MYANMAR

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Pulses Sector Assessment

Pre- and post-monsoon 2021 and 2022

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ABSTRACT

The pulse sector in Myanmar has emerged as a crucial income source for farmers during the triple crisis, driven by increased export demand and domestic consumption, as well as reduced production costs and irrigation requirements. However, pulse growers still face several challenges, including escalating fertilizer prices, conflict, border closures, and inadequate government support in terms of credit and extension services. This working paper focuses on assessing the performance and competitiveness of the pulse sector during the pre/post monsoon growing seasons of 2021 and 2022. The analysis is based on recall data obtained from the Myanmar Agricultural Performance Survey (MAPS), conducted between August 2022 and September 2022.

During the 2021/2022 pre/post monsoon seasons, pulses were the primary non-paddy crop for 25 percent of farmers nationwide. Despite the persistent increase in fertilizer prices, a small percentage of pulse farmers continued to utilize fertilizers, including urea and compound fertilizer. Although the quantity of fertilizer applied increased between 2021 and 2022, the overall utilization rate of chemical fertilizers remains inadequate in terms of quantity and imbalanced in terms of essential elements such as nitrogen (N), phosphorus (P), and potassium (K). Inadequate fertilizer usage and an upswing in pest and disease problems resulted in reduced yields, particularly for green gram, chickpea, and other varieties.

Despite yield reductions and higher cultivation costs over the past two years, pulse farmers have benefited from higher farm gate prices. In comparison to paddy rice production, pulse production which uses less chemical and physical inputs yielded relatively higher net returns. Despite facing challenges such as income decline, the coup, and the COVID-19 pandemic, farmers have shown resilience, with pulses emerging as a silver lining in the agricultural sector. To ensure the future sustainability of the pulse sector, it is crucial to address issues related to seed access, credit availability, export diversification, and compliance with international quality standards.

1. INTRODUCTION

Pulses are a major export crop for the Myanmar agricultural sector as well as an important source of nutrition for Myanmar's people. Pulses are also an important crop in the Myanmar cropping system; they require less water and chemical fertilizer than cereal crops and can fix nitrogen preserving the soil quality. As a result of lower production costs and increased demand for pulses both locally and abroad, cultivation of pulses in Myanmar increased substantially from 0.73 million hectares in 1988/1989 to 4.66 million hectares in 2016/2017, or 36 percent of arable land (World Bank 2019). In 2017, Myanmar was a leading country in pulse production among ASEAN member countries, producing 6.35 million MT of pulses. After 2017, however, pulse production declined due to import quota restrictions from India and, subsequently, the COVID-19 pandemic and political unrest. In 2021, the cultivated area of pulses was 3.95 million hectares (25 percent of arable land) which was 0.71 million hectares less than that of 2017 (MOALI, 2021). Further, production quantity decreased by 1.4 million MT.

At the same time, renewed export contracts with India and expansion of exports to other countries in the region have created sustained export demand for pulses. This export demand combined with increased domestic consumption, lower production costs, and lower irrigated water requirements make pulse cultivation an important source of income for growers during a time of crisis. Nonetheless, there are still many factors hindering pulse cultivation such as rising fertilizer prices, conflict, border closures, and failing government service provisions for farmers.

This working paper analyses the performance and competitiveness of the pulse sector during the 2021 and 2022 pre/post monsoon growing seasons. The farm level analysis is based on data from the Myanmar Agricultural Performance Survey (MAPS) which was conducted over two growing seasons spanning the period August 2022 to September 2022. MAPS is a representative sample of farmers at the national, urban/rural and state/regional level.

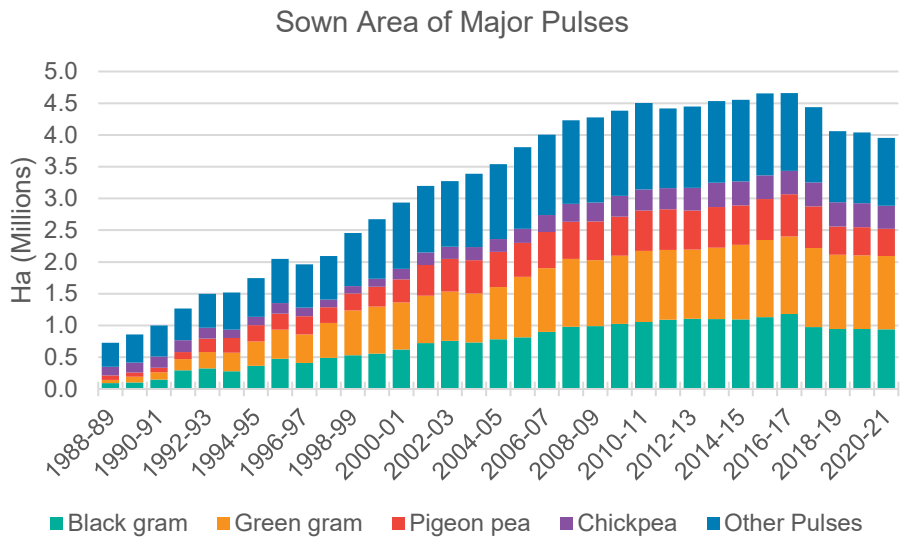
This paper proceeds as follows. First, we look at production, cropping patterns, yields, consumption, and exports. Next, we focus on the performance of the pulse sector at the farm level, presenting characteristics of pulse farmers and farms. Next, we discuss inputs, service delivery, and output for the different agroecological zones and the major pulse varieties. Subsequently, we discuss the shocks that were encountered by pulse farmers in our survey. Thereafter, we analyze change in yields over time and factors associated with increasing yields. Finally, we present gross margins for pulses and conclude with policy suggestions.

1.1 Production, Cropping Pattern, and Yield

Myanmar produces more than 20 types of pulses including black gram, mung bean (green gram), soybean, chickpea, pigeon pea, butter bean, cow pea, sultani, sultapya, lima bean, and kidney bean (Maung, 2020). In 2020, green gram, black gram, chickpea, and pigeon pea accounted for 70 to 75 percent of total pulse production and were the leading export varieties (USDA, 2020).

Cultivated area of pulses has increased substantially from 0.73 million hectares in 1988-1989 to 4.15 million hectares in 2020-2021 (Figure 1). Myanmar has a comparative advantage in pulse production because of its extensive cultivatable land, different agroecological zones, abundant water and labor resources. As a result of this comparative advantage, when Myanmar transitioned to a market economy, the pulse sector boomed (Boughton et al., 2015). India's trade liberalization further fueled the growth of Myanmar's pulse sector. In 1991, the Myanmar pulse export sector comprised almost 80 percent of the southeast Asian pulse market. The pulse sector continued to grow during the reform period as trade barriers were lowered, communication technology improved, and the production knowledge of Myanmar pulse farmers grew.

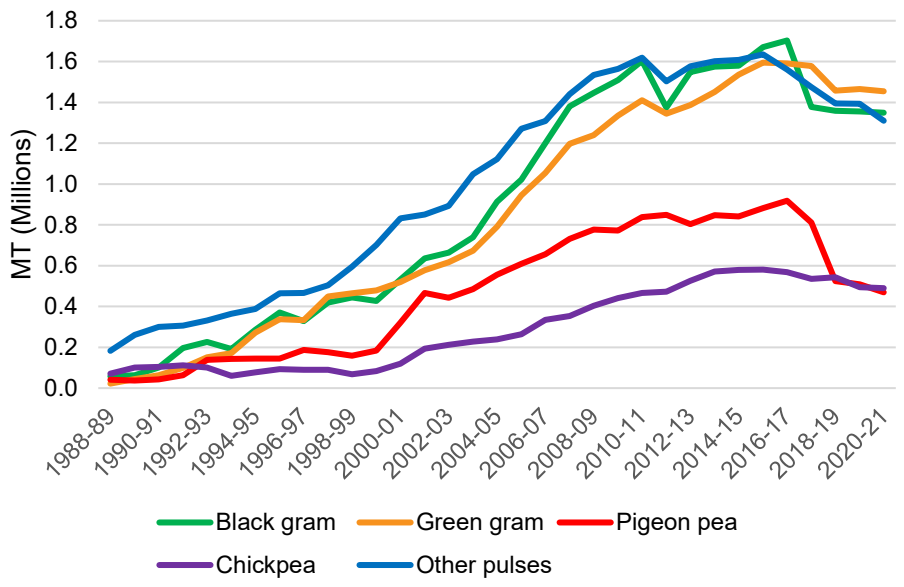
Figure 1. Trend of major pulses sown area, 1988-2021



Source: Department of Planning, Ministry of Agriculture, Livestock and Irrigation

However, cultivated area declined after the 2017/2018 growing seasons, dropping below 2008/2009 cultivated area. Pulse yields were estimated to be 1.10 t/ha in the 2019/2020 growing season dropping down to 1.00 t/ha in the 2020/2021 season (USDA 2021). Because of insignificant yield increases over the past ten years, this drop in cultivated area led to a large decrease in total production as well (Figure 2).

Figure 2. Trend in pulses production, 1988-2021



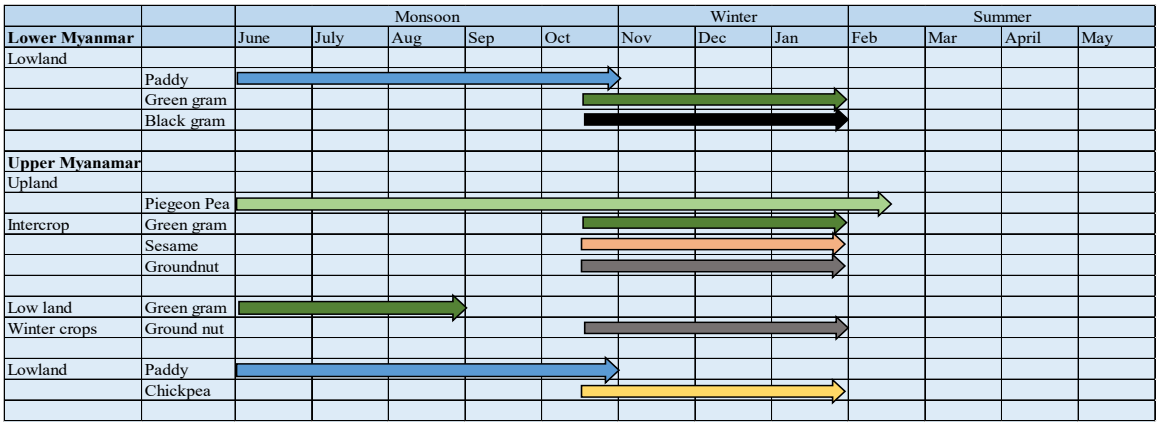
Source: Source: Department of Planning, Ministry of Agriculture, Livestock, and Irrigation

Different varieties of pulses are planted across Myanmar's agroecological zones depending on rainfall, temperature, elevation, and soil type. The Delta region and the Central Dry Zone are the two most important pulse production regions. Approximately 68 percent of pulses in Myanmar are grown in the Delta region and 32 percent of pulses are grown in the Central Dry Zone (MOALI, 2021).

Pulses are produced both during the rainy and winter seasons in different agroecological zones. However, about 70 percent of the pulses are grown during the winter season (USDA 2021). Rainy

season pulses are generally planted in June-July and harvested in September-October in the upland region (Figure 3). Winter season pulses are planted in November-December and harvested in January-February. Black gram is cultivated in the winter season as a second crop; it is planted starting in October immediately after monsoon paddy is harvested. Black gram is harvested in March-April. Green gram is grown in two seasons. In the winter season it is planted in October and harvested from February to April and in the rainy season it is planted in July-August and harvested from November to January (ICCO, 2021). With timely planting following the harvest of monsoon paddy, the short cropping cycle of 90 to 120 days for pulses permits their production solely on residual moisture. Long-cycle pigeon pea, a 200-day (about 6-7 months) crop is mostly sown in the early monsoon season (May to June) and harvested from January to March. It is often intercropped with sorghum, cotton, sesame, or maize.

Figure 3. Pulse cropping calendar for Myanmar



Source: MOALI, 2017.

1.2 Pulses Export

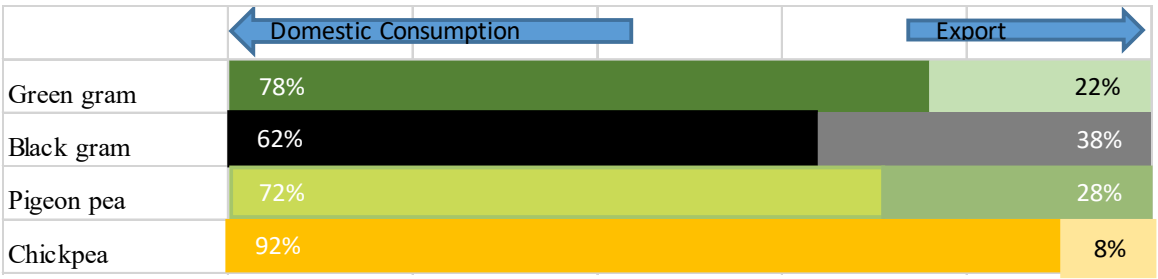
As a neighboring country of India, the world's top pulse consuming and importing country, Myanmar has a large market for its pulse production. In 2017 and 2018, however, India amended its pulse import policy to protect its domestic market reference price and encourage local production. As a result, in 2017, the volume of Myanmar pulses destined for India decreased. Since Myanmar had a significant export dependency on India, the export value of Myanmar's pulses fell from 820 million USD in 2016 to 296 million USD in 2018 (Laitha, 2019; Diao 2020). To make up for the smaller Indian market, Myanmar expanded pulse exports to other countries including Indonesia, Malaysia, Vietnam, and China (Diao 2020). India's bid for self-sufficiency was unsuccessful, however, and in 2021 India signed an MOU with the Myanmar government to import 350,000 tonnes of Myanmar pulses annually from 2021-22 to 2025-26 through the private sector.[1] Further, in March 2022, the India government extended the waiver on tax and quality requirements for black gram and pigeon pea until March 2024. In 2021, India was the largest importer of Myanmar's pulses followed by Indonesia, China, Thailand, and Malaysia (Table A.1).

The global crisis caused by the COVID-19 pandemic had an enormous impact on pulse trade. Border closures, quarantine policies, and container shortages led to new logistic measures and significant delays in exporting. In early 2021, the freight costs between Myanmar and India tripled as a share of the cargo value (OATA, 2021). Despite these issues, because of sustained export demand, Myanmar continued to export during the pandemic, and government data suggests that total pulse exports were approximately 970 million USD in 2022-2023 (MOC data, 2022).

[1] The total agreement volume includes 250,000 tonnes of black gram and 100,000 tonnes of pigeon peas, in addition to three other types of pulses.

It is estimated that on average, approximately 16 percent of pulses are exported, while the remaining 84 percent are used either for household consumption or livestock feed (ACIAR, 2021) (Figure 4). Chickpeas, the third most planted pulse in the 2021/2022 pre/post monsoon season, are primarily marketed domestically (92 percent). A larger percentage of black gram, green gram, and pigeon pea are exported, with 38 percent, 22 percent, and 28 percent exported, respectively (ACIAR, 2021).

Figure 4. Percentage of domestic consumption and export of total production



Source: Australian Center of International Agricultural Research (ACIAR)

1.3 Domestic Consumption

Domestic consumption of pulses in Myanmar has increased, along with the increasing population. In 2020, annual per capita consumption was estimated at 10.0 to 13.6 kg (8 viss) and average monthly expenditure for pulses was 2,936 MMK (1.75 percent of total expenditure) (Maung, 2020). According to the USDA's 2021 Grain Report, the consumption of beans and pulses decreased due to pandemic and coup related income reductions, lower purchasing power, and the closure of retail and snack shops. Table 1 shows the percentage of households that consumed pulses in the seven days prior to being interviewed for the Myanmar Household Welfare Survey. Although the share declined slightly over the four rounds, likely due to the impact of crises, pulses remained a vital source of nutrition with 83 percent of households consuming pulses in Q4. While in Q1 and Q4 2022, a slightly higher share of urban households consumed pulses relative to rural households, there was no difference between these regions in Q2 and Q3.

Table 1. Percentage of households that consume pulses in 2022

	Q1	Q2	Q3	Q4
National	88	83	84	83
Urban	91***	83	85	86***
Rural	87	83	84	82

Note: Asterisks show significance between rural and urban at p-values * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Households were asked to recount their consumption for the seven days prior to the survey. Quarters represent each round quarterly round of the MHWS.

Source: Authors' calculations from MHWS data

2. FARM LEVEL ASSESSMENT

2.1 Distribution of Sample Farmers and Farm Characteristics

In 2017, 32 percent of farm households nationwide grew pulses, according to the Myanmar Living Conditions Survey (MLCS). A similar share grew pulses in the 2021/2022 pre/post monsoon season (31 percent). Rice is the main staple crop in Myanmar, but pulses are also becoming a key staple. While 65 percent of farmers grew rice in the monsoon 2021 season, 15 percent of farmers grew pulses. During the 2022 pre/post monsoon season, only 13 percent of farmers grew paddy while 25

percent of farmers grew pulses. Pulses, therefore, are a more important crop during the pre/post monsoon season than rice.

In our survey, we asked the farmers to identify the three most important non-paddy crops. At the national level, 25 percent of farmers grew pulses as their most important non-paddy crop in the pre/post monsoon season of 2021-2022 (Table 2). Thirty-nine percent of farmers in the Delta grew pulses as their first priority crop and 11 percent grew pulses as their second priority crop. In the central Dry Zone, pulses were the first priority non-paddy crop for 28 percent of farmers and the second priority crop for 16 percent of farmers. Among the states and regions, 54 percent of farmers in Bago grew pulses as the first priority non-paddy crop, followed by 35 percent of farmers in Nay Pyi Taw, 33 percent in Yangon, and 32 percent in Ayeyarwady.

Table 2. Pulses are an important non-paddy crop in the pre/post-monsoon 2022

Percentages	Pulses as 1st important crop	Pulses as 2nd important crop	Pulses as third important crop
State/Region			
Kachin	7.6	3.4	2.5
Kayah	0.0	0.0	0.0
Kayin	13.9	3.4	1.8
Chin	1.4	0.7	6.9
Sagaing	26.9	15.3	4.0
Tanintharyi	0.0	0.0	0.7
Bago	54.2	15.2	1.6
Magway	31.1	20.0	5.9
Mandalay	25.4	13.8	4.8
Mon	16.6	4.3	0.6
Rakhine	2.3	0.9	0.2
Yangon	32.9	3.1	0.0
Shan	4.4	3.8	0.7
Ayeyarwady	32.3	9.9	1.5
Nay Pyi Taw	35.4	11.9	0.0
Total	25.0	10.2	2.4
Agroecological Zone			
Hills and Mountains	5.6	3.5	1.4
Dry Zone	28.0	15.9	4.5
Delta Region	39.4	11.0	1.4
Coastal Zone	1.6	0.6	0.4

Source: Authors' calculations from MAPS data

At the national level, pulse cultivation covered 31 percent of the total crop area. The two largest pulse production regions were the Central Dry Zone and the Delta Zone, where 42 and 41 percent of farmers grew pulses, respectively (Table 3). Sixty-one percent of the pre/post monsoon season pulses were grown in the Delta region, while 34 percent were grown in the Central Dry Zone. Further, pulse production accounted for 45 percent of total crop cultivated area in the Delta and 30 percent in the Dry Zone .

Table 3. Distribution of pulses farmers and cultivation by State/Region and ecological zone in the 2022 pre/post monsoon season

State/ Region/ Zone	% of pulse farmers among respondents N=1242	% of pulse area in sample cultivated area N=6369	MAPS estimate of share of national pulse area 2021	MOALI estimate of share of national pulse area 2021
State/Region				
Kachin	12.4	12.9	0.9	0.7
Kayah	0.0	0.0	0.0	0.3
Kayin	15.6	10.4	0.9	1.7
Chin	9.6	1.3	0.0	0.3
Sagaing	39.9	30.3	12.4	25.0
Tanintharyi	1.3	0.3	0.1	0.0
Bago	55.9	66.0	30.1	20.7
Magway	47.1	31.2	7.5	11.2
Mandalay	39.0	25.7	12.0	12.8
Mon	17.7	12.6	2.1	0.6
Rakhine	3.2	6.3	0.5	0.6
Yangon	33.3	32.1	6.0	4.3
Shan	8.1	8.4	2.1	4.1
Ayeyarwady	34.0	38.5	22.9	16.5
Nay Pyi Taw	43.9	34.6	2.5	1.4
Agroecological Zone				
Hills and Mountains	9.5	9.1	4.0	7.0
Dry Zone	41.7	29.2	34.4	50.4
Delta Zone	40.9	44.6	61.1	42.0
Coastal zone	2.6	1.6	0.5	0.6
	100.0	100.0	100.0	100.0

Source: Authors' calculations from MAPS data

Among all states and regions, Bago had the largest share of farmers that grew pulses at 56 percent, followed by 47 percent in Magway, and 44 percent in Nay Pyi Taw. In terms of area, 66 percent of the total area for all crops was cultivated with pulses in Bago region and around 30 percent of the total cultivated area was planted to pulses in Sagaing, Magway, Ayeyarwady, Yangon and Nay Pyi Taw. There are large differences between MAPS and MOALI estimates of the share of pulse cultivation by state/region. MAPS estimates show a larger share of pulse production in Bago and Ayeyawady while MOALI estimates have much greater production in Sagaing.

Table 4 presents information on the share of famers growing different types of pulses nationally. Green gram was grown by 45 percent of pulse farmers in the 2022 pre/post monsoon season (an increase of 4 percentage points from the previous year), followed by black gram at 31 percent and chickpea at 13 percent. About 30 percent of farmers grew other types of pulse crop such as pigeon pea, lablab bean, rice bean, kidney bean, cowpea, and butter beans.

Table 4. Share of farmers that grew different pulses in the 2021/202 pre/post monsoon seasons

Share of farmer that grow	2021	2022
Green gram	41.0	44.9
Black gram	31.8	30.9
Chick pea	15.4	13.1
Other pulses	11.5	10.8
Pigeon pea	4.2	3.8
Lab Lab bean	2.2	1.8
Rice bean	1.6	1.6
Kidney bean	1.6	1.6
Cowpea	1.2	1.3
Butter bean	0.7	0.7

Source: Authors' calculations from MAPS data

The characteristics of pulse farmers are presented in Table 5. For our phone survey, we requested to speak with the household member who is most familiar with farming activities. Most respondents who grew pulses were men (80 percent). The average age of a pulse farmers was 48 years, which is 2 years older than the national average for all farmers. Most pulse farmers had elementary to high-school education; 46 percent have completed only primary school, 30 percent completed middle school, and 12 percent completed high school. Only five percent of the pulse farmers completed their undergraduate study. This is similar to national education patterns for farmers.

Table 5. Demographics of pulse farming households and all farming households

	Pulse Farming Households (%)	All Farming Households (%)
Age (Year)	48	46**
Gender		
Male	80	7**
Female	20	23**
Highest level of education		
None	2	4**
Read and write	5	6
Standard 1-4	47	53***
Standard 5-8	30	22***
Standard 9-11	12	11*
Undergraduate	50	4
Graduate	0	1**
HH with at Least One HH Member Participating in Farming Activities		
Adult male	93	57
Adult female	70	46
Children	1	0

Note: Asterisks show significance at p-values * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.
Source: Authors' calculations from MAPS data

On average, there were 1.2 male family members and 0.91 female family members working on the pulse farm. Ninety-two percent of pulse farming households had at least one male working on the farm and seventy-two percent of pulse farming households had at least one adult female worker. Children rarely assisted with pulse production.

2.2 Average Farm Size and Farm-size Distribution of Pulses

The average size of pulse farms and the distribution of farm sizes is shown in Table 6. The average pulse farmer cultivated 7.5 acres in the pre/post monsoon 2022 season. The largest pulse farms are in the Hills region and are 8.9 acres on average, followed by farms in the Delta region which are 8.4 acres. Pigeon pea is the most widely grown pulse on the larger farms in the Hill region.

Table 6. Average farm size and farm size distribution for pulses

Size of farm and farm size distribution	2021	2022				
	Pulses	Pulses	Rice	Hills	Dry	Delta
Average farm size (acre)	7.7	7.5	6.7	8.9	6.4	8.4
=<5 ac (%)	49.4	52.3	59.1	54.9	56.7	47.1
>5 to =<10 ac (%)	30.0	27.3	22.9	17.0	27.0	29.1
More than 10 ac (%)	20.6	20.5	17.9	28.1	16.3	23.8

Source: Authors' calculations from MAPS data

At the national level, more than 50 percent of pulse farmers are working on small farms (less than 5 acres) in 2022, and 27 percent are working on larger farms of between 5 to 10 acres. In the Delta, however, more than 50 percent of farmers with larger landholdings cultivate pulses. In the Dry Zone, 16.3 percent of farmers with landholdings of more than 10 acres cultivate pulses. The share of large pulse farms is higher than the share of large rice farms.

2.3 Farm Management and Input Use

Timely access to inputs and the market are some of the most important factors in enhancing and ensuring the production of smallholder farmers. Evidence from developing countries suggests that input utilization of farmers is hampered by access to the input market (Buckmaster, 2012). Likewise, farmers from remote areas who are less connected to markets by roads often face higher input prices and lower output prices due to higher transaction costs, lower rates of mechanization or technological adoption, and lower rates of market participation for their products (Buckmaster 2012); IFPRI 2022). Table 7 shows the travel time in minutes for pulse farmers to input markets, post-harvest processing sites, and the township center where they likely sell their pulses.

Table 7. Travel time to access services (in minutes)

	Pulses					
	2021	2022				
Time (min) in mean value	National	National	Rice	Hill	Dry Zone	Delta
Most commonly used agri-input retailer	37	35	39	30	35	35
Most commonly used huller	27	27	27	21	27	28
(Closest) center of township	43	43	47	40	40	47

Source: Authors' calculations from MAPS data

Pulse farmers have similar travel times as rice farmers to access inputs and sell their products. Nationally, pulse farmers are further from a township center (47 mins) than they are from the agri-input retailers (39 mins) and the processing sites (27 mins). This indicates that the farmers do not always need to go as far as the township center to buy inputs or process their products. In the Delta, farmers typically require more time to reach the township center compared to farmers in other regions. Farmers in the Hill region have closer access to agri-input retailers, processing services, and the township center compared to other regions. This could be because the input companies have expanded their market into more rural regions in the Hill region or because of the compact structure of villages and cities created by the geological conditions of the Hill regions.

3. INPUT AND SERVICE DELIVERY

In this section, we analyze pulse farmers' access to production inputs such as seed, fertilizers, chemicals, labour, mechanization, and services including extension and credit. For our analysis we focus on green gram, black gram and chickpea and then combine other pulses into a single category. Moreover, we compare the pulse farmers to rice farmers to highlight key differences between the two sectors.

3.1 Access to Seed

Efficiency and effectiveness of other agricultural inputs depends on the quality of seeds (Mistary, V.S, 2022). Utilization of good quality seeds, which are suitable to different agroecological zones and can tolerate pests and diseases associated with climate change are crucially important to increase yields and improve the quality of pulses. In Myanmar's crop sector, there is relatively little quality seed distributed by the public sector. Further, while private sector seed production emerged during the last decade, there has been very little increase in the access to private seeds (Boughton et.al., 2020).

Table 8 depicts the source of pulse seeds that farmers used in the pre/post monsoon seasons of 2021 and 2022. Pulse farmers mainly use their own seeds saved from the previous year. In 2021, about 71 percent of farmers used seeds saved from the previous harvest. However, in 2022, this declined by nine percent to 64.6 percent of farmers. Further, the share of farmers who purchased seeds from agricultural departments (DOA or DAR), other farmers, or from agri-input retailers increased by 16 percent. This was still much lower than in the rice sector, where 56 percent of farmers purchased their seeds.

Table 8. Share of farmers in utilization of different seed sources

	2021	2022					
	Pulses	Pulses	Rice	Green Gram	Black Gram	Chick-pea	Other Pulses
Saved (harvested) from last year	71.2	64.6	41.9	55.5	69.4	68.1	74.6
Purchased from other farmers	12.8	16.1	27.9	20.9	14.2	11.8	10.9
Purchased from agri-input retailer or government	12.1	14.4	28.5	18.8	10.9	14.6	10.6
Other	3.7	4.5	1.3	4.0	5.5	5.5	3.4
Left over (unused) purchased seed from last year	0.2	0.4	0.4	0.7	0.0	0.0	0.4
Number of Observations	**1,062**	**1,042**	**678**	**393**	**330**	**131**	**188**

Source: Authors' calculations from MAPS data

Among the pulse varieties, the share of saved seed utilization is the highest among black gram (69.4 percent), followed by chickpea (68.1 percent). The share of green gram farmers that used saved seed was the lowest but was still more than 50 percent. This indicates that the government and private sector's distribution of quality seed is more prominent for green gram than for other pulses. This likely due to the introduction and dissemination Yellow Mosaic Virus (YMV) resistant varieties of green gram. The YMV is a serious virus disease in green gram and black gram that results in significant declines in yield and/or total crop loss. A qualitative interview with a private seed company in 2022 revealed that the company concentrates on green and black gram seed production rather than chickpea because chickpea is grown in only one season. Thus, return on investment for green and black gram seed production takes six months, while chickpea takes one year.

According to DOA data, the nationwide quality seed sufficiency ratio in 2022 was 0.35 percent for black gram, 0.29 percent for green gram, and 0.61 percent for pigeon pea. The seed sufficiency in the rice sector is 16.2 percent. From qualitative interviews between 2020 to 2023 we learned that some rice farmers are familiar with seed production technology because of technical assistance and COVID-19 recovery programs. There is no such farmer knowledge in the pulse seed sector as pulses making crosses through injecting new genes requires expertise in pollinating these species. The deficit supply of quality seed is the primary issue for the development of the pulses sector.

3.2 Access to Chemical Inputs

Table 9 depicts chemical input use among pulse farmers during the pre/post monsoon 2021 and 2022 seasons. Pulses can convert nitrogen from the atmosphere into plant and soil nitrogen, and thus lower nitrogen fertilizer requirements (Hardarson, G. & Atkins, C., 2003). The DOA recommends that pulse farmers use 25-50 kg/ac of urea, 25-50 kg/ac of T-Super, and 10-25 kg/ac of potash for basal application. The DAR recommends that legume farmers use 12 kg/ac of urea and 38 kg/ac of T-Super and 25 kg/ac of MOP (Muriate of Potash). Together with these NPK fertilizers, application of 50-100 kg/ac of gypsum and 100-150 baskets/ac of bio-compost fertilizer or animal manure is recommended.

Table 9. Percentage of pulse farmers who used fertilizers on their largest plot

	2021	2022
Pulses farmers	26	28
Green gram farmers	31	30
Black gram farmers	17	19
Chickpea	39	46
Other pulses	23	27

Source: Authors' calculations from MAPS data

At the national level, only 26 percent of pulse farmers during the 2021 pre/post monsoon season and 28 percent in the 2022 pre/post monsoon season used fertilizer (Table 9). However, there is variance between the fertilizer rates across different pulses. For instance, 46 percent of chickpea farmers used fertilizer in 2022 while only 19 percent of black gram farmers used fertilizer that same year.

Table 10 presents information on fertilizer application rates for different types of pulses among farmers who used fertilizer. Pulse farmers in 2021 used 9.7 kg of urea per hectare, 7.2 kg of 15-15-15 compound fertilizer per hectare, and 3.4 kg of other compound fertilizer per hectare. Despite the price increase of Urea fertilizer, the amount applied increased 3 percent over two years while the use of compound fertilizers decreased by 13 to 18 percent. The application of T-super and ammonium sulphate application also declined by 33 percent. Likewise, the per hectare application of other foliar fertilizer decreased by 50 percent. While pulse farmers often used at least two types of fertilizers, the amount applied was lower than the recommended usage rate. This was mainly due to low application of potash and T-super fertilizers which are important for pulses. Myanmar pulse farmers rarely use fertilizer if the pulse was grown after rice. However, sometimes they use small amounts as basal applications before cultivation and foliar spays before flowering time. The farmers' fertilizer usage rates are different depending on the type of pulse crop grown. The highest urea application rate (15.8 kg/ha) is found in the other pulses group, followed by green gram (11.6 kg/ha). The highest usage rate of compound fertilizer is found in chickpea cultivation (13.5 kg/ha).

Table 10. Chemical input use (kg/ha) among fertilizer users

	2021	2022					
	Pulses	Pulses	Rice	Green Gram	Black Gram	Chick-pea	Other Pulses
Urea	9.7	10.0	118.0	11.6	4.7	10.3	15.8
Compound 15-15-15	7.2	6.3	22.2	7.5	2.4	13.5	6.0
Compound other	3.4	2.8	23.4	3.0	2.9	3.1	2.1
T-super	0.6	0.4	14.8	0.4	0.2	1.4	0.0
Potash	0.3	0.2	3.0	0.1	0.4	0.0	0.3
Ammonium sulfate	0.0	0.1	2.5	0.0	0.1	0.0	0.2
Aukkyone/lower quality fertilizer	0.2	0.1	2.3	0.0	0.0	0.0	0.4
Pesticides (%)	84.2	83.9	59.3	90.6	90.1	79.1	59.4

Source: Authors' calculation from MAPS data

Pesticide application among pulse farmers was more than 80 percent in both 2021 and 2022. However, these rates varied across pulse types. For instance, usage was highest among green gram (90.6 percent) and black gram (90.1 percent) farmers and lower among chickpea (79 percent) and other bean and pea (65 percent) farmers.

Upon comparing the fertilizer application rates between pulse and rice production, we observed significant disparities. The urea fertilizer application rate is 92 percent lower for pulses than for rice cultivation. Compound fertilizer (15-15-15) application is 72 to 88 percent (other compound) lower for pulses, and P and K fertilizers application rates are more than 90 percent lower as well. These findings highlight that rice production requires relatively higher amounts of fertilizer. Amidst recent fertilizer price increases the higher fertilizer requirements for rice increased costs of production significantly, whereas the lower fertilizer requirements for pulses made them more cost effective to grow.

Table 11 presents the fertilizer application rate of pulse farmers in different agroecological zones. Urea and compound fertilizer application is highest in Hill zone, where usage is more than double that of other regions. On the other hand, pesticide application is highest in the Delta region and lowest in the Hill region.

Table 11. Fertilizer utilization (kg/ha) among pulses farmers in different agro/ecological zones

	2021	2022			
	National	National	Hills	Dry	Delta
Urea	9.7	10.0	23.6	8.3	9.6
Compound 15-15-15	7.2	6.3	14.1	6.7	5.2
Compound other	3.4	2.8	7.0	1.4	3.4
T-super	0.6	0.4	0.0	0.6	0.3
Potash	0.3	0.2	0.0	0.1	0.3
Ammonium sulfate	0.0	0.1	0.0	0.1	0.0
Aukkyone/lower quality fertilizer	0.2	0.1	0.0	0.0	0.1
Pesticides (%)	84.2	83.9	68.9	77.6	90.1

Source: Authors' calculation from MAPS data

3.3 Access to Labor and Mechanization

The Myanmar crop farming system is labor intensive, and pulses are no exception. About 79 percent of pulse farmers used hired labor in the 2021 pre/post monsoon season with little change in 2022 (Table 12). Only three percent of farmers relied solely on exchange labor for pulse cultivation while around 11 percent used both hired and exchange labor. About six to eight percent of pulse farmers did not use either hired or exchange labor, relying solely on family labor. Eighty-two percent of green gram farmers used hired labour, while seven percent used only family labour. Use of no outside labour was most common among chickpea and other pulse farmers. Use of hired labour was more common in pulse production compared to rice production. This is due to the crop management requirements for pulse production, including seed sowing and weeding, and multiple harvests for pulses.

Table 12. Percentage of labor and mechanization use among pulse farmers

	2021	2022					
	Pulses	Pulses	Rice	Green Gram	Black Gram	Chickpea	Other pulses
Labor							
Hired labor	78.3	77.7	66.0	82.0	79.9	72.7	67.3
Exchange labor	3.3	3.0	3.2	1.3	3.8	7.2	2.8
Both	11.6	11.1	3.6	7.3	9.8	13.4	20.5
No	6.9	8.2	27.2	9.5	6.5	6.7	9.4
Draught Animal							
Hired	13.0	14.3	22.7	17.0	5.0	17.6	22.8
Own	21.1	21.3	22.6	18.7	12.0	34.0	35.6
Both	1.8	2.6	1.2	2.6	0.8	3.9	5.2
No	64.1	61.8	53.5	61.8	82.1	44.5	36.4
Tractor for Land Preparation							
Hired	62.4	59.8	58.5	64.9	61.7	56.3	46.6
Own	14.2	15.7	27.2	14.6	16.4	15.6	16.8
Both	6.2	6.1	5.8	4.8	8.4	7.8	3.8
No	17.2	18.5	8.5	15.6	13.5	20.3	32.8
# of Obs.	**1,062**	**1,042**	**678**	**393**	**330**	**131**	**188**

Source: Authors' calculation from MAPS data

Many pulse and rice farmers relied on mechanization, but it was more prevalent in the rice sector. This could be because pulses can be cultivated with a minimum tillage system that can reduce the use of mechanization compared to rice cultivation. We found that the share of pulse farmers who used hired or owned mechanization is about 76 percent. The share that used hired or owned draught animals was about 40 percent. The use of hired mechanization is slightly higher in green gram than the other pulses varieties.

3.4 Access to Credit

Access to finance is crucial for crop production. The Myanmar Agricultural Development Bank (MADB) is the most common formal credit source for providing seasonal crop loans for 22 types of crops. For pulses, an MADB seasonal loan is MMK 100,000 per acre at a 5 percent annual interest rate. In addition to agricultural loans, the MADB also provides the JICA Two-Step Loan, the MEB Two-Step Loan, and the COVID-19 Relief loan. Since the outbreak of the COVID-19 pandemic, MADB extended the repayment period to ease the hardship of farmers amid COVID-19 travel restrictions, disruptions in trade flow and transportation, and to grant new loans for the winter crops.

The bank extended the repayment period for COVID-19 Relief Loans to March 2022, and for 2021 winter crop loans to the end of February 2023.

Thirty-two percent of pulse farmers received loans from MADB nationwide, 6.3 percent from microfinance institutes or NGOs, and 2.7 percent from the government's rural development project (Table 13). Only 0.2 percent of farmers borrowed credit from private banks. The MLCS in 2017 stated that the low rate of loans taken from the private sector is associated with lower rates of formal bank account utilization, lack of trust in financial institutions, lack of information or knowledge gaps, and social constraints. The events of February 2021 have further eroded farmers' trust in the private sector banking system. At the same time, agri-input suppliers are still part of the credit system with 4.8 percent of farmers borrowing from them in 2021 and 4.0 percent in 2022. Among informal credit sources, borrowing from friends and relatives (7 percent) was still prominent during the double crisis. Credit sources vary significantly across agroecological zones. MADB was the most frequent source of loans in the Delta Zone (46 percent), as well as the Hill region (24 percent). These findings indicate that MADB loans play as an important source of credit in all agroecological zones.

Table 13. Access to credit in different agro-ecological zones, percentage of pulse farmers

	National	National	Hill	Dry Zone	Delta	Coastal
Informal Credit Source						
Private money lender	4.0	4.4	1.4	4.1	5.3	0.0
Relatives/friends	8.0	7.3	4.8	7.2	7.5	25.8
Agricultural input suppliers	4.8	4.0	2.8	3.0	5.2	0.0
Agricultural trader (crops or crops + inputs)	1.6	1.6	3.8	0.9	2.0	0.0
Formal Credit Source						
MADB – (COVID-19 funds and other)	36.0	32.4	24.1	20.2	46.2	19.4
Department of Cooperatives	1.0	0.9	3.3	1.1	0.5	0.0
Microfinance institution/ NGO	7.0	6.3	14.0	6.7	4.7	6.2
Private bank	0.2	0.2	0.0	0.4	0.1	0.0
Revolving fund (Mya Sein Yaung)	2.7	2.7	3.1	2.3	3.1	0.0
Other	1.2	1.1	2.9	1.4	0.6	6.1
Number of Observations	**1,283**	**1,242**	**44**	**243**	**363**	**6**

Source: Authors' calculation from MAPS data

A much larger share of black gram farmers received MADB loans, about 50 percent, compared to green gram (33 percent) and rice (30 percent) (Table 14). Interestingly, the rice sector was relatively more dependent on informal loans. According to an interview with rice farmers, many farmers did not pay back MADB and COVID-19 loans, which made it difficult to receive formal loans and forced the rice sector to rely on credit from informal sources.

Extension was also widely used by pulse farmers and at a similar rate to rice farmers. Pulse farmers most frequently used private sector agents (27 percent) and least frequently NGOs (9 percent) (Table 15). Public extension agents (19 percent) were used less frequently for by pulse farmers than rice producers (25 percent). Compared to 2021, extension rates among pulse farmers decreased for all types of extension, except cellphones and the internet. This option is more easily accessible during the crises in Myanmar.

Table 14. Access to credit by different crops, percentage of pulse farmers

	Pulses	Pulses	Rice	Green Gram	Black Gram	Chick-pea	Other pulses
Informal Credit Source							
Private money lender	4.0	4.4	7.9	4.3	5.5	2.6	5.2
Relatives/friends	8.0	7.3	7.4	5.7	8.2	7.1	8.5
Agricultural input suppliers	4.8	4.0	8.9	5.6	5.5	3.7	2.2
Agricultural trader (crops or crops + inputs)	1.6	1.6	1.3	1.6	2.1	0.7	2.0
Formal Credit Source							
MADB – (COVID-19 funds and other)	36.0	32.4	29.3	32.6	50.2	24.8	22.6
Department of Cooperatives	1.0	0.9	0.3	0.7	0.6	1.3	1.0
Microfinance institution/ NGO	7.0	6.3	3.9	4.8	4.1	3.1	11.1
Private bank	0.2	0.2	0.2	0.5	0.0	0.3	0.0
Revolving fund (Mya Sein Yaung)	2.7	2.7	1.9	2.0	2.6	3.9	3.8
Other	1.2	1.1	0.5	0.5	1.0	1.2	2.2
Number of Observations	**1,283**	**1,242**	**678**	**555**	**408**	**186**	**356**

Source: Authors' calculation from MAPS data

Table 15. Percentage of pulse and rice farmers with access to extension in the 2021/2022 pre/post monsoon seasons

	Crop	2021	2022
Public extension agent (e.g., DoA in person or call centers MoALI)	Rice	28.8	24.9
	Pulses	20.0	18.7
Private sector agents (input companies, traders, agri-input suppliers, crop traders)	Rice	26.5	27.7
	Pulses	31.7	27.0
NGOs	Rice	13.2	9.6
	Pulses	12.7	8.6
Cellphone applications and internet (facebook, Htwet Toe, Greenway, Golden Paddy, ---)	Rice	16.8	14.2
	Pulses	16.9	18.2

Source: Authors' calculation from MAPS data

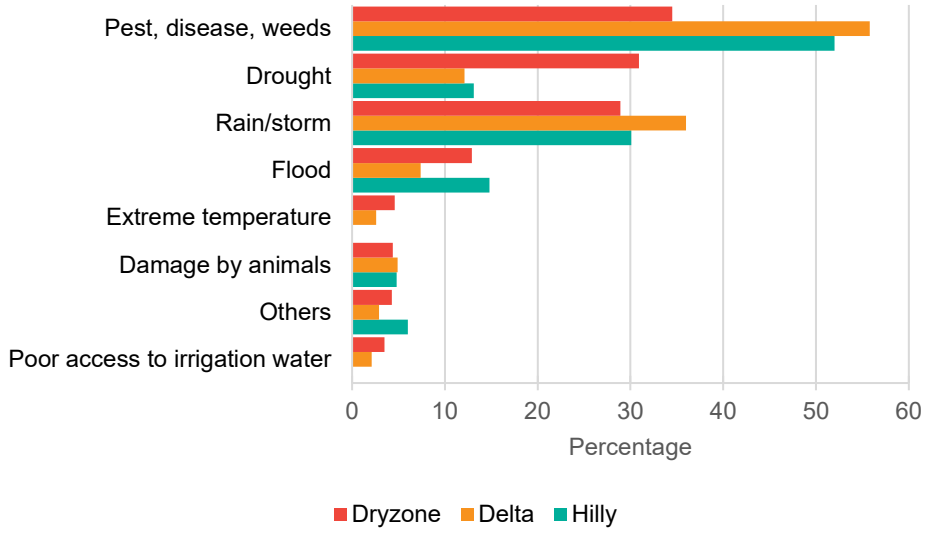
4. SHOCKS IN THE PULSE SECTOR

Crop production is heavily influenced by agroecological and climatic conditions, while pulses are particularly susceptible to pest and disease incidence. The country faced a drought during the July 2022 monsoon as well as storms and heavy rains in the Delta in the late monsoon. The incidence of natural shocks during the 2022 pre/post monsoon season is assessed in our survey. In general, the share of pulse farmers that experienced production shocks increased 36 percent nationwide over the two years. The major shocks were pests, diseases, and weed problems. These are likely related to the drought and the erratic rainfall that the farmers encountered. The most common diseases found in pulses are yellow mosaic virus, powdery mildew, and Cercosporin leaf spot (Proximity Designs, 2022).

Figure 5 illustrates the variation of shocks across different agroecological zones. Among these zones, pulse farmers in the Delta region experienced the highest incidence of pest and disease problems, accounting for 56 percent of reported cases. Additionally, the Delta region also had a higher occurrence of irregular rainfall compared to other regions. In the Dry Zone, farmers

encountered a relatively equal share of drought (31 percent) and pest and disease problems (35 percent). Similarly, farmers in the Hill region frequently reported pest, disease, and weed-related issues, representing 52 percent of reported cases. The second most common shock experienced by farmers in this agroecological zone was heavy rain and floods.

Figure 5. Natural shocks encountered by agroecological zones



Source: Authors' calculation from MAPS data

5. ANALYSIS OF PULSE AREA AND YIELDS

We run a fixed effects model at the household level to look at how cropping area has evolved between the pre/post monsoon 2021 and 2022 seasons for green gram, black gram, and chickpea (Table 16). When comparing the area cultivated in the pre/post monsoon 2022 to the same season in 2021, the area planted in 2022 was not greater than the area planted for the three pulses in 2021. In fact black gram and chickpea area planted declined slightly between the two seasons. There is a negative association between paddy acres planted and pulse acres planted. For each additional acre of pulses planted, an average of 0.16 fewer paddy acres are planted. Compared to pre/post monsoon 2021, an additional 0.35 fewer acres of paddy were planted for each pulse acre in the pre/post monsoon season. Similarly, 0.21 fewer acres of paddy were planted in monsoon 2022.

Table 16. Comparison of paddy and pulses cultivation acreage with monsoon 2020

	Green Gram	Black Gram	Chickpea	Paddy
Pre/post Monsoon 2022	0.02	-0.05**	-0.03***	-0.04
Pulse acres				-0.16***
Pre/post Monsoon 2022 # pulse acres				-0.35***
No. of Obs.	**10,042**	**10,042**	**10,042**	**10,042**

Note: Monsoon 2020 and Pre/post Monsoon 2021 are recall data. Asterisks show significance at p-values * p < 0.10, ** p < 0.05, *** p < 0.01.
Source: Authors' calculation from MAPS data

In Table 17 we run a fixed effects model at the household level to explore how green gram, black gram, and chickpea yields have changed compared to the pre/post monsoon 2021 season. We include yields for the largest pulse plot only. Compared to the pre/post monsoon season yields, there was no change in yields for all three varieties.

Table 17. Pulse yields compared to the 2020 monsoon season (Kg/acre)

	Green Gram	Black Gram	Chickpea
Pre/Post Monsoon 2022	10.54	2.76	5.31
No. of Obs.	**1,065**	**833**	**410**

Note: Monsoon 2020 and Pre/post Monsoon 2021 are recall data. Asterisks show significance at p-values * p < 0.10, ** p < 0.05, *** p < 0.01.
Source: Authors' calculation from MAPS data

In Table 18 we explore associative predictors of green gram and black gram yields for the pre/post monsoon 2021 and 2022 seasons, the most important pulse growing seasons. We use a random effects model at the household level to attempt to capture the impact of both time variant and invariant household and individual factors. We include state/region dummies, but the results are omitted here for brevity. We find a positive and significant impact of the use of fertilizer and herbicide on green gram yields. Using fertilizer increases green gram yields by 29 kg per acre, while using herbicide increases yields by 50 kg per acre. Given that the mean green gram yield is 374 kg per acre, this is an eight and 13 percent increase in yields with the use of these inputs, respectively. While farmers who accessed credit from the government did not have higher yields, those who accessed credit from agriculture input dealers had 59 kg per acre higher yields. Farmers who received extension training either from private, public, or online sources also had higher green gram yields. On the other hand, negative production shocks including climatic, and pest/diseases decreased yields by a similar magnitude. Female respondents also cited lower green gram yields. Finally, plots in townships with higher altitudes had marginally lower yields.

Table 17. Regression determinants of pulse yields (kg/acre) in the pre/post monsoon seasons

	Green Gram	Black Gram
Fertilizer (0/1)	29.07*	-16.31
Herbicide (0/1)	49.59***	20.48
Pesticide (0/1)	34.60	65.13*
Ag input credit (0/1)	58.99*	3.95
Government credit (0/1)	-4.29	25.58
Extension (0/1)	26.02*	-24.98
Production shock (0/1)	-59.66***	-33.48**
Mobility (0/1)	-13.03	26.30
Pulse acres (1-5)	6.00	-5.73
Pulse acres (>5)	12.84	24.54
Female (0/1)	-65.25**	-25.26
Age	-0.28	-2.15**
Lower education (0/1)	3.66	3.50
Altitude in meters	-0.23**	-0.10
2022 versus 2021	6.45	21.32***
No. of Obs.	**735**	**681**

Note: Asterisks show significance at p-values * p < 0.10, ** p < 0.05, *** p < 0.01.
Source: Authors' calculations from MAPS data

For black gram, it was harder to identify regression predictors of yields. While the application of pesticides increased yields by 65 kg per acre, neither fertilizer nor herbicide had a positive association with black gram yields. Negative production shocks decreased black gram yields by 33 kg per acre. Since black gram yields were on average 432 kg/acre, production shocks decreased yields by eight percent for black gram compared to 13 percent for green gram. Older farmers had lower black gram yields. Overall this highlights that there are omitted variables that likely have an important impact on pulse yields.

6. GROSS MARGIN ANALYSIS FOR PULSES

Gross margin is defined as the value of output at the farmgate, less variable costs. Table 19 provides a breakdown of variable costs, yields, prices, and value of output for each type of pulse in 2022, with rice included for comparison. The average costs and returns for pulses in 2021 are also included. The cost of fertilizers and chemicals makes up about 10 percent of the total expenditure in pulse cultivation, compared to 45 percent in rice cultivation. However, according to the pulse sector development strategy, the cost of fertilizer in pulse production accounted for 20 percent of the total production cost in 2017 (MOALI, 2017). Our results show a 10-percentage point lower cost share for fertilizer and chemicals. The share of expenditure for fertilizer and other chemicals is the highest for other beans (17 percent), followed by chickpeas (15 percent). This is not surprising because utilization of expensive urea fertilizer is higher in chickpea and other beans, as stated in Table 10.

Table 18. Total expenditure and output value of different pulse varieties

	2021	2022					
	Pulses	Pulses	Rice	Green Gram	Black Gram	Chickpea	Other pulses
Total expenditure (MMK/ha)	424,358	473,296	756,710	544,329	467,717	425,278	350,183
Expenditure for fertilizers and chemical (MMK/ha))	44,408	60,833	319,181	68,942	40,379	68,915	65,278
Share of fertilizers and chemical expenditure to total expenditure (%)	10	12	45	12	8	15	17
Yield (kg/ha)	1,104	1,082	4,092	993	1,154	976	1,186
Total Production (kg)	1,972	1,859	4,769	1,965	1,316	1,528	2,613
Farmgate price (MMK/kg)	1,211	1,624	468	1,529	1,790	1,675	1,587
Total output value (MMK/ha)	133,1530	1,783,172	1,927,769	1,526,222	2,097,988	1,664,727	1,849,483
Gross Margin	907,172	1,309,877	1,171,059	981,892	1,630,271	1,239,449	1,499,300

Source: Authors' calculations from MAPS data

At the national level, total expenditure for pulse cultivation increased by 12 percent over two years, but it is still 60 percent lower than that of rice cultivation. Among the different pulses, total expenditure for green gram cultivation was the highest. It was 16 percent higher than the expenditure for black gram, 22 percent higher than for chickpea, and 55 percent higher than for the other pulses.

The total value of pulses was 34 percent higher in 2022 than during the 2021 pre/post monsoon seasons. Black gram cultivation received the highest total output value at 2,097,988 MMK per ha, which is 18 percent higher than the average for all pulses, while green gram had the lowest average total output value at 1,526,222 MMK per ha. The total value of rice per ha is eight percent higher

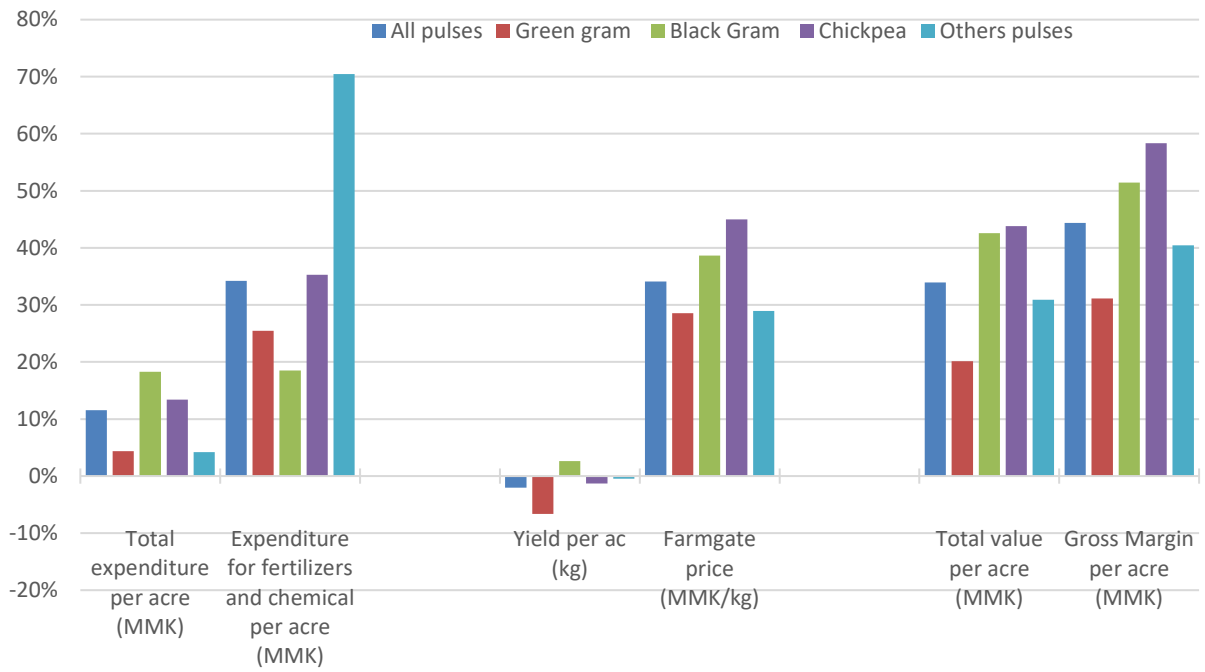
than that of pulses, while the total expenditure for paddy cultivation is 34 percent higher than for pulses.

The total monetary expenditure in our data covered only the average variable costs incurred during crop production. We calculated the gross margin for each type of pulse and for rice as a comparison. In 2022, the gross margin of pulses witnessed a significant increase of 44 percent when compared to the preceding year, despite the rising cultivation costs.

At the national level, the gross margin of rice cultivation in 2022 was 11 percent lower than that of pulses, despite rice achieving a significantly higher yield. This difference can be attributed primarily to higher total expenditures and lower prices per kilogram compared to pulses. Notably, the price per kilogram of pulses is 71 percent higher than that of paddy, while the overall expenditure for pulse cultivation is 37 percent lower than that for rice cultivation.

Figure 6 illustrates the percentage change in total expenditure, expenditure for fertilizers and chemicals, average yield, farm gate prices, and average output value of pulses between the 2021 and 2022 pre/post monsoon seasons. Across different pulse crop types, there was an overall increase in total expenditure ranging from four percent to 18 percent, with an average change of 12 percent observed for all pulses. Notably, black gram production incurred higher costs for farmers in 2022, experiencing the highest total expenditure change at 18 percent.

Figure 6. Percentage changes in expenditure, yield, price, cost and value of different pulses between 2021 and 2022



Source: Authors' calculations from MAPS data

Increase in expenditure for fertilizer and chemicals ranged from 19 to 70 percent for different pulses while the change for all pulses was 34 percent over the two years. Although the total expenditure for cultivation of other pulses showed the lowest percentage change at four percent, the change of expenditure for fertilizer and other agro-chemicals for other pulses was the highest at 70 percent.

Farm gate prices for pulses increased sharply by 34 percent compared to the previous year. Changes in farmgate prices were highest for chickpeas at 45 percent, followed by black gram at 39

percent, and green gram and other pulses at 29 percent. According to Mandalay Commodity Exchange Center (CEC) data, the market price of chickpeas increased by 56 to 58 percent, green gram increased by 8 to 18 percent, and black gram increased by 39 to 53 percent between the 2021 and 2022 monsoon seasons.

Despite non-changing yields and an increase in input prices, the increase in farmgate prices kept farmers from experiencing a decline in the value of their production. We found surprising positive changes in the total value of production of all pulses over 2 years (34 percent), and particularly high changes for chickpea (44 percent).

7. KEY FINDINGS

Based on our survey data of 1,242 pulses farmers for the pre/post monsoon of 2021 and 2022, we found that:

1. Twenty-five percent of respondent farmers nationwide grew pulses as their most important non-paddy crop during the pre/post monsoons of 2021 and 2022.
2. Only 28 percent of pulse farmers used fertilizer on their pulse crops. Among farmers who did apply fertilizer, the application rate and nutrient balance is not adequate.
3. About 79 percent of pulse farmers used hired labor and this has not changed much over the two most recent years.
4. While the fuel price increased, 76 percent of farmers still used mechanization services. Draught animal power is still important in the pulse sector and its utilization is about 40 percent for both hired and owned.
5. MADB loans play an important role in pulse credit. There is a scarcity of loans from other financial sources. More than 30 percent of pulse farmers still rely on formal loans for pulse production.
6. The major production shocks that farmers experienced increased by 36 percent in pre/post monsoon 2022. Pest and disease problems associated with the drought and erratic rainfall might become major constraints for production and product quality for the export market moving forward.
7. Increased in farm gate prices helped maintain production value despite increases in input prices and decreases in yield. Farmgate prices of pulses sharply increased by 34 percent on average and, with similar yields to the previous year, led to a 34 percent higher value of output. Increases farmgate prices were highest for chickpeas at 45 percent, which experienced high domestic demand.
8. Compared to paddy production, pulse production has many comparative advantages. For paddy, the cost of fertilizers and chemicals in paddy production are 45 percent of the total cultivation cost. For pulses, the larger farm sizes and lower consumption requirements of fertilizers and physical inputs led to higher net returns than for rice.

8. CONCLUSION AND POLICY IMPLICATION

To ensure the long-term financial sustainability of Myanmar's pulse sector, it is crucial to proactively seek new avenues for growth. This entails addressing key concerns related to seed access, credit access, export diversification, and compliance with international quality standards, all of which play integral roles in driving future expansion.

One major challenge within Myanmar's pulse sector is the limited access to improved seed varieties. The seed production capacity of the Department of Agriculture falls significantly short of meeting the requirements for the extensive pulse cultivation across the country. Therefore, active involvement of the private sector in the pulse seed sector is essential for distributing improved seed varieties that are resilient to climate conditions and resistant to pests.

Enhanced access to agricultural finance is imperative for the holistic development of Myanmar's pulse value chain. The availability of seasonal loans from the Myanmar Agricultural Development Bank (MADB) is currently limited to purchasing seed and fertilizer, leaving the remainder of the crop production costs inadequately covered. Moreover, stringent regulations within the financial sector hinder the ability of commercial banks to introduce profitable financial products or assume the higher risks associated with agriculture.

To mitigate the risks arising from policy uncertainties in major importing countries, diversifying export markets is also of utmost importance. While India continues to dominate Myanmar's pulse exports, relying solely on one market poses significant risks. In efforts to diversify, exploring opportunities in other countries and expanding the range of pulse varieties cultivated for export purposes becomes an imperative.

Meeting globally recognized production standards is a crucial prerequisite for accessing international markets. Although Myanmar's Good Agricultural Practices (GAP) protocol was introduced in 2017, its acceptance among farmers has been relatively slow, resulting in a limited number of farms receiving GAP certification. As global food safety standards continue to rise, it becomes increasingly vital for Myanmar to adhere to internationally recognized standards to access higher-quality markets. Additionally, upgrading lab testing certificates such as phytosanitary certificates issued by the Plant Protection Division is necessary to meet global expectations. By addressing these critical aspects, Myanmar's pulse sector can pave the way for sustained growth and secure a solid position in the international market.

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APPENDIX TABLE

Table A.1 Pulses export of Myanmar by major destination (2021)

No.	Countries	Value exported in 2021 (USD thousand)	Quantity exported in 2021 (Tons)	Share in Myanmar's exports (%)
1	India	616,295	679,477	65.8
2	Indonesia	101,112	90,963	10.8
3	China	70,247	86,293	7.5
4	Thailand	32,317	39,086	3.4
5	Malaysia	26,886	25,361	2.9
6	Philippines	23,988	22,789	2.6
7	Japan	15,264	15,852	1.6
8	Netherlands	7,456	5,018	0.8
9	United States of America	6,739	3,985	0.7
10	United Kingdom	6,479	5,014	0.7
11	Korea, Republic of	6,064	5,523	0.6
12	Taipei, Chinese	5,825	6,942	0.6
13	Singapore	5,755	5,132	0.6
14	Canada	2,974	2,205	0.3
15	Australia	2,257	1,849	0.2
16	France	1,573	883	0.2
17	Hong Kong, China	1,166	912	0.1

Source: International Trade Center (ITC, 2022)

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