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The Stalled Transformation of Food Processing in Myanmar







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ABSTRACT

We assess the status and effects of the twin crises (COVID-19 and the military coup) on different segments (production, trade, and consumption) of Myanmar's food processing sector. Since 2020, we note overall a stalled transformation in food processing in the country:

- <u>Production (post-farm)</u>: The food-processing sector and especially rice milling is shown to be very important, making up more than 80 percent of the revenue and value addition of the local industrial sector. The sector suffered substantially from the twin crises, as seen by reduced output and limited new investments in the two most recent years.
- 2. <u>International trade:</u> Myanmar is in most years a net agricultural exporter (in value terms). However, food exports are dominated by unprocessed and minimally processed products while food imports are mostly more expensive processed foods. While there was fast growth in international food trade between 2009 and 2019, new central bank regulations – focused on an import-substitution strategy to mitigate foreign exchange constraints – have altered trade substantially since.
- 3. <u>Consumption:</u> The categories of unprocessed and especially of minimally processed food products represent 64 and 23 percent of calories and food expenditures respectively, reflecting the importance of rice in Myanmar's food economy. After the twin crises, the value of food consumption significantly decreased by 30 and 36 percent for rural and urban areas respectively between 2020 and 2022. However, consumption levels for rural residents are still lower after the crises than those of urban ones. Moreover, while real food consumption expenditures declined significantly for all income groups, the poorest suffered most from the crises as seen in the higher reduction of expenditures for the poorest quintiles (by 31 and 39 percent in rural and urban areas respectively).

1. INTRODUCTION

Processed foods account for 80 percent of global food sales and are increasingly important in lowand middle-income countries, driven by an increasing demand for convenient and ready-to-eat products in these countries (World Bank 2008).^{1'2} The aim of this paper is to analyze the state and evolution of the food processing sector in Myanmar and to assess the effect of the twin crises (COVID-19 and the military coup) on the different segments - production, trade, and consumption of the processing sector. This assessment is important given possible implications of changes in food processing on agriculture, employment opportunities in the food processing industry and food service sector, and effects on nutritional outcomes. We look at data from food processing enterprises and analyze the importance of different levels of processing in international food trade and in food consumption, and quantify the importance of prices and income, by processing category, in food demand. We further analyze the effects of the twin crises on food processors, on international food trade, and on changes in the consumption of foods from different processing categories.

The agri-food system in Myanmar has been compromised because of two major crises from 2020 onwards. First, the COVID-19 pandemic and measures to contain the virus led to significant disruptions of economic activities and livelihoods overall and had important implications on the functioning of the agri-food system in particular (Boughton et al. 2021). Second, the military takeover in the beginning of 2021 further exacerbated a number of these disruptions. It has been estimated that without the COVID-19 pandemic and the military takeover Myanmar's GDP would have been 30 percent larger in 2021 (World Bank 2021b). A multitude of problems have plagued agrobusinesses from 2020 onwards.

After the military takeover in 2021, there was a shift in agricultural policies as the military government emphasized (again) import substitution as a preferred trade policy. For example, in May 2021, a number of processed products (soft drinks, fruit juice, ready-made coffee, sweetened condensed milk and fresh milk) were banned from being imported overland from Thailand. Renewed investments in palm oil production were also announced despite the large social and environmental costs of previous investments in this area (Nicholas et al. 2018).³ Such import substitution measures were seen as leading to lower productivity and inefficient resource allocation (World Bank 2021).

Moreover, Myanmar's economy has been hampered by several other domestic and international shocks in 2022. Internationally, fuel and fertilizer prices have spiked after Russia's invasion of Ukraine. Prices of wheat and vegetable oils also increased substantially. Diao et al. (2022) estimate that these international events on their own led to a fall of Myanmar's real GDP by 3.5 percent and that the decline in the contribution of the agri-food system to GDP was even larger (4.2 percent).

¹ For example, in Bangladesh, Nepal, Indonesia, and Vietnam, Reardon et al. (2014) show that the average share of processed foods in the value of food consumption was already 59 percent in rural areas and 73 percent in urban areas. They also found that the processing share in food consumption raises with income levels, indicating increased importance with possible future income growth. In a case study in Tanzania, Sauer et al. (2021) found that processed food had penetrated the diets of rural areas and of the rural and urban poor, mostly driven by the pursuit of saving home-processing and cooking time but also because of food environment factors. On the other hand, de Brauw and Herskowitz (2021) illustrate in the case of Nigeria that consumption of highly processed foods at home had declined, while food consumed away from home (FAFH), often assumed to be highly processed, had risen substantially.

² With the growth in the consumption of processed foods in low- and middle-income countries, two important associated trends are seen. First, the off-farm segment in agricultural value chains becomes increasingly important and that segment then evolves into an important source of employment in these countries (e.g., Mueller and Thurlow 2019). Second, the increasing consumption of processed, but especially ultra-processed foods, has been linked to rapid increases in overweight and obesity, often referred to as the double burden of malnutrition given the combination of under- and over-nutrition in these countries (Popkin et al., 2019; Reardon et al. 2021a; Demmler et al. 2018). These trends have sparked public health concerns and a policy debate as to ways to reverse these outcomes (Boysen et al. 2019).

They also show a decline in employment overall and especially in the agri-food system as the costs of food processing and food-related services went up and demand for these services decreased.

Locally, additional effects were seen because of the impact of the military coup. They included problems, among others, related to: (a) *Banking*. Withdrawal limits from bank accounts were imposed for most banks immediately after the coup and have persisted since; (b) *Electricity*. Widespread electricity outages were seen in 2022 due to less electricity generation as a result of closure of rented gas fired power plants, destruction of power infrastructure, and lower water levels in hydropower reservoirs in the dry season (World Bank 2022); (c) *Insecurity*. Insecurity has been on the rise since the beginning of 2021. OCHA (2022) estimated in July 2022 that 1.2 million people were displaced in the country. More than 70 percent of those were displaced because of conflict and insecurity since the coup of February 2021.

The structure of the paper is as follows. In Section 2 we describe the data. The functioning of the food processing sector is analyzed in Section 3. In Section 4 we assess food trade by processing category. Section 5 assesses the consumption of processed products overall and for different socioeconomic groups, then presents the results of demand assessments, using a quadratic almost ideal demand system (QUAIDS) model, as well as assessments of the effect of the twin crisis on consumption. We finish with the conclusions in Section 6.

2. DATA

We rely on the food consumption module of the nationally representative Myanmar Poverty and Living Conditions Survey (MPLCS) fielded in 2015 (MoPF and World Bank 2017) to assess the importance of the consumption of different types of processed foods in Myanmar.⁴ The MPLCS was a comprehensive household survey undertaken by the Central Statistical Office (CSO) with the objective to provide updated estimates of socio-economic indicators and living conditions in Myanmar.⁵

We use the NOVA food classification system proposed by Monteiro et al. (2019) to classify different foods by their degree of processing in four groups: 1) unprocessed, 2) minimally processed (unprocessed foods altered by industrial processes but that do not add salt, sugar, oils or fats or other food substances to the original food), 3) culinary processed (mostly oils and sugars), and 4) processed foods (see annex 1 and 2 for a detailed description and for the allocation of foods identified in the MLPCS to the different processing categories). We assess the consumption of foods in these processing categories nationally, for urban vs rural, by income quintile, and by agroecological zone.⁶

We further rely on import and export data for the last decade from the BACI dataset (Gaulier and Zignago 2010). This dataset is based on trade data (Comtrade⁷) gathered by the United Nations but to ensure consistency, a special procedure was applied to these data that reconciles declarations of importing and exporting countries. A "Harmonized System" nomenclature is used at the 6-digit level to classify different products. To assign foods to processing categories, we use the same NOVA

⁷ http://comtrade.un.org/

⁴ While a more recent and larger nation-wide survey was fielded in 2017 – the Myanmar Livelihood Conditions Survey (MLCS) – the authors unfortunately did not have access to the consumption data collected in this survey.

⁵ 108 urban Enumeration Areas (EAs) and 196 rural EAs were visited, and 3,648 households were interviewed, comprising 1,296 urban and 2,352 rural ones.

⁶ Five agro-ecological zones are distinguished in the following manner: 1/ Delta (Ayeyawaddy, Bago, Mon, Yangon rural); 2/ Coastal (Rakhine, Tanintharyi); 3/ Central Dry (Mandalay, Magwe, Nay Pyi Taw, Sagaing); 4/ Hills and Mountains (Chin, Kachin, Kayah, Kayin, Shan); 5/ Yangon (city).

categories as mentioned above and assign the HS levels to one of the NOVA categories. The trade data include information on quantities, country of origin or destination, values, and prices of imported and exported foods.

More than 540 active rice millers – the most important food processors in the country – were interviewed in 11 states and regions In March 2022 (just over a year after the military coup) to assess business disruptions at the midstream of Myanmar's most important agricultural value chain. In addition to the medium- and large-scale modern mills⁸ that participated in previous interview rounds (MAPSA 2022a), the March 2022 sample included traditional small and micro-mills locally known as *Halar Sat* and *Ngar Pone Sat* (15 percent of the sample). In the past decade, these smaller mills have seen a declining market share as the number of modern mills has increased. While small/micro mills generally have much lower milling capacity than modernized mills, they nevertheless play an essential role in remote rural communities providing milling services on commissions mostly for household consumption.

Finally, we rely on a panel of phone surveys with food vendors interviewed in different rounds from June/July 2020 until August 2022. The food vendor sample was constructed by identifying respondents that are well-informed on food markets, that deal regularly with food traders (such as suppliers and wholesalers) and are highly numerate and knowledgeable about food prices. Although the sample is not representative, there is good national coverage with respondents in each agro-ecological zone and each state/region.

3. PRODUCTION - THE FOOD PROCESSING SECTOR

3.1 Characteristics

The role of food processing in the local economy of Myanmar is not well understood. However, several characteristics of the local food processing sector are worth highlighting. First, food processing is very important in the overall industrial and manufacturing sector in Myanmar, as illustrated by a number of indicators. Table 1 presents the number of registered industrial enterprises by commodity group, indicating the high share of food processing enterprises in Myanmar's industrial enterprises: 56 percent of industrial enterprises are involved in the 'food and beverages' commodity group. Table 1 further shows that almost two-thirds (65 percent) of industrial food processing enterprises are estimated to be small, defined as those enterprises with less than 50 employees, while 14 percent are estimated to be in the large category. This size distribution follows broadly the distribution of other commodity groups.

		Number of	⁻ enterprises	5	Share
Commodity group	Large	Medium	Small	Total	%
Food and beverages	4,173	6,038	18,987	29,198	56.5
Clothing apparel	926	914	1,314	3,154	6.1
Construction material	1,246	1,596	1,875	4,717	9.1
Personal goods	709	680	451	1,840	3.6
Household goods	147	87	89	323	0.6
Printing and publishing	109	213	138	460	0.9
Industrial raw material	236	193	175	604	1.2
Mineral and petroleum products	421	735	2,400	3,556	6.9
Agricultural equipment	12	28	37	77	0.1
Machinery and equipment	30	32	31	93	0.2
Transport vehicles	72	28	13	113	0.2
Electrical goods	70	18	17	105	0.2
Miscellaneous	252	1,205	5,970	7,427	14.4
Total	8,403	11,767	31,497	51,667	100.0
%	16.3	22.8	61.0	100.0	

Table 1: Registered private industrial enterprises in Myanmar (2019)

Source: Myanmar SME development agency (https://www.msme.gov.mm/en/page/228)

Note: The size of SMEs is defined based on the number of employees, type of activity, capital invested or level of turnover. Small manufacturing enterprises have fewer than 50 employees and less than 500 million Kyats of capital, medium more than 50 and fewer than 300 employees (301-600 employees in case of labor-intensive manufacturing) and up to 1 billion Kyats of capital, large more than 300 employees and capital that is more than 1 billion Kyats.

Second, exact employment numbers in Myanmar's food processing sector are lacking. Paudel et al. (2022) estimate, based on the national household survey of 2017, that about 5 percent of the rural population is employed in manufacturing in Myanmar. They indicate that this sector covers mostly food processing activities. In the national Myanmar Household Welfare Survey (MHWS) fielded in the beginning of 2022 (MAPSA 2022b), 3.2 percent of households reported that they were involved in food processing. The shares were slightly higher in rural (3.4 percent) compared to urban areas (2.9 percent).

Third, rice mills are the most important food processing enterprises, as well as most the important enterprises in the manufacturing sector, as measured by their share in revenue and value added of the manufacturing sector as a whole (Table 2). Table 2 also shows - based on a large survey of manufacturing firms (MOPF and UNU-WIDER 2017) - that rice mills made up 59 and 57 percent of total revenue and value added respectively of the industrial sector. Rice mills combined with all other enterprises in food, beverage, and tobacco made up 84 and 83 percent of all revenue and value addetition respectively in the country. Table 2 further shows that the average size of rice mills is significantly larger than other manufacturing enterprises, as it is shown to be more than double the average size of the average industrial enterprise, measured in revenue as well as value added. It is to be noted that rice mills are an essential food processing sector with seemingly limited potential for growth and revenue generation, in contrast with other types of processing such as rice noodles and crackers.

Table 2: Revenue and value added by industry

	Rever	nue	Value a	dded
	Sum	Mean	Sum	Mean
	Million MMT	ММТ	Million MMT	ММТ
Rice mills	15.74	951	4.26	257.7
Food, beverage and tobacco	6.68	335	1.92	96.5
Textiles, apparel and leather	1.43	266	0.41	75.4
Wood, paper and printing	0.78	156	0.21	41.9
Coke, chemicals, rubber and minerals	0.83	177	0.28	59.0
Metal	0.41	96	0.10	24.1
Elec. equipment, machinery and motor vehicles	0.42	148	0.11	41.2
Furniture and other manufacturing	0.31	99	0.12	40.3
Total	26.6	430	7.43	120

Source: MOPF and UNU-WIDER 2017.

Fourth, innovations in the food processing sector have seemingly been limited in the last decade but they are increasingly being adopted for some commodities. For example, Belton and Win (2019) show that most oil mills use very old equipment. In the case of pulses, most are exported as unprocessed grains after cleaning, and size and (in some cases) color sorting (Boughton et al. 2017). It has further been shown that poor tapping and processing practices in the rubber sector led to low-quality and low prices for Myanmar rubber exports (van Asselt et al. 2017). On the other hand, Myanmar's rice milling sector has undergone important changes since the industry was liberalized in 2003 (Okamoto 2005), particularly in the decade under the civilian government from 2010 onwards. Some upscaling has happened but medium- and large-scale mills, which are classified as having a daily throughput capacity greater than 15 tons, accounted for just 12 percent of all rice mills in Myanmar in 2018 (USDA 2020). Yet, in terms of total rice produced, these medium- and large-scale mills are becoming increasingly important, as the number of small-scale mills is declining (USDA 2020). Goeb et al. (2021) find that such modern mills pay higher prices to their suppliers and, due to extra processing, sell rice at higher prices than their competitors.

Fifth, the inflow of Foreign Direct Investment (FDI) in low- and middle-income countries has been associated with investments, innovations, and improved efficiencies in food processing. For example, liberalization of foreign investment in food processing in the 1990s and 2000s unleashed large FDI inflows in China, contributing to an increase in food processing investments (Reardon 2015). However, FDI in food processing in Myanmar has been limited. While there has been increasing interest by foreign companies to invest in processing in Myanmar - e.g., Wilmar International, a large Singaporean headquartered agri-food sector investment holding company, invested in Myanmar's rice sector in 2019 after partial liberalization in that sector - the number of firms that have done so in food processing is still very limited.

Sixth, food processors typically achieve higher revenues through branding and product differentiation. Reardon et al. (2014) show for several Asian countries that rice mills have over time changed from custom milling (where customers bring paddy to be the mill and pay only for the milling services) to packaging and branding of rice and that mills themselves often get themselves involved in such practices. Similar processes are happening in Myanmar where branded local products have increasingly appeared in local retail markets (Euromonitor 2020). Belton and Win (2019) show in the case of oil mills, that rural mills mostly focusing on custom milling while urban ones add value and are more involved in value addition and branding. Increasing urbanization in the country - and

demands for choice and quality by urban residents – might therefore be contributing to this change in practices.

Seventh, the increase of consumption of processed products has been linked to the rapid emergence of modern retail in a number of other countries (Demmler et al. 2018, Reardon et al. 2021a). It is estimated that modern retail grew by double digits in the decade before the 2020s in Myanmar, albeit from a low base (Euromonitor 2021). Moreover, the growth of modern retail was concentrated mainly in urban areas, and mostly in the capital Yangon, as typically seen in the early stages of modern retail roll-out (Reardon et al. 2012). In any case, that growth might have been associated with an increase in the sales of processed foods, be it imported or obtained from local firms.

3.2 The effect of the twin crises

To illustrate the effect of the twin crises on food processing, we focus on the rice milling industry given its pivotal importance for farmers, consumers, and export earnings. Millers were asked in March 2022 a series of questions on different forms of disruptions faced in the 30 days prior to the interview. Overall, fuel and electricity were the most common disruptions. About 80 percent of modern larger mills reported having difficulties accessing electricity and high fuel prices. Many traditional smaller mills are run on diesel generators, and nearly 90 percent reported disruptions from high prices of fuel. Fuel access was a large disruption for both mill types. Modern millers require transportation for both the paddy input and rice output and were thus more severely affected by rising transportation costs (65 percent) and transport restrictions and curfews (35 percent). Among those millers reporting transport disruptions, the most common restrictions were check points (35 percent), special permissions (27 percent), and fees (23 percent). To further evaluate these challenges, millers were asked to identify which group of disruptions they considered to be the most significant (Figure 1). With frequent power outages and rising fuel prices since the start of 2022, electricity and fuel were overwhelmingly the largest disruptions for both mill types, overtaking banking which dominated throughout 2021. Disruptions related to banking were also still a challenge, particularly to medium and large mills which conduct more purchases and sales.





Source: Miller survey-March 2022 survey round

In the surveys, a series of questions were also included on milling operations to understand how rice mills have responded to these challenges. For the 2021/22 monsoon harvest season, millers reported an average total throughput decline of about 15 percent relative to the 2020/21 season (Table 2). Throughput in the 30-day periods prior to interviews showed larger declines, perhaps reflecting the acute power challenges mills were facing. Paddy storage also declined, and these results together suggest a decline in monsoon paddy production. While that is likely the main factor

in reduced milling throughput, electricity and fuel disruptions likely also contributed to lower operating hours.

Average costs of diesel more than doubled in 2022 compared to a year earlier which increased operating costs and continued to widen the price gap between consumers and producers (MAPSA 2022a). The rising fuel costs and declines in throughput contributed to lower mill profits and an average decline in working capital of 9 percent for larger mills. Yet, employment and credit were mostly stable, particularly for larger mills. Lastly, millers continued to be heavily reliant on cash due to banking restrictions. On average, cash transactions account for 99 percent of paddy purchases and 69 percent of rice sales, though in-person bank transfers rose relative to previous months to 19 percent of rice sale transactions in March 2022.

	Small / micro mills			Medium / large mills		
	21-Mar	22-Mar	% change	21-Mar	22-Mar	% change
Throughput						
Last 30 days (MT)	39	26	-35%	366	272	-26%
Monsoon harvest season (Sept-Mar, MT)	199	166	-16%	1,504	1,275	-15%
Storage						
Paddy (# of bags)	1,246	901	-28%	24,676	20,343	-18%
Rice (# of bags)	58	63	8%	724	717	-1%
Transport						
Cost of diesel (MMK/L)	976	2,186	124%	911	1,843	102%
Employees						
Permanent employees (#)	2.8	2.4	-13%	6	6	0%
Daily workers (#)	2.1	2.1	-2%	20.5	20.5	0%
Daily wage (MMK/day)	6,936	7,021	1%	7,691	7,701	0%
Working capital						
Weekly capital to buy paddy ('00,000 MMK)	29	29	-1%	612	556	-9%
Milling commission fees						
Fees for milling 108lb bag (MMK)	1,131	1,218	8%	1,207	1,290	7%
Credit lent out						
Share lending out	4%	5%	33%	18%	18%	2%
Conditional average amount ('00,000 MMK)	158	120	-25%	834	781	-6%
Credit borrowed in						
Share borrowing	4%	5%	33%	13%	14%	9%
Conditional average amount ('00,000 MMK)	235	209	-11%	1,559	1,530	-2%

Table 3: Operations	, employment	, and credit in Marc	h 2022, com	pared to March 202 ⁴
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Source: Miller survey-March 2022 survey round

The turbulence and uncertainty from the COVID-19 pandemic since 2020 along with the political unrest since early 2021 have led to a clear decline in machinery investments for modern larger mills (Figure 2). The survey of mills therefore indicates significant problems in the sector since the twin crises. Changes in the once rapidly expanding and modernizing rice milling sector have stalled, machines are depreciating without replacement, and output is declining. These changes are indicative of the broader changes in the manufacturing sector (World Bank 2022).



Figure 2: Purchase year of operating machines owned by modern rice mills, 2016 to 2022

Source: Miller survey - March 2022 survey round

To summarize, the milling sector has proven highly resilient to multiple shocks since the onset of COVID-19 crisis. This has helped to ensure market access for the most important crop for Myanmar farmers in quantity and value terms, and reliable access for consumers to rice at competitive prices, even as higher energy and transport costs widened the price "wedge". Continued declines in new investment in mills will undermine Myanmar's competitiveness in rice markets, impacting the welfare of Myanmar farmers and consumers alike.

4. INTERNATIONAL TRADE

Figure 3 shows the value of international trade of three food processing groups - unprocessed & minimally processed, culinary-processed, and processed - over the period 2009 until 2019. The graph on the left illustrates that the value of food imports increased rapidly in nominal USD values by 18 percent annually over that decade leading to a fivefold increase, from 732 million dollars in 2009 to 3,419 million dollars in 2019.⁹ On the export side, we also note a substantial increase but less so than for imports. The value of overall food exports increased in nominal terms by 10 percent annually, increasing from 1,520 million USD in 2009 to 3,993 million USD in 2019, almost a tripling over that period. Myanmar participated substantially more in international trade over the period 2009 - 2019, but food imports increased much more rapidly than exports. In value terms, Myanmar was a net agricultural exporter in 2009 of 788 million USD as well as at the end of the period studied (574 million USD in 2019).¹⁰ However, the agricultural trade surplus declined over time and was negative for some years (2015 to 2017).

We further see a large difference in the composition of exports and imports. Within food imports, the processed culinary (31 percent of value imported in 2019) and processed (42 percent in 2019) foods are the two main groups. For processed culinary ingredients, palm oil and sugar are the two major imported commodities. Together they accounted for two-thirds of processed culinary food imports in 2019. The category of unprocessed and minimally processed food imports (making up 28 percent of total food imports) is diverse, with wheat, apples, frozen bovine meat, nuts, and citrus fruit together accounting for half of unprocessed food imports in 2019. Within food exports, by contrast, unprocessed and minimally processed and minimally processed and minimally contrast, by contrast, unprocessed and minimally processed food products were the major food groups exported by

⁹ The peak in imports in 2016 in Figure 3 is explained by substantially higher imports of sugar in that year.

¹⁰ It is to be noted that only official statistics are used for this assessment. That is a caveat for the current assessment.

Myanmar between 2009 and 2019, accounting for around 93 percent of the value of total food exports in 2019.



Figure 3: Food trade in Myanmar, by processing level, 2009 to 2019

Source: Authors' calculations based on BACI database, 2022

We further present an assessment in Figure 4 of the origin (left) and destination (right) countries of differently processed items in 2019. The relative shares for the five most important countries that import (left) or export (right) are shown. On the import side, Thailand is an important source of processed products. For culinary processed products (palm oil and sugar), Indonesia and Thailand are the two most important countries. The top 5 countries represent 82 percent of all products imported in Myanmar. On the export side, China is the most important destination country as it imported 35 percent of all exports from Myanmar, in value terms, in 2019. China imports a significant share of unprocessed and minimally processed products, as well as almost all processed culinary products. Thailand comes second, closely followed by India. The top 5 countries represent 66 percent of the total value of food exports, indicating a slightly lower concentration than for imports.





Source: Authors' calculations based on BACI database, 2022

Note: The 'processed' category is dropped in the right panel given the low number of observations

Finally, we look at the prices - averaged for the period 2009 to 2019 - for different types of processed foods in imports as well as exports (Figure 5). Prices are calculated by simply dividing the value of a specific processing category by traded quantities. Within processing categories, we see small differences between prices for imports into and exports from Myanmar. If there are differences, they are mostly driven by different portfolios between exports and imports. However, we note significant price differences between processing categories, with processed products being 2.5 to 4 times more expensive than unprocessed and minimally processed products. This suggests that Myanmar exports mostly cheap unprocessed and minimally processed primary products and imports significantly more expensive processed products.



Figure 5: Import and export prices, by processing level, average for the period 2009-2019

Source: Authors' calculations based on BACI database, 2022

Since the military coup, international trade has been altered in important ways. First, the military government abandoned the managed floating exchange rate regime and fixed the exchange rate at an overvalued rate, leading to a growing spread between the parallel and official market rates. Second, international trade is restricted through a system of requirements of import and export licensing, import bans and quotas, and restrictive currency policies. While only 35 percent of imported items required trade licenses in 2021, this increased to 81 percent by mid-2022 (World Bank 2022). The capacity to manage these licenses is limited, leading to a long time to obtain licenses for imports, increasing uncertainty and price rises for imported products, such as processed foods. On the export side, 13 percent of export items were subject to license requirements mid-2022, including agricultural products such as beans and pulses, oilseeds, and edible oils (World Bank 2022).

The vegetable oil market is a good example of the effects of these policies. The government has attempted to reduce palm oil imports - the most important imported (culinary processed) food product - over time through different policy measures, with the intention to promote consumption of locally produced edible oils, such as groundnut, sunflower, and sesame oils. Prior to 2010, quotas were set limiting imports to 20,000 tons per month. From May of 2011 onwards, this restriction was lifted but the military government re-established import restrictions, at 50,000 tons per month at the end of 2021. Eighty-one companies were permitted by the Government to import edible oils.

If there would be no trade and market restrictions, the price of palm oil in the local market should be determined by the full cost of imports.¹¹ To compare prices of imported palm oil with local palm oil prices in retail markets, we calculate import parity prices, reflecting the FOB price, at the major port in Yangon. We plot these import parity prices against a price series of average national retail prices, based on monthly price data, collected by WFP in a large number of retail markets in the country (Figure 6). Using the market exchange rate, we note that margins between palm oil retail prices have been tracking import parity prices at the wholesale level rather well over most of the period looked at. Average mark-up margins were on average 20 percent over the period 08/2021 to 04/2022. However, we see an increasing wedge since, with retail prices in July 2022 more than double the wholesale parity price, indicative of the increasing "starvation" (Frontier 2022) of local markets of palm oil.

¹¹ Including the costs of insurance, freight charges, prices of imports at the port, tariffs, taxes, transport, handling and marketing, and exchange rate costs.



Figure 6: Import wholesale parity and retail prices of palm oil, August 2021 – July 2022

Source: Authors' calculations based on MEODA and WFP retail prices

On top of higher prices, there have also been increasingly issues of availability of vegetable oils in retail markets because of these trade policy changes. A survey of local food vendors found that almost half of the food vendors indicated that vegetable oils were "less available" in March 2022 compared to the same period a year earlier (MAPSA 2022c). Availability was especially an issue in the conflict-affected areas. The situation has further worsened since (Frontier 2022).¹² The situation of palm oil illustrates how the new trade regulations are reshaping agricultural pricing and incentives, with important implications on local food processing, as seen in renewed investments in previously uncompetitive oil mills (Frontier 2022).

In sum, international trade in processed food products has been hampered by structural constraints and adverse foreign exchange policies. Myanmar has not been able to diversify away from unprocessed or minimally processed exports as imports of more highly processed food products increased, steadily narrowing the agri-food trade surplus over time. More recently, foreign exchange policies under the military regime have led to large and unpredictable increases in imported cooking oil prices for consumers. The effects of price and income shocks on food consumption patterns are examined in detail in the next section.

5. FOOD CONSUMPTION

5.1 Descriptive statistics

A number of stylized facts on food consumption and processing in Myanmar are obtained from the analysis of the consumption data of the MPLCS. Table 4 presents an overview of the share of the consumption of 5 categories of foods in consumer's expenditures and calories: (1) unprocessed; (2) minimally processed foods; (3) culinary processed foods; (4) processed foods; (5) alcohol and stimulants. We present stimulants and alcohols separately given the difficulty of assigning them to

¹² In the middle of August, the Myanmar Edible Dealers Association (MEODA) distributed palm oil to the public at a price of MMK 5000 per viss (3,125 MMK/I) across the country. However, quantities sold at that price are limited to one half or one viss. The distribution takes place through a token system, and it is estimated that people sometimes had to queue for 3-4 hours to acquire this quantity (BBC, Burmese News, August 22, 2022).

other categories. Moreover, we additionally present the share of food-away-from-home (FAFH) consumption (given the rapid growth of this way of consumption in Asia in recent years).

The highest share of the caloric and monetary values of food consumption are in the category of unprocessed (10 percent of calories; 43 percent of food expenditures) and minimally processed (64 percent of calories; 23 percent of food expenditures) food products (Table 4). The importance of the latter category reflects the importance of rice in Myanmar's food economy. Four percent of the food budget goes towards alcohol and stimulants, representing 1.5 percent of the calories. Processed foods make up 3 percent of calories consumed but 9 percent of expenditures, three times as much. The average daily expenditure on any type of processed foods - combining all types of processing - in 2015 was 444 kyat per day or about 1.25 USD per adult equivalent per year.

As found in a number of low- and middle-income countries, Myanmar is beginning to suffer from a double burden of malnutrition where incidences of obesity and overweight exist together with a large prevalence of undernutrition. It has been found that obesity and overweight are increasingly becoming a problem in urban areas: WFP (2019) estimated that 40 percent of women of reproductive age in urban areas are overweight or obese. This has partly been linked to the rapid increase of the consumption of unhealthy ultra-processed foods. While the share of the consumption of highly processed food is still relatively low, the consumption data reflect the situation in 2015 and the noted rapid increased imports from processed foods since is leading to increasing worries on negative nutritional and health impacts (WFP 2019; Baker and Friel 2016; Monteiro et al. 2012).

Strong differences in the composition of consumption baskets are also seen over expenditure quintiles, as documented in other countries (Subramanian and Deaton 1996; Bouis 1994; Bouis and Haddad 1992; Pingali 2007).¹³ When people become richer, they also spend relatively more money on FAFH.¹⁴ This process is also happening in Myanmar. The rich spend 21 percent of their food budget on FAFH. This compares to just 6 percent for the poorest quintile. We also note a large difference in FAFH between urban (19 percent) and rural areas (12 percent).

Comparing expenditures and calories allows for the calculation of average calorie prices by processing category. As already illustrated in section 4 for products that are traded internationally, Figure 7 also shows large differences between these categories. The prices of unprocessed products are the most expensive. That category reflects the relatively high prices of nutrient-dense (but low-calorie content) foods such as some animal-source foods, fruits, and vegetables. Relatively high prices for these foods have been noted in other countries as well (Headey and Alderman 2019). The prices per calorie for processed foods are found to be about 4 times higher than prices of minimally processed foods (the cheapest of all the categories), partly an indication of the economic value added by processing.

¹³ Various dynamics seem to take place with income growth of countries: changes in lifestyle, with more women working outside the home and access to technology such as refrigerators and microwave ovens; the development of better packaging technologies; and the entrance of modern marketing channels, including modern retail, the processing sector, and the food service industry (Reardon et al. 2020).

¹⁴ For example, Smith et al. (2014) note that food eaten away from home increased from 10 to 49 percent of total food expenditures in the US between 1900 and 2010 and that similar fast changes are seen in this area in a number of quickly transforming economies such as India, China, and Mauritius.

Table 4: Food consumption, by processing level

	Unprocessed	Minimally processed	Culinary	Processed	Alcohol & Stimulants	FAFH	Total
National							
Calories (per ad. eq.)	273	1724	339	85	41	236	2698
Share calories (%)	10.1	63.9	12.6	3.2	1.5	8.7	100.0
Expenditures (kyat per ad.eq.)	494	270	69	105	49	169	1156
Share expenditures (%)	42.7	23.3	6.0	9.1	4.2	14.6	100.0
Rural versus urban (sha	re (%) expenditu	res)					
Rural	42.0	25.7	6.5	9.1	4.3	12.3	100.0
Urban	44.2	18.5	4.9	9.1	4.0	19.4	100.0
By expenditure quintile (share (%) expen	ditures)					
q1 (poorest)	36.5	37.9	7.6	8.0	3.5	6.5	100.0
q2	40.3	31.2	6.9	8.1	4.2	9.2	100.0
q3	42.6	25.1	6.4	9.1	4.4	12.3	100.0
q4	43.8	21.9	6.1	9.3	4.6	14.2	100.0
q5 (richest)	44.9	15.9	4.8	9.7	4.1	20.7	100.0
By agro-ecological zone	(share (%) expe	nditures)					
Hills and mountains	43.1	27.3	5.6	7.9	5.6	10.5	100.0
Dry zone	38.3	24.6	8.5	8.6	3.9	16.0	100.0
Delta	45.5	23.2	5.5	10.3	4.0	11.6	100.0
Coastal areas	43.4	22.9	4.4	10.7	4.4	14.2	100.0
Yangon	44.6	18.3	3.9	8.4	3.7	21.1	100.0

Source: Authors' calculations based on the MPLCS 2015

Figure 7: Prices per calorie for different processing categories



Source: Authors' calculations based on the MPLCS 2015

Driven by the relatively high prices per calorie in the unprocessed categories (animal-source foods, fruits, vegetables), the poor consume less of these unprocessed foods compared to the rich. The share of unprocessed products increases from 36 to 45 percent from the poorest to the richest

quintile (Table 4), indicating a 4.4-times increase in absolute expenditures between poor and rich. This implies that with economic and income growth, the unprocessed - but often nutritious and therefore healthy - food producing sectors are expected to grow rapidly (Reardon et al. 2021b). We further find that the rich spend more on processed foods than the poor in absolute terms but the share in total expenditure is similar. The poorest quintile spent 8 percent of expenditures on the consumption of processed foods. This contrasts with 10 percent for the richest quintile. As the rich spend more on food (3.5 times more), this implies that the richest quintile spends significantly more on processed foods than the poor do. We further see that the share of minimally processed foods decreases over expenditure quintiles, making up 38 percent of the food basket of the poor compared to only 16 percent for the rich.

Extrapolating consumption of processed foods based on expenditures reported by households allows us to estimate the size of the processed food sector (incorporating foods that are minimally, culinarily, and highly processed through adding ingredients or through preservation). Using that definition, Myanmar's processed food consumption was 6.1 billion USD out of a total of 15.9 billion USD spent on food in 2015. Of all the agro-ecological regions, the value is highest for the Dry and the Delta Zones (each counting for 1.8 billion USD). The urban population spent 28 percent of the value of all processed products and the rural population spent 72 percent. Comparing consumption numbers with imports in 2015 indicates that local food processing accounted for approximately 82 percent of the consumption of processed foods in the country.¹⁵

5.2 Food demand assessments

Tables 5 and 6 show the results of the demand model estimation described in Annex 3. In the presented results, income and poverty is proxied by total household consumption expenditure as is typically done, given the problems of correctly measuring income and given that expenditures might better reflect the 'permanent income' of a household. The QUAIDS model specification further controls for a rural/urban dummy and for household economies of scale. Elasticities are reported at the per capita population mean and they are derived for each household individually. They have further been cleaned for extreme outliers.¹⁶

Table 5 shows that income elasticities vary relatively little between different processing categories, i.e., between 0.69 and 0.82 (except for culinarily-processed foods), indicating that a 10 percent increase in income leads to an approximated increase in consumption for these categories between 6.9 and 8.2 percent. These estimated elasticities are consistent with the elasticities that were estimated from a 15-food-group demand system (Ecker and Comstock 2021) and with the results of De Brauw and Herskowitz (2021), who also found point elasticity estimates on processed foods in Nigeria that are relatively close to other food categories. In contrast to other food groups, the income elasticity for culinarily-processed foods is relatively low (0.186). This group is dominated by the consumption of oil, sugar, and salt, which generally tend to be less income-responsive than other foods.¹⁷

¹⁵ Assuming half of category unprocessed and minimally processed food category fall in the minimally processed food category and that there is a margin of 20 percent on imported foods.

¹⁶ Results based on our estimation approach were compared with the results of the standard QUAIDS command for STATA (which does not address the zero-consumption problem). The latter method produced implausible elasticities for the food groups that have a considerable number of households that didn't report food group consumption over the recall period. However, the ranking of the elasticities by magnitude is identical, increasing confidence in the approach followed.

¹⁷ Moreover, the food group is diverse (oil, sugar, salt) - oil prices differ substantially from sugar and salt prices - and these items are commonly consumed in most households. Hence, we do have some considerable bunching of different items within this food group. It is to be noted that the elasticities for oils/fats and sugars/condiments separately are each higher, but still lower than those for all non-rice food groups derived from our 15-food-group system.

Table 5 also presents elasticities for urban and rural areas and by expenditure quintile. The most striking differences in income elasticities are noted by expenditure quintiles. The gradient is especially large for processed foods, where the income elasticity drops from 0.93 for the poorest quintile to 0.61 for the richest quintile in rural as well as urban areas, and for FAFH, where we see a similar drop for the same quintiles from 1.06 (1.08) to 0.61 (0.65) in rural (urban) areas. We see that income elasticities are overall slightly higher for rural areas compared to urban ones, likely due to lower income levels in these areas (MOPF and World Bank 2017).

A. Rural versus urban					
			Rural		
	Mean	Med	Min	Max	SD
Unprocessed & min. processed foods	0.724	0.742	0.460	0.833	0.070
Culinarily-processed foods	0.150	0.119	-0.086	0.517	0.110
Processed foods	0.805	0.805	0.342	1.180	0.125
Alcohol & stimulants	0.827	0.842	0.469	1.023	0.091
FAFH	0.887	0.881	0.260	1.584	0.194
			Urban		
	Mean	Med	Min	Max	SD
Unprocessed & min. processed foods	0.659	0.675	0.455	0.827	0.087
Culinarily-processed foods	0.139	0.111	-0.127	0.497	0.098
Processed foods	0.741	0.736	0.372	1.144	0.128
Alcohol & stimulants	0.750	0.761	0.480	1.007	0.109
FAFH	0.830	0.822	0.266	1.455	0.194
B. By poverty quintile (mean elasticities	;)				
			Rural		
	1	2	3	4	5
Unprocessed & min. processed foods	0.747	0.728	0.724	0.711	0.659
Culinarily-processed foods	0.087	0.127	0.195	0.226	0.249
Processed foods	0.927	0.834	0.770	0.699	0.611
Alcohol & stimulants	0.822	0.825	0.839	0.839	0.795
FAFH	1.059	0.936	0.838	0.724	0.609
			Urban		
	1	2	3	4	5
Unprocessed & min. processed foods	0.703	0.695	0.676	0.653	0.622
Culinarily-processed foods	0.083	0.101	0.124	0.156	0.188
Processed foods	0.928	0.854	0.788	0.718	0.615
Alcohol & stimulants	0.758	0.771	0.763	0.748	0.730
FAFH	1.085	0.995	0.898	0.802	0.651

Table 5: Estimates of income elasticities, QUAIDS model

Source: Authors' calculations based on the MPLCS 2015

Table 6 further shows the results of the estimates of price elasticities. For most food groups, these estimates are close to negative unitary, implying that if prices would increase by 1 percent, consumption would drop by 1 percent. This illustrates the high importance that consumers in Myanmar attach to prices when making food consumption choices. The highest price elasticities are found in the case of FAFH and culinary-processed foods while the lowest are noted for unprocessed foods. Few differences are noted for urban versus rural areas and for the poorest quintile compared to the richest one.

Table 6: Estimates of price elasticities, QUAIDS model

A. Rural versus urban					
			Rural		
	Mean	Med	Min	Мах	SD
Unprocessed & min. processed foods	-0.846	-0.854	-0.976	-0.622	0.049
Culinarily-processed foods	-1.161	-1.159	-1.313	-1.012	0.047
Processed foods	-0.978	-0.982	-1.000	-0.822	0.018
Alcohol & stimulants	-0.974	-0.978	-0.990	-0.813	0.015
FAFH	-1.044	-1.052	-1.101	-0.830	0.031
			Urban		
	Mean	Med	Min	Max	SD
Unprocessed & min. processed foods	-0.819	-0.830	-0.973	-0.603	0.065
Culinarily-processed foods	-1.152	-1.150	-1.300	-1.038	0.046
Processed foods	-0.970	-0.976	-1.000	-0.829	0.025
Alcohol & stimulants	-0.973	-0.977	-0.989	-0.771	0.015
FAFH	-1.026	-1.039	-1.098	-0.754	0.047
B. By poverty quintile (mean elasticities)					
			Rural		
	1	2	3	4	5
Unprocessed & min. processed foods	-0.848	-0.846	-0.850	-0.849	-0.822
Culinarily-processed foods	-1.131	-1.158	-1.180	-1.188	-1.193
Processed foods	-0.980	-0.979	-0.976	-0.976	-0.973
Alcohol & stimulants	-0.978	-0.973	-0.972	-0.971	-0.973
FAFH	-1.048	-1.044	-1.043	-1.041	-1.037
			Urban		
	1	2	3	4	5
Unprocessed & min. processed foods	-0.827	-0.828	-0.825	-0.818	-0.810
Culinarily-processed foods	-1.106	-1.132	-1.149	-1.161	-1.177
Processed foods	-0.972	-0.972	-0.969	-0.970	-0.971
Alcohol & stimulants	-0.974	-0.976	-0.973	-0.973	-0.970
FAFH	-1.041	-1.033	-1.027	-1.022	-1.020

Source: Authors' calculations based on the MPLCS 2015

5.3 The effect of the twin crises

We use the income and price elasticities from the previous section to make assessments of the effect of recent crisis on the consumption of different food processing categories in Myanmar. To model the impact of the crises, we need information on income and price changes over the last two years. The crisis created by the COVID-19 pandemic and the military takeover has led to a contraction of the economy and consequently household income in 2020 and 2021. The World Bank (2021b) estimates that the economy in the fiscal year 2021 contracted by 18 percent and that the economy would therefore in 2021 be 30 percent smaller than it would have been in the case of a scenario

where there would have been no pandemic or military takeover.¹⁸ For 2022, the World Bank estimates that the economy might show a 3 percent growth (World Bank 2022).¹⁹

We have seen large food price changes over the last two years, especially in 2022 compared to 2021. We present price changes for a selected number of food products for rural as well as urban areas, based on a food vendor survey that was fielded regularly between 2020 and 2022, in Table 7. We see that price changes were on average higher in urban areas than in rural ones. The cost of an average consumption basket increased by 1.3 percent in rural areas and 7.2 percent in urban areas mid-2021 compared to mid-2020. In 2022, these price increases were 54.8 percent and 58.6 percent respectively. Over the two-year period urban prices increased by 70 percent, compared to 57 percent in rural areas. Part of the food inflation was caused by the very high increases in the prices of vegetable oils, which increased in rural areas by more than 200 percent. However, rice prices also increased substantially, by 43 and 41 percent in urban and rural areas respectively in the most recent year. We use these price changes at the processing category level based on average changes from the (limited) products covered in that survey for each processing category.²⁰

	July '21	vs July '20	Aug '22	vs July '21
	Rural	Urban	Rural	Urban
rice	12.9	14.2	41.0	43.0
chickpea	19.2	-0.4	71.5	72.1
potato	1.6	0.6	150.5	137.3
water leaf	-15.9	15.3	15.5	54.1
banana	-14.8	12.0	44.4	30.4
chicken	-4.8	-6.5	29.4	37.5
fresh fish	-15.9	-13.1	32.0	47.2
dried sea fish	1.3	12.6	66.7	44.5
palm oil	75.0	74.9	201.6	177.6
food basket	1.3	7.2	54.8	58.6

Table 7: Price changes of major food products in 2022 and 2021, compared to 2020

Source: Authors' calculations based on MAPSA food vendor surveys

We model the effects of income and price changes under the scenario for 2022 where there was a positive income growth in line with projections by the World Bank in 2022 (+3 percent), after a dramatic contraction in 2021 (-18 percent), and using the price changes above as indicative for price changes for the different food processing categories. As the focus of the exercise is on the change caused by the twin crises, we assume similar consumption levels in 2015 as in 2020. The results of that simulation are presented in Figure 8 for urban and rural areas separately. Base consumption levels in urban and rural areas were 1,050 MMK (0.84 USD) and 1293 MMK (1.04 USD) per capita respectively. The results show the large effects of the crises as average real food expenditure levels decreased by 30 percent in rural areas and 36 percent in urban areas. With regards to the different processing categories, the biggest impacts are seen in FAFH consumption – a decline by 37 and 49 percent in rural and urban areas respectively - as well as for the consumption of alcohol and stimulants – a decline by 42 and 47 percent in rural and urban areas respectively. The declines for

¹⁸ The World Bank (2021b) also showed the significant declines in imports and exports in the country in 2021, likely associated with a reduced availability of processed products overall.

¹⁹ However, given lack of data, there are significant uncertainties on those estimates. Diao et al. (2022) for example indicate a 3.5 percent lower GDP in Myanmar, due to the impacts of the international crisis linked to the Ukraine invasion by Russia.

²⁰We use relative food price changes for these food categories (compared to the cost of a food basket) and assume that food price inflation was in line with overall inflation in the country.

culinary processed foods are substantially larger in rural areas (36 percent) compared to urban areas (27 percent) - partly because of higher price increases and higher own price elasticities for the former - while the opposite is the case for processed products (a decline of 22 percent in rural areas compared to 30 percent in urban areas). Despite the relatively larger impacts of the twin crises in urban areas, consumption levels in rural areas are on average still 12 percent below urban ones. The gap was 19 percent before the crises.





We further assess how urban and rural areas and different poverty quintiles have fared since the twin crises (Figure 9). The poorest quintile in rural and urban areas saw the biggest declines in consumption, of 31 and 39 percent, respectively. This compares to a decline of the richest quintile in rural areas by 29 percent and by 33 percent in urban areas. Despite the bigger declines for the poorest quintile in urban areas, their consumption level after the crises was still 10 percent higher than the poorest quintile in rural areas. Within food processing categories, it is noteworthy that FAFH consumption decreased by 60 percent for the poorest urban quintile and is now almost at similar levels as in rural areas. Processed food consumption also decreased substantially for the poorest urban quintile, but after the crises it was still 36 percent above rural areas.

In sum, dramatic increases in food prices over the period 2020-2022, aggravated by lower incomes, forced consumers to reduce food consumption in all categories. The poorest quintiles of consumers are the most seriously affected. In the concluding section we examine the cumulative effects of changes in post-farm processing, trade, and consumption on Myanmar's food processing sector.

Source: Authors' calculations



Figure 9: Change in the value of food consumption in 2022, by processing sector, for urban/rural and by poverty quintile



Urban

Source: Authors' calculations

6. CONCLUSIONS AND IMPLICATIONS

We assess the status and changes in Myanmar's agri-food processing sector by analyzing the production of processed food, international trade in food products, and food consumption by food processing category, and the impact of the twin crises (COVID-19 and the military coup) on these three segments.

We find that the food processing sector – and especially rice milling – is very important in the country, making up more than 80 percent of the revenue and value addition of the local industrial sector. The value of food imports - dominated by culinary-processed foods (oils and sugar) and processed foods - rapidly increased over the period 2009-2019 in Myanmar. Agricultural exports have also increased over that same period, but they are mostly dominated by lower value unprocessed and minimally processed food products. We find that prices of these unprocessed and minimally agricultural products are half to one-third the price of the imported agricultural products in Myanmar. On the consumption side, we find that the highest share of the value of food and calorie consumption falls in the category of unprocessed (10 percent of calories; 43 percent of food expenditures) food products. The importance of the latter category reflects the importance of rice in Myanmar's food economy. There are substantial differences in food composition by income levels, with the rich relying more on unprocessed foods, processed products, and especially food consumed away from home (FAFH) than the poor and consuming less minimally processed products.

The military takeover and the COVID-19 pandemic crises have led to enormous problems in food demand and in the functioning of the agri-food system overall (Boughton et al. 2021, MAPSA 2021a). The growth seen in the food economy and international food trade have taken a serious hit because of these crises. The problems with agricultural and business credit, transport, banking, and communications have resulted in substantially reduced agro-business activities (Boughton et al. 2021, MAPSA 2021b). The impact of these crises is well documented in the case of rice mills, the most important food processing sector in Myanmar, where a consistent drop in business activities compared to normal years has been shown. Import-substitution trade policies and foreign exchange control are leading to substantial price increases and lower availability of imported food products, such as palm oil. Food consumption assessments after the twin crises show a significant decrease in overall food consumption. Moreover, while consumption declined significantly for all income groups, the rural poor suffered most from the crises as seen in a decrease of 31 and 39 percent in food consumption expenditures in rural and urban areas, respectively.

The findings of this research have a number of important implications. First, by focusing more on value-addition through investments in processing industries, Myanmar could significantly improve its trade position in agriculture. Current low levels of value-added processing – for example, in pulses and maize – reduce potential earnings from Myanmar's agricultural exports. Emphasis on diversified pulse export markets and an increased focus on value added processing (noodles, sprouts, flour, dahl, and prepared foods) would improve Myanmar's trade situation, with the added benefit of generating highly nutritious processing residues to meet Myanmar's growing demand for animal feed. Investing in its processing industry would also allow for improved competition with processed food products that are currently imported from abroad. Moreover, unprocessed and minimally processed products are not very diverse and have concentrated buyers. This results in potential price volatility for upstream actors, especially producers, which might be countered with more value addition.

Second, to further stimulate access to rewarding high-value markets for Myanmar, improved incentives through appropriate international trade policies are needed. As shown in the last decade, outward looking strategies have helped to increase international agricultural trade, contributing to an improved situation of Myanmar's citizens because of better incomes for its farmers and more choice for its consumers (World Bank 2021b). A more outward trade orientation will bring in new technologies and insights that would significantly help to further strengthen Myanmar's export situation as well as local food systems. Investments in trade would however best be guided by comparative advantages of the country and less by import substitution concerns.

Third, it is crucial that an enabling business environment is created that will ensure increased investments in the food processing sector as to allow for better prices for farmers, more efficient value chains, and more choice to consumers. Such an environment includes among others predictable policy frameworks, secure property rights, access to reliable and affordable communication and transport infrastructure, and a well-functioning banking system. This would also attract desired FDI. More effective incentives to encourage FDI in agricultural trade and processing are necessary for Myanmar's processing sector to achieve quality and standards required to compete in growing urban and international markets. Investments in more modern local processing plants would be beneficial for farmers who would obtain higher prices and consumers who benefit from more choice.

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ANNEX 1: PROCESSED FOOD CLASSIFICATION

The proposed classification by Monteiro et al. (2019) is the following:

- 1. Unprocessed: Edible parts of plants, fungi, algae, or animals all after separation from nature. Includes fresh meats/fish, eggs, roots, fruits, vegetables.
- 2. Minimally processed: Unprocessed foods altered by industrial processes such as removal of inedible or unwanted parts, drying, powdering, squeezing, crushing, grinding, fractioning, steaming, poaching, boiling, roasting, and pasteurization, chilling, freezing, placing in containers, vacuum packaging, non-alcoholic fermentation, and other methods that do not add salt, sugar, oils or fats or other food substances to the original food. Includes rice, pulses, nuts, seeds, milk, dried chilies, spice powders, noodles, tea leaves (not laphet).
- 3. Processed culinary ingredients: Substances obtained directly from group 1 foods or from nature by industrial processes such as pressing, centrifuging, refining, extracting or mining. Includes oils, sugar, jaggery, salt.
- 4. Processed (including ultra-processed) foods: Products made by adding salt, oil, sugar or other group 2 ingredients to group 1 foods, using preservation methods such as canning and bottling, and, in the case of breads and cheeses, using nonalcoholic fermentation. Ultra-processed food includes dried meats, fish, fish, and bean paste and sauces, tofu, fermented tea leaves, prepared dishes, etc.

ANNEX 2: COMMODITY GROUPS IN PROCESSING CATEGORIES

Table A.1: Importance of different food groups in processing categories

NOVA processing classification	Food groups	Food Expenditure Share (%)
Unprocessed	Nuts/Seeds	0.4
	Tubers/Roots	3.5
	ASFs	57.7
	Vegetables/Fruits	35.9
	Sugar/Spices	2.5
	Total	100.0
Minimally processed	Cereals	74.6
	Pulses	8.7
	Nuts/Seeds	2.3
	ASFs	1.3
	Sugar/Spices	8.1
	Others	5.0
	Total	100.0
Culinarily processed	Oils	86.0
	Sugar/Spices	14.0
	Total	100.0
Processed	Cereals	1.9
	Pulses	1.1
	ASFs	18.3
	Sugar/Spices	9.3
	Others	20.4
	Prepared/FAFH	49.0
	Total	100.0

ANNEX 3: DEMAND SYSTEM ESTIMATION AND ELASTICITY DERIVATION

We use a two-stage estimation approach to obtain household-specific, unconditional income and price elasticities for five food groups, with a different degree of processing, in a complete consumer demand system modeling framework. We first estimate a Working-Leser model (Leser 1963, Working 1943) to derive the elasticities for total food demand vis-à-vis the aggregate demand for nonfood consumption. This model is conducive to our analysis because it does not require prices for nonfood consumption goods and services that are mostly unobserved in our household survey data. However, the two-stage approach relies on the assumption of separability between food and nonfood consumption. We thus assume that a household first decides on the allocation of the total budget to food and nonfood goods and services and then allocates the food budget to the considered food groups.

The within-food budget allocation is modeled separately in the second stage, where we allow for full substitutability between all food groups conditional on the available food budget. To estimate the food group demand, we use a quadratic almost ideal demand system (QUAIDS). We chose the quadratic version over the more commonly used linear-approximate AIDS to allow for the flexibility of a rank-three demand system, which has been shown to be empirically necessary (Buse, 1994; Lewbel, 1991). We augment the standard QUAIDS model specification by Banks et al. (1997) to account for censored observations in the dependent variables (that are, food budget shares), following the procedure proposed by Shonkwiler and Yen (1999) and implemented by Ecker and Qaim (2011), for example. Censoring occurs in our survey data for a considerable number of observations particularly for the two food groups of alcohol and stimulants and foods consumed away from home, because households did not consume these food groups during the recall period but are assumed to do so over a longer observation period. Ignoring censored dependent variables in demand system estimations yields biased parameter estimates (Heien & Wesseils, 1990). In conformity with the Working-Leser model specification, we also augment the standard QUAIDS model by controlling for household demographic characteristics using a linear translation through the intercept.

Assuming weak separability in consumer preferences and low variability of food group prices with income levels, we derive unconditional elasticities by adding up the conditional elasticities over the two budgeting stages, as suggested by Edgerton (1997). We calculate household-specific income and own- and cross-price elasticities and average them at the per capita population means. The details of the estimation methods are discussed in Ecker and Comstock (2021).

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