the maize value chain (feed mills, seed companies, etc.), and other traders only provided 13% of loans. Traders in southern Shan were slightly more likely to have borrowed from any source than those in northern Shan (39% and 26%, respectively). Yoma Bank, which offers a loan scheme designed specifically for traders, was the most popular bank, providing loans to 30% of traders who borrowed working capital. Other private banks (Asia Green Development Bank, Kabar Yadanar Bank, Kanbawza Bank and Myawaddy Bank) lent to a combined total of 15% of traders who borrowed working capital, and state-owned bank (Myanmar Economic Bank) lent to 9%.

Average loan sizes are large. Traders who took loans during the past 12 months borrowed an average of MMK 110 million (\$73,600) in total. Traders in tercile 3 borrowed an average of MMK 167 million (\$111,600), while those in tercile 1 borrowed an average of MMK 377 million (\$25,100). These numbers are a reflection of the large volumes of product traded. The average size of loans taken from private banks (MMK 118 million, or \$78,700) is roughly double the average size of loans taken from relatives (MMK 59 million, or \$39,000). Traders who borrowed money during the past 12 months took an average of 2.5 loans during this period. Smaller traders borrowed more frequently (an average of 3.2 loans for traders in tercile 1, versus 2 loans for those in tercile 3). Amounts borrowed by traders in North and South Shan varied little.

The number of enterprises in the maize value chain has grown rapidly since 2013. All survey respondents were asked to estimate the numbers of actors in the maize value chain in their township at the time of the survey in 2018, and five years earlier in 2013. Enterprises of all types increased substantially in surveyed townships. In the midstream of the value chain, the total number of maize traders grew 71%, from 231 to 395. The availability of maize drying services increased even more rapidly, though from a low base, up 500%, from four to 24. The number of ‘truck stations’ (locations where transport rental services are available) grew from 14 to 20, in line with an increase in logistics serving traders, and the number of businesses offering truck rental services jumped from 28 to 52. Upstream, numbers of agricultural input suppliers grew 69%, from 113 to 191, and numbers of agricultural machinery suppliers providing equipment to farmers increased from 25 to 37. Downstream, the number of businesses selling animal feeds nearly trebled, from 8 to 22, reflecting an increase in poultry and livestock production utilizing maize-based feeds (Figure 16).

Figure 16 Number of businesses in the maize value chain in surveyed townships (2013 and 2018)

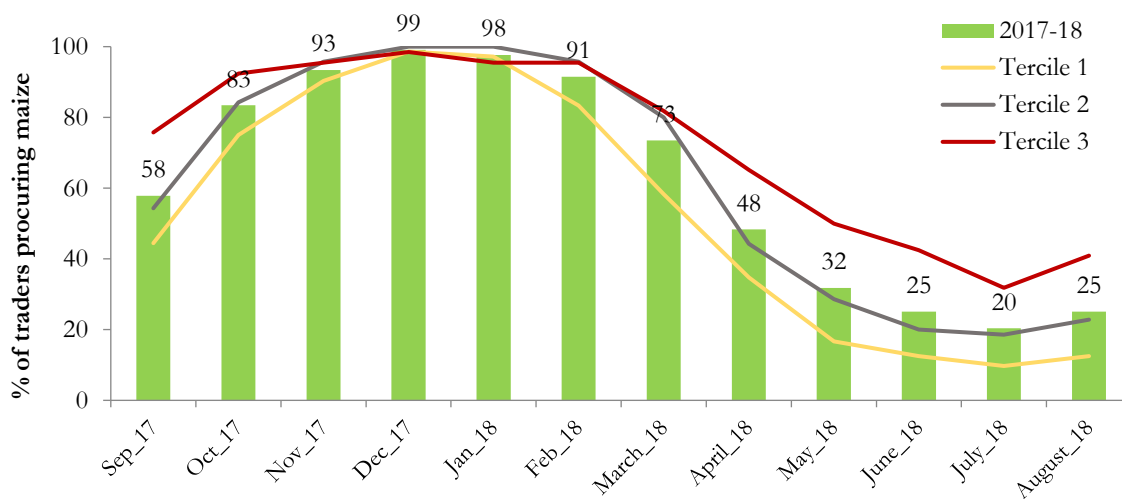


4.3 Buying maize

This subsection presents analysis of the purchasing behavior of maize traders.

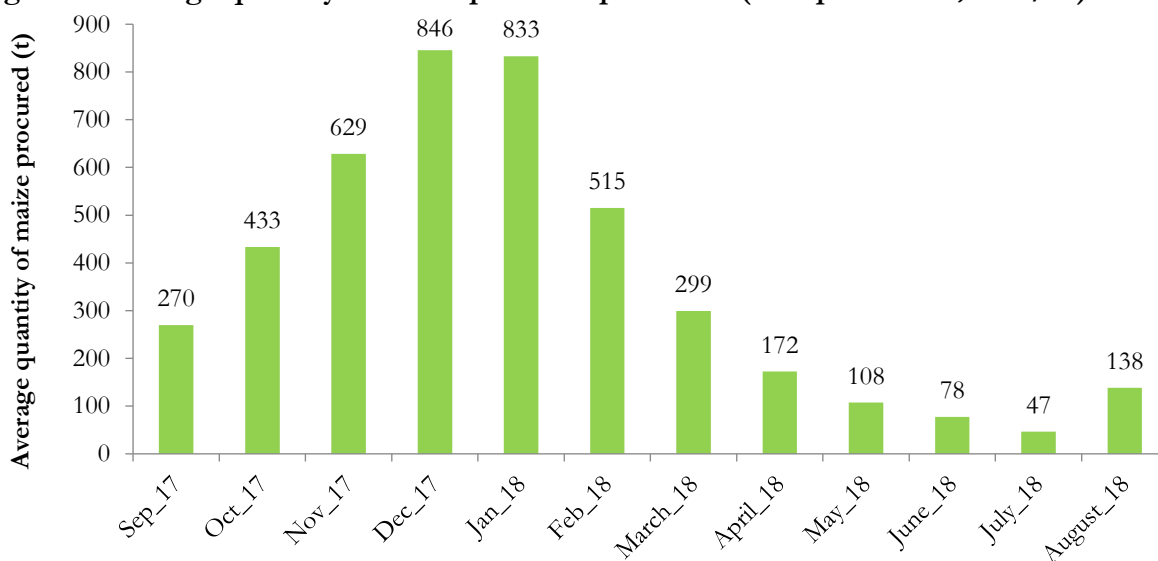
Maize procurement is highly seasonal. The vast majority of maize in Shan is planted in May or June, at the onset of the monsoon season, and harvested from September to December. This is reflected in the share of businesses trading. This starts to pick up in September, when 58% of traders procure maize, builds through December, when 99% of traders purchase, and declines until April, when 48% of businesses buy maize. Less than one-third of traders procure maize during the monsoon growing season months of May to August (Figure 17).

Figure 17 Percentage of traders trading maize in each month



Larger traders buy maize for more months per year. Traders procure maize for an average of 7 months per year. Tercile 1 traders procure maize for an average of 6 months, whereas those in tercile 3 procure for an average of 9 months each. Nearly than one-third (29%) of traders in tercile 3 procured maize in all 12 months of the year, compared to only 6% of those in tercile 1.

Figure 18 Average quantity of maize procured per trader (tons per month, 2017/18)



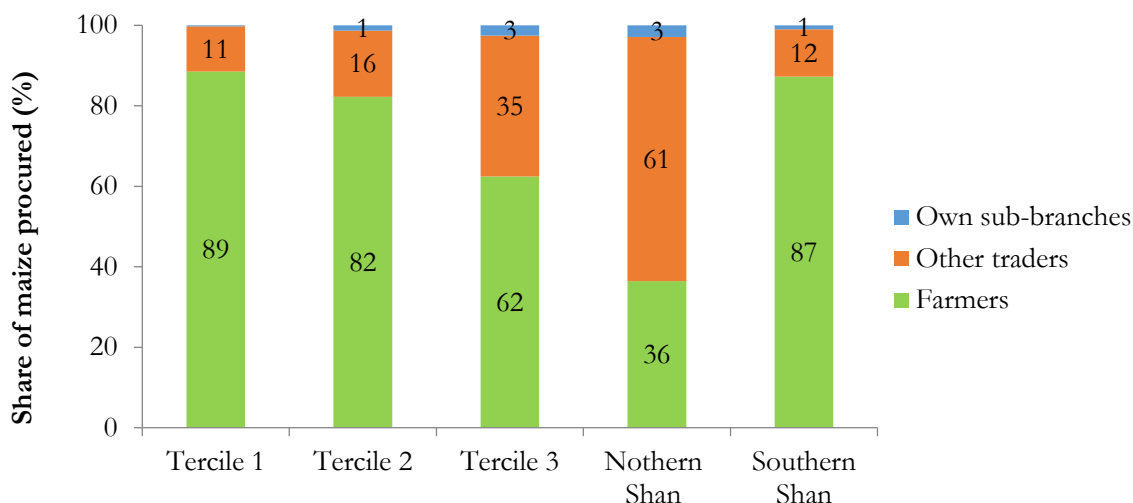
The average volume of maize procured per month follows a similar pattern to frequency of maize purchases. December and January are peak months for maize procurement, with traders buying well in excess of 800 t of maize each on average during these months (Figure 18). The average annual volume procured by each trader is 4,452 t. Traders in tercile 3 procure approximately 20 times more maize each year than those in tercile 1 (10,803 t vs 533 t). The total volume handled by traders in our sample in trading year 2017/18 was 921,582 t, equivalent to approximately half of Myanmar’s maize harvest. Traders in North Shan procured about three times more maize each on average than those in South Shan (9,780 t and 3,367 t, respectively).

Table 9 Share of traders procuring maize by source and trader size terciles (%)

	Tercile 1	Tercile 2	Tercile 3	Total	North	South
Direct from farmers	92	94	83	90	58	97
From other trader	19	37	68	41	94	30
Own sub-branch	3	4	8	5	8	5

Most traders source maize from farmers. Ninety percent of traders procure maize directly from farmers, as compared to 41% who source maize from other traders. (Table 9). Larger traders are more likely to buy maize from other traders (reported by 68% of those tercile 3, versus 19% in tercile 1). Conversely, smaller traders are somewhat more likely to source maize directly from farmers (92% of traders in tercile 1, vs 83% in tercile 3). South Shan traders are more likely to buy maize from farmers than traders in North Shan (97% and 58%, respectively), whereas North Shan traders are three times more likely than those in South Shan to procure maize from other traders (94% and 30% respectively). This reflects the relative positions of traders from the two zones in the value chain, with traders in the South acting mainly as suppliers to traders in Muse and Lashio.

Figure 19 Share of maize procured by source and trader size terciles



The majority of maize is procured directly from farmers. Farmers contributed 78% of total the maize procured by traders in our sample. Other traders contributed 21. Similar to the pattern described above, the larger the trader, the greater the share of maize procured from other traders. Traders in tercile 1 procured 11% from traders and 89% from farmers, whereas those in tercile 3 procured 31% of their maize from other traders and 62% from farmers (Figure 19). Traders in northern Shan procured a much larger share of maize from other traders (61% of maize procured) than those in southern Shan (12% of maize), confirming that traders in southern Shan act mainly as buyers of locally produced maize, which they forward to traders in Lashio and Muse who aggregate large volumes for export. Average volumes of maize procured by traders in northern Shan are 2.7 times greater than in southern Shan (9,780 t/year, and 3,678 t/year, respectively).

The volume of maize procured by traders in our sample nearly doubled from 2013 to 2018. The total volume of maize purchased annually jumped from 486,364 t to 943,530 t (94%) over this period. The number of traders operating increased by just 22% over this period. Some caution must be exercised in interpreting these figures as the number of traders who operated in 2013 but subsequently ceased trading, and the volumes of purchases that they made, are unknown. Nevertheless, the magnitude of the change suggests that a large increase in maize production took place during this period. (Table 10).

Table 10 Average and total quantity of maize traded in 2013 and 2018

Item	Number of traders		Average quantity traded (t)		Change in average quantity traded (%)	Total quantity traded (t)		Change in total quantity traded (%)
	2013	2018	2013	2018	2013-2018	2013	2018	2013-2018
Tercile 1	57	72	411	498	21	23,003	35,889	56
Tercile 2	61	70	1339	2370	77	82,997	165,909	100
Tercile 3	52	66	7266	11,238	55	377,851	741,732	96
All	179*	218*	2779	4536	63	486,364	943,530	94

* Total not equal to sum of terciles 1-3 as some observations dropped due to missing information

The trading sector is concentrated, but the degree of concentration is decreasing. The Gini coefficient of total maize quantity traded by traders in the sample in 2018 was 0.62. This is very similar to the degree of concentration (Gini coefficient 0.65) reported among maize traders in Nigeria by Liverpool-Tasie et al., (2017). The smallest traders (tercile 1) accounted for just 4 % of total volume of maize traded while the larger traders in tercile 3 contributed for 79% of the total. The average quantity of maize traded in 2018 by traders in tercile 3 (11,238 tons) was 22 times higher than that in tercile 1 (498 tons). The concentration of volumes traded in 2013 was higher than 2018 with a Gini coefficient of 0.72. This is the same as the level of concentration reported among pulse and oilseed traders in the Dry Zone in 2017 (Belton and Mather 2018). The deconcentration that took place since 2013 appears linked to the growth of procurement by medium sized maize traders (tercile 2) (see Table 10).

4.4 Processing, storage and value addition

This sub-section details the behavior of traders once they take possession of purchased maize.

Traders are increasingly taking measures to improve the quality of maize. Most traders dry maize prior to storage or onward sale. The most common method of drying is in the open air (usually on concrete surfaces or tarpaulins arranged on the ground close to the traders’ business premises). The share of traders drying maize in the open air increased from 69% to 73% between 2013 and 2018. The share of traders drying maize using a machine doubled from 5% to 11% over the same period. Scoping interviews suggested that use of driers is linked to the increasing volumes of maize traded, which has resulted in space constraints for air-drying. Use of digital moisture meters to measure moisture content accurately has also increased substantially. These were used by 47% of traders in 2018, up from 28% in 2013. Use of machines to clean maize also increased substantially, with the number of traders doing so roughly doubling from 9% to 19% (Table 11). Southern traders are more likely to air-dry maize, measure moisture content, and clean maize with a machine than those in North Shan, likely due to the former receiving most of the maize they trade direct from farmers.

Table 11 Percentage of traders handling before selling

	2013	2018	North	South
Dried in the open air	69	73	45	79
Measured moisture content using moisture meter	28	47	18	54
Treated to prevent pests	38	47	45	48
Cleaned using machine	9	19	3	22
Treated to prevent fungus	12	13	16	13
Dried using machine	5	11	11	11
Dried over fire	1	2	0	2
Sorted and graded by automatic machine	2	2	3	2
Crushed maize to sell as animal feed	1	2	0	2
Labeled sacks with own name and location	1	1	0	1
Branded with own brand	0	0	0	0
None of these	20	13	39	7

Changes in trader behavior may represent a response to increasing quality standards from buyers. Our scoping interviews indicated that demand for maize from domestic feed mills is growing, and that these mills tend to have higher standards than buyers from China. However,

changes in the way that maize is handled likely also reflects improvements in the availability, or reductions in cost, of equipment.

Almost half of traders treat maize to prevent pests. Forty-seven percent treated maize by fumigation to prevent pest infestations. This share increased somewhat, up from 38% in 2013, possibly indicating that storing maize prior to sale is also becoming more common. Fewer traders (13%) treated maize to prevent fungus, and this share changed little from 2013, suggesting that few traders are concerned about the risk of aflatoxin (Table 11).

Few traders did no value addition or quality improvement activities. Thirteen percent of traders conducted no activity of any kind, falling from 20% in 2013. Very few traders (2%) sorted or graded maize using an automatic machine. Crushing maize to sell as animal feed was also rare (2%).

Some quality-based grading was observed. One-third of traders (35%) reported grading maize, based on the size and color of grains. Large traders were slightly more likely to grade maize than small traders (39% vs 31%). Among traders who graded maize, 63% did so most of the time. Grading maize was more common among North Shan traders than those in South Shan (practiced by 58% and 28%, respectively). South Shan traders are slightly more likely than those in North Shan to sell Grade 1 ('best' quality) maize (accounting 45% and 35% of sales, respectively). This may reflect the higher likelihood of southern traders selling to feed factories in Myanmar, which are reported to have higher quality requirements than the traders in China who are the main buyers for traders in North Shan. The maximum moisture content of maize accepted by almost all types of buyer was 16%, but maize driers accept maize with a moisture content of up to 40%.

All maize is traded as an unbranded bulk commodity. No trader sold maize in branded sacks, and just 1% of traders sold maize in sacks labeled with their own name and location, meaning that there is no traceability in the supply chain.

There is very little loss of maize between time of procurement and time of sale. Losses of maize during trading amounted to just 0.18% of the total volume procured. One-third (34%) of traders reported zero loss of maize between procurement and sale, and over half of traders (54%) reported that the loss was less than 1%. The remaining 11% of traders reported losing 3% of the amount procured on average.

4.5 Selling maize

Most traders store maize before selling. One quarter (24%) of traders always sold maize immediately. The remainder stored maize for an average of 3 months (95 days) between procurement and sale. Traders in tercile 3 stored maize for 16 days longer than those in tercile 1, on average. The share of traders selling maize immediately, and the length of time for which maize is stored varies vary little by trader location.

The majority of maize sales are made locally. Traders were asked to name the three most important locations of their buyers. More than half of traders (56%) reported that the township they lived (29%) or other townships in southern Shan (27%) were the most important destinations for sales. Yangon and Mandalay (combined) were reported to be the most important destinations by 19% of traders, while 14% reported China and the border town of Muse as the most important destination. Other locations in northern Shan accounted for the remaining 11%. Traders in

northern Shan overwhelmingly report China (54%) or Muse (35%) as their most important destination for sales, whereas southern traders sell primarily within southern Shan (63%) and to Yangon and Mandalay (combined total of 21%) (Table 12).

Table 12 Percentage of traders reporting most important destination of sales

Location	Tercile 1	Tercile 2	Tercile 3	All	North	South
Same township	43	21	25	29	5	32
Other township in southern Shan	24	31	28	27	0	31
Yangon	10	15	13	13	3	14
Muse	4	11	10	8	35	5
China	2	2	12	6	54	0
Mandalay	4	7	5	6	0	7
Lashio	5	8	2	5	0	6
Nawngkhio	5	6	3	4	0	5
Other location in northern Shan	2	0	0	1	0	1
Wa self-administered zone	0.0	0.0	0.8	0.3	3	0

Traders are the main buyers of maize, followed by feed factories. Almost all traders (97%) sold maize to other traders, while 29% reported selling to feed factories. Almost one-quarter of traders (24%) sold to CP feed factories, while 16% sold other feed factories, underlining CP's large market share in Myanmar's animal feed sector. Sales of maize to local livestock farmers are also common, reported by 14% of traders. Only 7% of traders sold to maize drying businesses, and very few (1%) sold direct to an alcohol factory (Table 13).

Sales volumes follow a similar pattern. More than three-quarters (77%) of maize was sold to other traders. Feed factories account for 20% of the volume of maize sold. Sales to factories operated by CP account for 13% of the total; almost double the share of sales to other feed factories (7%). This underlines the extent of CP's dominance in the animal feed market in Myanmar. Sales to other types of buyer account for just 3% of the total. Sales to other traders account for almost all (97%) of sales made by northern traders, as compared to 64% of sales made by southern traders, with sales to feed factories accounting for most of the remainder (29%) (Table 13).

Table 13 Percentages of traders selling maize and quantity sold, by location and buyer

	Traders selling to each buyer (%)			Share of total quantity sold (%)		
	All	North	South	All	North	South
Traders	97	100	96	77	97	64
CP factory	24	3	29	13	3	19
Feed factory other than CP	16	0	19	7	0	10
Maize dryer	7	0	8	1	0	2
Alcohol factory	1	0	1	1	0	1
Local livestock farmers	14	0	16	1	0	2
Any feed factory (CP+other)	29	3	34	20	0	1

Larger traders sell more maize to feed factories, smaller traders sell more maize to other traders. Fourteen percent of traders in tercile 1 sell maize to feed factories (accounting for 7% of

the volume sold by this group). In comparison, 42% of traders in tercile 3 sell to feed factories, accounting for 20% of their sales. Conversely, sales to other traders accounted for 89% of the volume of maize sold by tercile 1 traders, and 75% of sales by tercile 3 traders (Table 14). The total quantity of maize sold by traders in tercile 3 (708,419 t) was 17 times higher than the quantity sold by traders in tercile 1 (40,940 t) (Table 15).

Table 14 Share of maize sold, by buyer, tercile and location

	Tercile 1	Tercile 2	Tercile 3	All
Traders	89	81	75	77
CP factory	3	11	14	13
Feed factory other than	4	4	7	7
Maize dryer	2	3	1	1
Alcohol factory	0	0	0	0
Local livestock farmers	2	1	2	1
Other	0	0	1	1
Total	100	100	100	100

Table 15 Total quantity of maize sold, by buyer, tercile and location

Quantity sold (tons)	Tercile 1	Tercile 2	Tercile 3	All
Traders	36,473	132,174	530,760	699,407
CP factory	1175	17,848	101,600	120,623
Feed factory other than	1501	6430	51,728	59,659
Maize dryer	761	4765	6159	11,685
Alcohol factory	9	0	1080	1089
Local livestock farmers	1022	1037	11,141	13,200
Other	0	793	6711	7504
Total	40,940	163,047	709,178	913,165

CP factories have higher quality standards than other buyers. Nearly half (45%) of traders reported selling Grade 1 ('best' quality) maize, 28% Grade 2 ('normal' quality), 15% Grade 3 ('poor' quality), 15% 'any' quality, and 30% 'ungraded' (multiple answers possible). Three-quarters (75%) of traders who sold maize to CP factories reported selling 'best' quality maize to them. In comparison, 44% of traders sold 'best' quality maize to other traders, and only 26% reported selling 'best' quality maize to other feed factories.

More than half of traders made agreements with buyers prior to sale. One-third of traders (35%) made agreements with all of their buyers, and 27% of traders made agreements with some of them. Among those who made agreements, three-quarters (76%) made verbal agreements, 9% made formal written contracts and 15% had both verbal and written agreements. Traders who had agreements with one or more buyers reported that 62% of maize sold was supplied under agreement. The vast majority of agreements made with traders (96%) were verbal, but around half (48%) of the agreements made with CP feed factories were formal written contracts, as were 41% of agreements with feed factories other than CP. All other agreements (e.g. with maize driers, local livestock farms, were verbal). The use of written contracts by feed companies suggests that they need to ensure timely access to predictable volumes of raw material in order to meet production schedules, resulting in a degree of formalization within the sector.

Most agreements to supply maize are short term. Traders who reported having made agreements to supply other traders during the past 12 months had an average of 12 such agreements (median 6). Traders with agreements to supply CP factories had 15 such agreements over this period (median 7.5), and those with agreements to supply other feed factories had an average of 17 agreements (median 10). This suggests that agreements between buyers and sellers are short-term arrangements entered into to enable to buyers to secure reliable supplies of maize over the short to medium term and guarantee sellers an outlet for purchased product.

Very few traders receive credit from buyers. Only 6% of traders received an advance from any maize buyer during the last trading year. Among these 32% had to pay interest on all occasions, and 11% had to pay interest on some occasions. This indicates that traders are not generally tied to their buyers through debt, and that little, if any, credit flows from large buyers to farmers through traders.

Most traders receive payments in arrears. The vast majority of traders (92%) receive payments in arrears following sales but the average waiting time is short, averaging seven days, with maximum delay of two months. In effect, this means that sellers provide short-term trade credit to buyers.

Bank transfer was the most common method of payment. Over two-thirds of traders (69%) received payment for their most recent sale of maize by bank transfer, and 30% received cash. Payment by bank transfer was most common for sales made to CP, accounting for 93% of all payments from the company. Two-thirds (67%) of all payments made by other traders and 64% of payments made by feed factories other than CP were also by bank transfer. These findings both indicate the growing role of the formal financial sector in facilitating business, and underline the high level of formalization associated with CP's activities. Traders in North Shan received a greater share of payments by bank transfer than those in South Shan (83% and 65%, respectively). This is likely to reflect the method of payment for exports reported by respondents during scoping research. Some Myanmar traders are able open RMB bank accounts in the Chinese city of Shweli (bordering Muse). RMB can be withdrawn and exchanged informally for MMK, or used to pay for goods imported from China on behalf of other traders, who then deposit MMK in maize traders' Myanmar bank accounts.

Most traders earn a markup, not a commission. This is a reflection of the organization of maize trading, with most traders functioning as wholesalers (who obtain profit from arbitrage), rather than as brokers (who earn a commission from facilitating transactions between buyers and sellers). Only 7% of traders reported having earned a commission from their most recent transaction, earning an average of MMK 92 per sack (\$0.06) for doing so. This equates to approximately 0.7% of the average purchase price of a 50 kg sack of maize (MMK 13,700, or \$9.15). This low margin reflects the fact that brokers do not risk their own capital or pay costs (e.g. transport, loading). The vast majority of traders (92%) earn a markup.

Markups are modest, but the total value of income earned over the course of a season can be substantial. The average markup (after deducting operating costs) reported by traders was MMK 583 per sack (\$0.39); a margin of 4.3% over the average purchase price. The average sales price per sack of maize during the most recent transaction was 12.9% higher than the average purchase price of MMK 15,480 (\$10.30). This indicates that, on average, the operating costs

(transport, labor, energy etc.) account for approximately two-thirds of the difference between the purchase price and sales price of maize, with the balance retained as profit. On this basis, a trader trading the average quantity of 4563 t of maize over the course of trading year 2017/18 would have earned approximately MMK 52.9 million (\$35,000).

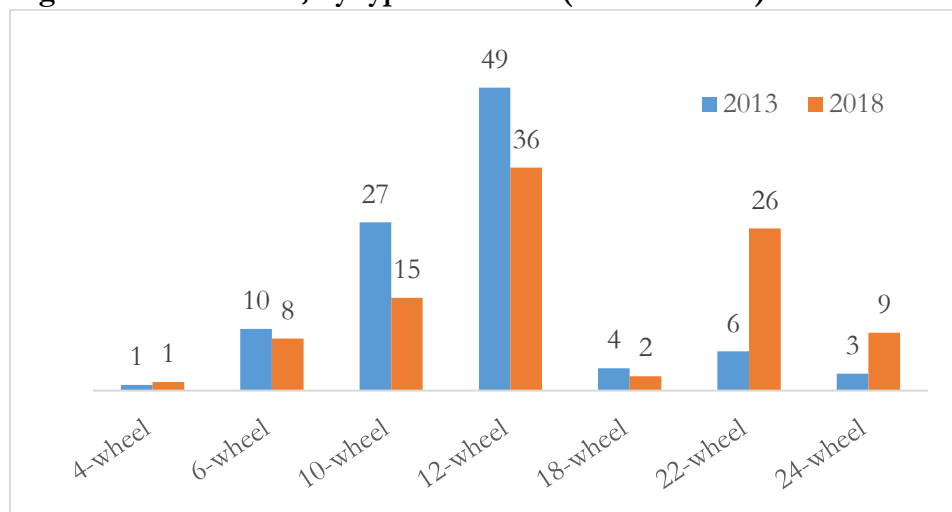
Traders transport maize to buyers using a mix of arrangements. During the most recent completed transaction, the most common arrangement was for buyers to collect (44% of cases). This arrangement is particularly common when the seller is small (63% of transactions by tercile 1 traders, versus 24% of transactions by tercile 3 traders). Use of third party logistics services (3PLS) that provide vehicles and drivers is next most common arrangement (27% of cases). Fourteen percent of deliveries were made using trader’s own vehicles. This option is more common among large traders than small (26% of deliveries for tercile 3 traders, compared to 6% for tercile 1), as the former are more likely to own large vehicles. Traders also hire vehicles without driver in 9% of cases. Finally, in 7% of cases, maize is delivered from seller to buyer without the intermediary trader taking possession (Table 16). This final set of cases probably corresponds to sales made on commission. Together, these findings indicate that although many traders own motor vehicles, there is a high degree of reliance in 3PLS and, to a lesser degree, vehicle rentals. This occurs because traders’ demand for transport services often exceeds their own capacity (and, conversely, at other times they may have surplus capacity that is rented out others).

Table 16 Transportation arrangements for maize sales (% of traders)

	Tercile 1	Tercile 2	Tercile 3	Total
Buyer collected	63	46	24	44
Delivered using 3PLS hired by self	24	27	30	27
Delivered with own vehicle	6	11	26	14
Delivered using vehicle hired by self	6	11	11	9
Seller delivered direct to buyer	3	4	9	6

The average size of vehicles used to transport maize has increased over the past five years. Traders were asked about the type of vehicle used to deliver maize during their most recent sale, whether they made deliveries to the same destination five years previously, and, if so, the type of vehicle usually used at that time. The share of deliveries made using 22 to 24-wheel trucks grew from 9% to 36% over the period 2013 to 2018. These vehicles have taken the place of 10 to 18-wheel trucks, deliveries made with which fell from 80% to 54% of the total over this period. The share of deliveries made using small (4 to 6-wheel) trucks has remained roughly constant (10%) (Figure 20). 78% and 88% of traders who used 22-wheel and 24-wheel trucks, respectively, began to do so after 2012. The recent growth in the use of larger vehicles likely reflects both the increasing volumes traded, and the relaxation of restrictions on vehicle imports from 2012 onwards.

Figure 20 Vehicle use, by type of vehicle (2018 and 2013)



Even small traders use large vehicles. As expected, larger traders use large vehicles for frequently than small traders. Almost half (48%) of the most recent deliveries made by tercile 3 traders in 2018 used 18 to 24-wheel trucks, but even 31% recent deliveries made by traders in tercile 1 utilized these vehicles.

Average transport times for maize deliveries have only fallen slightly in the past 5 years. The average distance travelled to the sales destination during the most recent transaction was 253 km (median 170 km). It took an average of nine hours and forty for maize deliveries to reach their destination in 2018. This is only a small improvement over the average journey time of 10 hours reported in 2013 for trips to the same locations. This is somewhat surprising given that the condition of rural roads in Shan is thought to have improved during this period (see Lambrecht and Belton, 2018).

The average transport cost vary widely by destination. The cost within Myanmar was MMK134 (\$0.09) per ton-kilometer. This is likely expensive compared to other countries in the region. For instance, the average cost for road transport in Thailand is reported TBH 1.72-2.02/t-km in 2016 (\$0.06-0.07 at 2019 exchange rates) (Wongsanguan, 2018). Transport costs reported to destinations within Shan are considerably higher than those from Shan to Mandalay or Yangon. This may reflect differences in road conditions, but could also indicate the existence of informal tolls levied on transport along some routes within Shan. Transport costs for journey to China are extremely high, averaging MMK 19,500/ton-km (\$0.13). This is an outcome of the informal nature of maize exports from Myanmar to China, the vast majority of which, according to our scoping interviews, are smuggled, with the transporter assuming financial responsibility for any confiscated cargo, and charging for their services accordingly.

4.6 Shocks

We asked traders about events affecting their maize trading businesses over the preceding five years, and the severity of any positive and negative impacts. These responses are summarized in Table 17.

Table 17 Share of traders reporting that their business was impacted by shocks within the past five years, and perceived severity of impact the most recent time this occurred.

Traders experiencing effects of a significant.... within the past 5 years	Total number	% of total	Type of impact experienced (%)				
			Big negative	Small negative	No impact	Small positive	Big positive
Increase in maize price	196	90	3	3	6	46	42
Fall in maize price	184	85	41	49	2	3	4
Closure of China border	177	82	64	28	5	1	2
Increase in fuel price	169	78	23	62	13	1	1
Increase in number of farmers	168	77	2	4	7	71	17
Increase in number of traders	162	75	7	49	32	6	6
Increase in transport costs	137	63	20	71	5	3	1
Increase in price of fertilizer	109	50	18	48	30	3	1
Depreciation of Kyat	101	47	24	55	19	2	0
Poultry/livestock disease (Myanmar)	96	44	14	44	41	1	1
Shortage of maize seed from CP	83	38	11	58	31	0	0
Quicker transport times	59	27	2	0	2	73	24
Delay transporting maize due to poor roads	38	18	11	84	5	0	0
Delay transporting maize due to conflict	33	15	61	27	9	3	0
Increase in demand from mills in Myanmar	30	14	7	3	13	53	23
Poultry/livestock disease (China)	29	13	7	48	41	0	3
Seizure of maize during border trade	28	13	71	25	4	0	0
Reduction in transport costs	25	12	0	0	20	64	16
Shortage of maize supply from farmers	24	11	8	83	8	0	0
Losses or theft of maize during transport	5	2	60	40	0	0	0

The following results stand out:

Significant increases and decreases in the price of maize are the most common shock (reported by 90% and 85% of respondents respectively). Price increases are mainly associated with positive impacts, and prices decreases mainly negative impacts, but these price movements appear to balance over the long run in terms of their effects on traders.

Closure of the China border to maize exports impacted 82% of traders, resulting in predominantly negative impacts. Scoping interviews indicated that nearly all overland trade in maize from North Shan to China is informal, and that enforcement of restrictions against smuggling were periodically imposed by the Chinese authorities, resulting in higher risks and costs, and severe delays for exporting goods. The most recent of these clampdowns was particularly severe, beginning a few weeks prior to the survey in October 2019, and continuing for several months afterward. Thirteen percent of traders reported losing maize due to seizure by Chinese officials during informal border trade.

The rapid depreciation of the Kyat during 2018 had significant effects on local prices of inputs and services. Increases in the price of fuel and transport affected 78% and 63% of traders respectively, while about half reported being impacted by increases in the price of fertilizer, resulting in what were predominantly perceived as small negative impacts. It is likely that currency depreciation was the main driver of domestic prices of imported fuel and fertilizer and resulted in

increased domestic fertilizer production and transport costs. About half of traders reported being affected directly by the depreciation of the Kyat, with predominantly negatively results. While the effect of exchange rate shocks on the domestic cost of imported inputs should eventually be compensated for by higher domestic prices for maize, the subsequent clampdown by Chinese authorities on illegal imports of maize may have prolonged the impact of the depreciation of the Myanmar Kyat on traders' businesses.

Delays affecting road transport are relatively rare, but few traders report big improvements in transport times. Eighteen percent and 15% of traders reported that their movements of maize had been impacted by poor roads or conflict, but only 27% reported significantly shorter transport times.

Conclusions

In sum, the findings presented in this report indicate that upstream and midstream segments of the maize value chain in Shan State are growing and transforming rapidly. In doing so, they are becoming more competitive, more inclusive, and show early signs of modernization, formalization and the emergence of forms of conduct intended to produce higher quality goods. As such, there are relatively few areas where intervention is necessary or desirable, but the following stand out:

- Formal imports of maize from Myanmar into China are subject to high tariffs, leading to informal cross border trade to evade them. Periodic crack-downs on informal trade are a major cause of price volatility and unpredictability for traders and farmers in Myanmar. Securing a bilateral agreement on export quotas could help to address this issue, and government efforts to do so should be prioritized. Investment in technologies that facilitate long term storage of maize grain by traders or farmer groups could also help to smooth out troughs in demand.
- Rapid increases in pesticide and herbicide use have potentially negative implications for environmental and human health. Strengthening existing regulation and regulatory enforcement of the sale and use of these products, and supporting and expanding ongoing efforts by government and development partners to provide safety training and information for farmers should be a priority.
- The marketing activities of agricultural input companies are important conduits for delivering information to traders and agricultural input supply businesses, who pass information to their customers. Forging closer partnerships between government, development partners and input companies can provide opportunities to disseminate extension messages and materials to large numbers of end users.
- The terms of informal credit provision by traders and input suppliers and are not exploitative, but the cost of borrowing informally remains several times higher than subsidized borrowing from Myanmar Agricultural Development Bank (MADB). Relatively few Shan farmers are able to access MADB loans, in part because land use rights in Shan are often informal, making it difficult to use land as loan collateral. Innovative ways to deliver formal agricultural credit to farmers at scale are therefore required.

- The success Yoma Bank's efforts to provide working capital loans to traders, and high levels of trader enrolment in the formal banking sector indicate that there is considerable potential to expand delivery of formal financial services to enterprises in agricultural supply chains.

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