IFPRI

MYANMAR

STRATEGY SUPPORT PROGRAM | WORKING PAPER 56 MAY 2024

Rice Productivity and Profitability in Myanmar

Assessment of the 2023 Monsoon

USAID FROM THE AMERICAN PEOPLE
FEED THE FUTURE The U.S. Government's Global Hunger & Food Security Initiative

CONTENTS

TABLES

FIGURES

ABSTRACT

We have analyzed rice productivity and profitability data for the 2023 monsoon season from the Myanmar Agriculture Performance Survey (MAPS), conducted at the beginning of 2024. This survey encompassed plots managed by 2,840 rice producers, distributed across all states/regions of the country. Our findings reveal:

1. **National rice productivity exhibited an average increase of 7 percent during the 2023 monsoon compared to the previous year**, reversing the decline witnessed in the 2022 monsoon. This year's heightened productivity primarily stems from increased input usage (particularly fertilizer), greater labor inputs (with more farmers adopting transplanting), and reduced occurrences of natural shocks, notably droughts.
2. **The Ayeyarwady region, the country's principal rice-producing area, experienced an 11 percent increase in rice productivity.** Conversely, rice yields remained low in Kayah and Chin, two states affected by severe conflict. The highest yields, along with notable increases over the past three years, are observed in Nay Pyi Taw.
3. **Significant changes in input costs for rice cultivation were observed between the two seasons:**

   3.1 Prices of urea, the most important chemical fertilizer used by rice farmers, decreased by 16 percent.

   3.2 Mechanization costs surged by a notable 42 percent, which is concerning, especially in light of escalating rural labor scarcity. Particularly pronounced increases in mechanization costs were noted in coastal areas where fuel prices were high, or fuel was not available at all.
4. **Substantial changes in technology adoption and input utilization compared to the previous monsoon were noted:**

   4.1 Fertilizer use on rice increased by 20 percent.

   4.2 Use of self-preserved seed – instead of obtaining it from the market - increased by 6 percentage points compared to last monsoon, and 17 percentage points compared to 2020.

   4.3 Transplanting increased by 5 percentage points while broadcasting declined by 7 percentage points.

   4.4 The use of combine harvesters on rice was 1 percentage point lower compared to last year but was 12 percentage points lower than in 2020.
5. **Thirty percent of paddy farmers reported being impacted by climatic or other production shocks during this monsoon**, with floods (reported by seven percent of farmers) and droughts (reported by five percent) having significant adverse effects on yields. When affected, paddy yields decreased by 32 and 51 percent, respectively. Incidences of pests, diseases, and weeds have the highest frequency overall (13 percent).
6. **Substantial changes in input usage and technology adoption were observed in paddy cultivation within coastal areas (Rakhine and Tanintharyi), seemingly linked to insecurity, mobility constraints, and fuel accessibility issues:**

   6.1 Fertilizer use declined by one-third.

   6.2 The utilization of combine harvesters plummeted by 26 percentage points.

7. **Paddy prices at the farm level surged by 64 percent**, reflecting changes in international rice prices as well as the depreciation of the MMK.
8. **Real – in terms of the cost of an average food basket – profits from rice farming during the monsoon of 2023 increased by 43 percent compared to the previous year.** While nominal profits doubled since the previous monsoon, high price inflation tempered the increase in real profits.
9. **The paddy sector has proven resilient in 2023**, with improved pricing incentivizing farmers to intensify production through increased usage of chemical fertilizers and labor inputs.

The outlook for paddy production in 2024 appears promising yet uncertain due to the following factors:

1. **Weather conditions:** Adverse weather, as witnessed during the 2023 monsoon, can significantly impact yields. Most models predict the El Niño conditions - with drier-than-average rainfall conditions - to continue weakening[1].
2. **Evolution of insecurity:** Insecurity correlates with reduced access to inputs and, when accessible, higher costs, thereby lowering profitability for farmers.
3. **Labor scarcity:** Labor availability is expected to become increasingly constrained in the next monsoon due to significant out-migration linked to the Military Service Law.
4. **Fuel availability:** A quarter of Myanmar's farmers reported limited access to fuel during the post/pre-monsoon season of 2024, complicating irrigation, and agricultural mechanization, which is typically relied upon by most rice farmers.

These findings underscore three primary implications for Myanmar's rice sector:

1. **Ensuring adequate access to mechanization for rice farmers:** Despite benefiting from increased mechanization over the past decade, there is a concerning trend of dis-adoption in combine harvester usage, attributed to mobility issues and fuel accessibility problems. This is particularly worrisome given the anticipated rise in rural labor scarcity.

2. **Emphasizing access to climate-resilient seeds:** While farmers are increasingly relying on self-preserved paddy seeds, there is a pressing need for the adoption of improved, high-yielding, and stress-resistant varieties. As evidenced by our results, farmers affected by floods and droughts experience significantly lower yields than unaffected farmers. Given an expected increase of weather shocks, higher adoption of adapted seeds is required.

3. **Addressing the impact of high rice prices on food security:** While beneficial for farmers, elevated paddy prices contribute to high rice prices in the country, posing a significant concern, especially for the most vulnerable segments of the population.[2] The most effective means of mitigating the adverse effects of high rice prices on poor consumers is through expanded safety net programs, providing additional liquidity directly to them.

[1] http://asmc.asean.org/asmc-el-nino#Seasonal_Outlook

[2] The high paddy prices are associated with high rice prices (which increased by 62 percent in early 2024 compared to a year earlier), leading to significant food price inflation in the country. It is estimated that the cost of a commonly consumed diet increased by 37 percent in the beginning of 2024 compared to a year earlier, increasingly exacerbating food security problems in the country.

1. INTRODUCTION

Rice is a very important product for farmers' livelihoods and for food security in Myanmar. Rice is the main staple, accounting for 51 and 62 percent of urban and rural calories consumed, respectively, making it crucial for food security in the country.[3] It is also the predominant crop for a large number of farmers, especially during the monsoon season, as well as an important export product. However, large international changes in commodity markets and local crises have hit the agri-food sector of Myanmar hard and have raised doubts on the performance of the agricultural sector overall and the rice sector in particular.

Internationally, there have been large changes in fertilizer markets in 2022 and 2023. International fertilizer prices increased significantly due to high prices of feedstock in the beginning of 2022 (Hebebrand and Laborde 2023). Following Russia's invasion of Ukraine in February, fertilizer prices increased even further, given that Russia and Ukraine are major suppliers of feedstock for fertilizers (Hebebrand and Laborde 2023). However, fertilizer prices decreased again by the end of 2023 with prices for nitrogenous fertilizers in December 2023 at one-third the level of their peak in April 2022 (Rice and Vos 2024).

Locally, the COVID-19 and political crises have created unprecedented challenges to the functioning of agricultural value chains and the agri-food system. The political crisis has caused substantial problems in the banking and finance sector, in international trade, and in the local transport sector, among others. Moreover, the currency of Myanmar, the kyat (MMK), has been rapidly depreciating, leading to high price inflation in the country (MAPSA 2024b).

The assessment on farmers' rice productivity during the monsoon of 2023 presented in this paper is based on data from the Myanmar Agriculture Performance Survey (MAPS) that was conducted with 2,840 rice producers, in all states/regions of the country, over the period January – March 2024.[4] Detailed questions were asked to farmers about their background, input use and input prices, farm management practices, rice output and output prices, and natural and other shocks during the monsoon of 2023.[5] This Working Paper presents the results from this assessment and then discusses implications of the findings.

The structure of the paper is as follows. In section 2, we present the data collection method and descriptive statistics. Section 3 looks at prices of inputs and outputs over the last two monsoons. In Section 4, results on input use and farm management practices in rice production are presented. Section 5 looks at the prevalence of natural and other shocks. Section 6 presents results on rice productivity and profitability. We finish in the last section with conclusions and implications.

[3] Estimated in 2015 (based on Myanmar Poverty, Livelihood, and Consumption Survey).

[4] For food markets, we note important price increases for some major staples. Grain prices in March 2023 were on average 23 percent higher than a year earlier, especially driven by high price increases of wheat (Hebebrand and Laborde 2023).

[5] In this paper, rice refers to rice in paddy form throughout.

2. DATA

The Myanmar Agricultural Performance Survey (MAPS) is a sub-sample of almost 13,000 households interviewed by phone during the sixth round of the Myanmar Household Welfare Survey (MHWS) that was fielded at the end of 2023 (MAPSA 2024a). In the MHWS, information was collected, among others, on the background of these households, welfare indicators, and livelihoods. The follow-up MAPS focused on the agricultural activities of those households that were identified as crop farmers in the MHWS. This survey was implemented by phone over the period January 22nd until March 7th, 2024. Almost 5,000 farmers (4,663) could be reached for a follow-up interview.

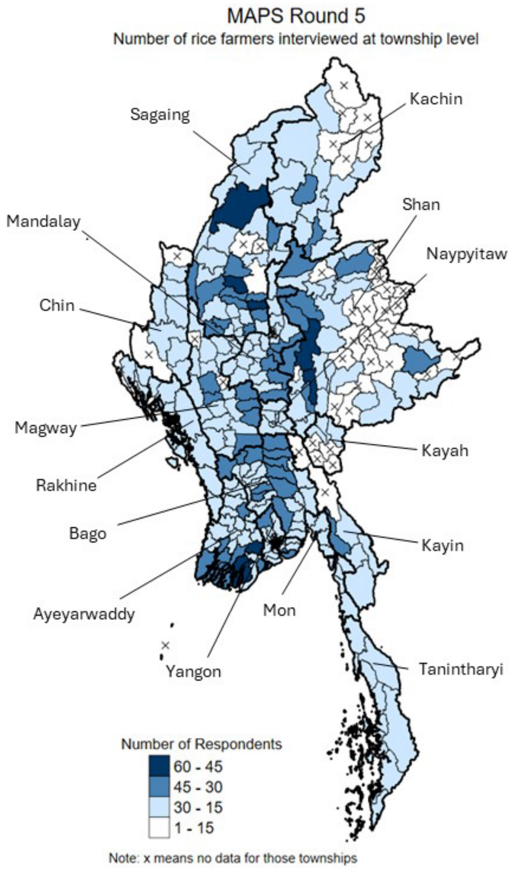
Of the 4,663 crop farmers in the MAPS, 2,840 farmers (61 percent) cultivated rice in the 2023 monsoon (Table 1). The number of rice farmers interviewed by township is shown in Figure 1, indicating their spread in the country. The analysis that is presented in this paper focuses on these rice farmers. Table 1 shows the number of rice farmers interviewed by state and region compared to the rice area harvested as estimated by the Ministry of Agriculture, Livestock, and Irrigation (MoALI). MoALI evaluated the rice area cultivated during the monsoon of 2020 at 14.6 million acres. This implies that with the MAPS, approximately 1.9 rice farmers were interviewed, on average, for each 10,000 acres of rice cultivated in the country.

Table 1: Sample rice farmers, MAPS

	Monsoon			Paddy harvested area 2020 (1,000 acres)
	Crop farmers	Rice farmers		
	2023	2022	2023	MoALI
By State/Region				
Kachin	148	102	108	486
Kayah	39	56	21	82
Kayin	107	77	52	430
Chin	132	13	33	69
Sagaing	764	484	544	1,552
Tanintharyi	136	53	54	224
Bago	490	440	407	2,683
Magway	482	240	235	579
Mandalay	568	235	253	487
Mon	141	62	76	685
Rakhine	68	143	56	980
Yangon	171	140	123	1,166
Shan	690	469	371	1,262
Ayeyarwady	645	452	442	3,751
Nay Pyi Taw	82	68	65	166
By agro-ecological zone				
Hills and mountains	1,116	717	585	2,329
Dry zone	1896	1,027	1,097	2,784
Delta region	1,447	1,094	1,048	8,284
Coastal zone	204	196	110	1,203
Total	4,663	3,034	2,840	14,601

Source: Authors' calculations based on MAPS, monsoon season 2023.

Figure 1: Sample of rice farmers, MAPS monsoon season 2023



Source: Authors' calculations based on MAPS, monsoon season 2023.

To assure that crop farmers are representative of the crop farming population in their state or region, a weighting factor was calculated building on the method used for the MHWS (Lambrecht et al. 2023). We use the share of the respondents that reported living in a household where crops were harvested in the past 12 months as our measure of a crop farming household. The share of crop farming households was also calculated based on the same question in the 2017 Myanmar Living Conditions Survey (MLCS) implemented by the Myanmar Central Statistical Organization (CSO), UNDP, and The World Bank (CSO, UNDP & World Bank 2019), which was the last in-person nationally representative socioeconomic survey conducted in Myanmar. Basic weights are calculated to match the MAPS numbers to this crop farming population of the MLCS. The basic weights further correct for education bias in the sample (based on MLCS numbers) and make sure that we match overall population numbers of the 2019 Inter-Censal Survey (at urban/rural and State and Regional level) (DOP, UNFPA 2020). An entropy correction approach was then implemented to additionally correct for large farm bias (using 5 land sizes) as well as adjust the share of women-adult-households in the farm population to the MLCS number.

The MAPS collected information on household characteristics, overall area cultivated, crops grown, rice production and sales, agricultural input and output prices, and the incidences of natural and other shocks. In this paper, we focus in particular on the information that was collected on the biggest rice plot of rice producers in the monsoon seasons of 2022 and 2023. Data for these plots were collected on input use and farm management practices, such as the use of seeds, agro-chemicals, fertilizers, labor and mechanization, and rice output. Farmers were also asked to estimate overall monetary input expenditures on these plots. While we collected these data from 2,840 rice farming households, caution is warranted in interpretation and extrapolation to national and state/region-wide rice production as we only collected this information on the largest rice plot.

We divide the country into four major agro-ecological zones that are commonly used in Myanmar and present our results at that level.[6] The average farm size of the interviewed rice farmers was 5.4 acres (Table 2). The biggest rice farms are seen in the Delta region (8.5 acres) while farms in the Hills and Mountains agro-ecological zone are substantially smaller (3.2 acres). Nationally, the size of the largest plot was on average 1.2 acres while the median was 1.0 acre. A large majority of rice plots at the national level are in lowlands (87 percent), whereas in the Hills and Mountains zone 35 percent are in the uplands.

The main farm management decision maker for these rice farms was male in 83 percent of the cases and 49 years old on average. Three percent of these agricultural decision makers had no education at all while 87 percent indicated that they had completed standard levels from 1 to 10. Three percent reported that they had obtained a bachelor's degree. The number of household members working on the farm was on average 2.2. Like results from earlier surveys, there were relatively more adult males working on the farm (59 percent of all labor) than females (41 percent of all labor) (Lambrecht et al. 2022), while work by children (defined as less than 15 years old) was reported by respondents to be less important.

Table 2: Descriptive statistics of rice farmers, MAPS

				Monsoon 2023		
	Unit	National	Hills	Dry	Delta	Coastal
Total number of rice farmers	Number	2,840	585	1,097	1,048	110
Background rice farm						
Average size rice farm - mean	Acres	5.4	3.2	4.0	8.5	4.3
Size largest plot - mean	Acres	1.2	1.2	1.1	1.4	0.9
Size largest plot - median	Acres	1.0	1.0	1.0	1.0	0.7
Land type largest plot						
Upland - steep slope	%	1.2	4.1	0.4	0.4	0.5
Upland - gentle slope	%	3.7	14.6	0.8	0.4	0.1
Upland- flat	%	6.0	16.0	4.9	2.0	0.7
Lowland	%	87.4	63.7	93.2	94.5	98.0
Deepwater	%	1.6	1.6	0.7	2.8	0.7
Background of main farm management decision maker of rice farms						
Age	Years	48.7	46.9	48.7	49.9	48.6
Gender	% male	82.8	79.9	83.5	86.0	75.9
Highest level of education achieved						
None	%	2.6	7.0	1.4	1.1	1.2
Standard 1-10	%	86.9	86.3	86.9	87.3	87.3
Bachelor	%	3.5	1.1	4.0	3.8	6.0
Other	%	7.0	5.6	7.7	7.8	5.6
Household members working regularly on the rice farm						
Adult male - mean	Number	1.3	1.3	1.3	1.2	1.2
Adult female - mean	Number	0.9	1.1	1.0	0.7	1.0
Children - mean	Number	0.0	0.0	0.0	0.0	0.0

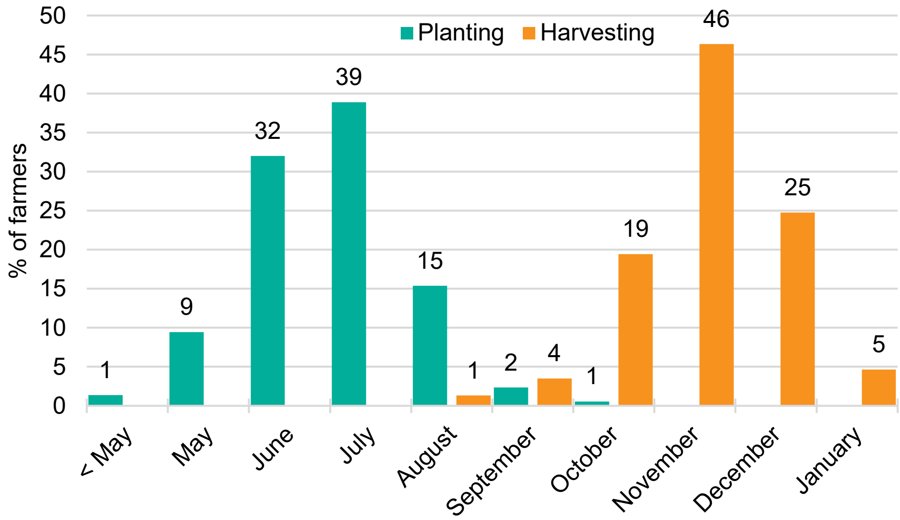
Source: Authors' calculations based on MAPS, monsoon season 2023.

MAPS was conducted from the end of January until the beginning of March to assess the situation of the monsoon crops of 2023. We asked farmers to indicate what they considered the main planting

[6] Delta (Ayeyarwady, Bago, Mon, Yangon); Coastal (Rakhine, Tanintharyi); Central Dry (Mandalay, Magway, Nay Pyi Taw, Sagaing); Hills and Mountains (Chin, Kachin, Kayah, Kayin, Shan).

and harvest month of paddy on their most important paddy plot (Figure 2). Planting was mostly done during the months of June (32 percent of farmers), July (39 percent), and August (15 percent). The main harvest month was November as reported by 46 percent of farmers. Twenty-five percent reported December and 19 percent October as their main harvest months. Five percent of the farmers reported that their main harvest was during the month of January, just before MAPS was fielded. It seems therefore that at the time of the survey, most of the monsoon crop was harvested for most states and regions in the country. Moreover, the time between harvest and the survey was not too long, reducing recall error.

Figure 2: Main planting and harvest month of monsoon paddy 2023



Source: Authors' calculations based on MAPS, monsoon season 2023.

3. INCENTIVES FOR RICE CULTIVATION - INPUT AND OUTPUT PRICES

Input prices for rice farmers have changed substantially over the last two monsoons (Table 3). First, chemical fertilizer prices reflected by the price of urea, the most important fertilizer used by rice farmers, have decreased by 16 percent on average (the median by 22 percent) during the monsoon of 2023 compared to a year earlier. These lower fertilizer prices were mostly driven by international price changes, as international prices of nitrogenous fertilizers were in July 2023 at less than one-third the prices of a year earlier (Rice and Vos 2024). However, the depreciation of the MMK as well as restricted and regulated imports kept decreases much lower in local markets. Table 3 also shows that urea prices are relatively higher in the Hill and Mountain area compared to the rest of the country, likely reflecting distances from the entry points of fertilizer imports from abroad as well as problems with domestic transport to these often conflict-affected areas.

Second, agricultural mechanization has rapidly taken off in the last decade and is now being used by a large majority of crop farmers (Belton et al. 2022). As a measure of the costs of mechanization, Table 3 presents the prices for plowing one acre of land by a four-wheel tractor. Farmers report that those costs increased by 42 percent on average during the monsoon of 2023 compared to the previous one, partly reflecting the substantially higher cost of fuel in the country over these two seasons. However, a survey of mechanization service providers during the monsoon of 2023 showed that they faced financial challenges and fears of foreclosure on machinery loans (MAPSA 2023), possibly contributing to further price increases to farmers. The mechanization costs were especially high in coastal areas.

Third, the use of wage labor in agricultural activities is very common in Myanmar. It has been shown that wage levels in the past (before the COVID-19 pandemic) had been increasing fast because of the increasing possibilities of alternative employment in cities and neighboring countries. This partly explains the rapid adoption of agricultural mechanization in the country (Belton et al. 2022). However, this increase in real wages has come to a halt, seemingly due to widespread economic problems because of the political crisis (World Bank 2023). Table 3 shows that the average daily wages of hired labor of men increased in nominal terms by 21 percent and by 24 percent for women this monsoon compared to the one before. However, wages decreased in real terms because of high inflation in the country. MAPSA (2024b) estimated, based on a large food vendor survey in different parts of the country at the same time as the MAPS, that the costs of a typical food basket increased by 35 percent compared to a year earlier, substantially higher than these changes in wages.

We also see large increases in paddy prices, positively impacting the profitability of rice production. Table 3 shows that at the national level average prices for paddy increased by 64 percent (the median shows an increase of 57 percent). Paddy prices were relatively lower in the Delta region, likely reflecting their surplus status, and the coastal areas, possibly because of the major problems in the commercialization of paddy in that area.

Table 3: Input and output prices in paddy rice cultivation, monsoon 2022 and 2023

		Monsoon 2022			Monsoon 2023		
	Unit	National	National	Hills	Dry	Delta	Coastal
Inputs							
Urea price (kg)	Mean	2,352	1,969	2,080	1,990	1,906	1,863
	Median	2,400	1,880	2,000	1,850	1,800	1,600
Costs plowing 1 acre (4-wheel)	Mean	43,968	62,303	67,138	58,683	60,889	83,409
	Median	42,000	60,000	60,000	55,000	60,000	80,000
Daily wage man	Mean	7,448	9,004	9,811	8,438	8,730	10,046
	Median	7454	8,000	10,000	8,000	8,000	10,000
Daily wage woman	Mean	5,896	7,298	8,151	7,047	6,923	7,498
	Median	6,000	7,000	8,000	7,000	7,000	7,000
Output							
Paddy price (kg)	Mean	688	1,125	1,142	1,251	1,052	950
	Median	670	1,053	1,100	1,196	1,005	919

Source: Authors' calculations based on MAPS, monsoon season 2022 (round 3) and monsoon season 2023 (round 5).

4. INPUT USE AND FARM MANAGEMENT PRACTICES

In this section, we look at input and farm management practices used in paddy cultivation, including seeds, agro-chemical and fertilizer use, and labor and mechanization as well as assess overall commercial input expenditures. Rice farmers in Myanmar predominantly rely on their own saved rice seeds from their previous harvest (Table 4). For the monsoon of 2023, 61 percent of the seed planted were own saved seeds, 21 percent of the rice farmers indicated that they bought seeds from agri-input suppliers or the government, while 16 percent bought them from other farmers. Purchased seeds are usually improved seeds. The quality of reused seeds typically worsens the longer they are used by farmers, suggesting that this lower reliance on the market likely leads to lower rice yields overall (Spielman and Kennedy 2016; Denning et al. 2013). We also note strong regional differences in the source of rice seeds. Farmers use less purchased seeds from agri-input retailers or the government in the Coastal areas while rice farmers in the Delta zone rely the most on purchased seeds.

Table 4: Seed use, monsoon 2023

	Unit	National	Hills	Dry	Delta	Coastal
Seed source						
Purchased from agri-input retailer or government	%	20.9	25.1	29.9	14.3	5.1
Purchased from other farmer	%	16.5	14.9	16.9	17.2	16.2
Left over (unused) purchased seed from last year	%	0.4	0.9	0.5	0.2	0.0
Saved (harvested) from last year	%	61.1	57.3	51.8	68.2	75.1
Other	%	1.0	1.7	0.8	0.1	3.7
Total	%	100.0	100.0	100.0	100.0	100.0

Source: Authors' calculations based on MAPS, monsoon season 2023.

Table 5 gives an overview of fertilizer and other agro-chemical use on the largest rice plot in the monsoon of 2023. We see relatively high shares of farmers that use chemical fertilizers and other agro-chemicals, with 90 percent of the farmers using any chemical fertilizer during the 2023 monsoon. Seventy-five percent of the farmers used urea on their largest plot. The share of other types of fertilizers being used is much lower than urea. Thirty percent of the farmers used compound 15-15-15 while other compound fertilizers were used by 11 percent of the farmers in the monsoon of 2023. Organic fertilizers were used by 53 percent, lime/gypsum by 13 percent, herbicides by 46 percent, and other pesticides by 45 percent.

We further note that chemical fertilizer use is widespread in all agro-ecological zones. In the Delta zone, 93 percent of farmers were using chemical fertilizer compared to 79 percent in the Coastal areas. Organic fertilizer use is significantly higher in the Dry Zone (66 percent of rice farmers used it on their largest rice plot), likely linked to the higher prevalence of livestock ownership in that area. The use of lime, gypsum, and herbicide is most prevalent in the Delta region.

Table 5: Agro-chemicals and fertilizer use on paddy rice cultivation, monsoon 2023

	Unit	National	Hills	Dry	Delta	Coastal
Chemical fertilizer						
Any chemical fertilizer	%	89.9	89.2	90.7	92.6	79.0
Urea	%	75.0	69.2	75.8	81.3	62.3
Ammonium sulphate	%	2.2	0.9	2.5	3.3	0.0
Compound 15-15-15	%	30.0	35.3	30.2	32.1	9.0
Other compound combined	%	11.5	15.6	14.0	7.3	8.7
Tsuper	%	9.7	10.2	6.5	12.8	8.2
Potash	%	2.6	2.4	2.0	4.1	0.1
Low quality fertilizer	%	0.3	0.0	0.7	0.3	0.0
Other fertilizer and agro-chemicals						
Organic fertilizer	%	53.5	48.9	65.7	44.6	55.6
Lime - gypsum	%	12.7	5.9	12.3	20.4	1.6
Herbicides	%	45.7	46.8	45.3	53.3	16.0
Other pesticides	%	45.3	47.6	44.2	49.5	28.3

Source: Authors' calculations based on MAPS, monsoon season 2023.

During the monsoon of 2023, rice farmers used 66 kgs of fertilizer per acre on average (Table 6). Urea is the most important fertilizer used on rice, making up 57 percent of all fertilizers used. Fertilizer use on rice differs between regions and states in the country (Table 6). Fertilizer used on rice in the monsoon season is highest in the Delta (72.7 kgs per acre) and lowest in the Coastal areas (26.9 kgs per acre).

Table 6: Chemical fertilizer use in paddy rice cultivation (kgs per acre), monsoon 2023

	Unit	National	Hills	Dry	Delta	Coastal
Urea - kg	mean	38.2	33.4	39.2	44.9	21.3
	median	33.3	25.0	33.3	50.0	14.0
Ammonium sulphate - kg	mean	1.1	0.3	1.1	1.9	0.0
	median	0.0	0.0	0.0	0.0	0.0
Other fertilizer - kg (compound 15-15-15)	mean	15.4	20.5	15.6	15.7	2.2
	median	0.0	0.0	0.0	0.0	0.0
Other fertilizer - kg (other compound combined)	mean	6.4	10.2	8.2	3.6	2.0
	median	0.0	0.0	0.0	0.0	0.0
Other fertilizer - kg (T_super)	mean	4.1	5.7	2.8	5.0	1.3
	median	0.0	0.0	0.0	0.0	0.0
Other fertilizer - kg (Potash)	mean	1.0	1.2	0.8	1.3	0.0
	median	0.0	0.0	0.0	0.0	0.0
Other fertilizer - kg (Low quality - aukkone)	mean	0.2	0.0	0.5	0.1	0.0
	median	0.0	0.0	0.0	0.0	0.0
Total fertilizer - kg	mean	66.5	71.2	68.1	72.7	26.9
	median	50.0	50.0	60.2	62.5	21.7

Source: Authors' calculations based on MAPS, monsoon season 2023.

The MAPS also captures the extent to which rice farmers relied on hired labor, draught animals, and mechanization during the monsoon of 2023 (Table 7). During the monsoon of 2023, only 16 percent of the rice farmers relied exclusively on their own family labor while 84 percent used outside help. On top of their own household labor, 66 percent of rice farmers used solely hired labor, 6 percent used exchange labor, and 12 percent used a combination of hired and exchange labor. Substantial differences are noted over agro-ecological zones with 89 percent of rice farmers in the Dry Zone relying on outside help while farmers in the coastal zones rely more on their own labor. However, outside help is still high, with 77 percent of famers relying on hired labor. In contrast with other zones, we see relatively more reliance on exchange labor in the Hills. In the Delta area, 81 percent of rice farms relied on hired labor. Transplanting of rice, that typically is very labor intensive, was done by 46 percent of the rice farmers. Its practice is most prevalent in coastal areas (64 percent of the rice farmers).

Rice farmers in Myanmar rely heavily on mechanization for their rice farm activities. Draught animals have traditionally been very important in rice cultivation but were only used by 37 percent of rice farmers. Draught animals are still important in the Dry Zone where 68 percent of the rice farmers used them. Nationally, 85 percent of farmers used a tractor for plowing plots and about half of the farmers used combine-harvesters to harvest paddy. Combine-harvesters are relatively less used in the Hills and Mountains, likely due to the higher share of upland rice cultivation making it more difficult for combine-harvesters to move around there. Most rice farmers relied on mechanization service providers for plowing, but it is noteworthy that 28 percent used their own tractor for plowing.

Table 7: Labor use and mechanization in paddy rice cultivation, monsoon 2023

	Unit	National	Hills	Dry	Delta	Coastal
Non-family labor						
Hired	%	66.2	51.5	66.2	74.7	69.4
Exchange	%	6.2	10.2	9.7	1.6	2.1
Both	%	12.0	24.2	13.4	4.6	5.5
No	%	15.6	14.1	10.6	19.0	23.0
Draught animals						
Hired	%	11.3	7.6	20.8	4.1	14.4
Own	%	24.1	14.2	44.1	11.5	26.5
Both	%	1.9	1.7	3.5	1.0	0.6
No	%	62.7	76.5	31.7	83.5	58.5
Seeding methods						
Transplanting	%	46.1	53.3	55.3	28.4	63.8
Broadcasting	%	36.8	30.0	25.6	54.3	26.3
Row planting	%	10.2	13.3	15.2	4.8	6.3
Combination	%	6.8	3.5	3.9	12.5	3.5
Tractor for plowing						
Hired	%	53.9	44.9	56.2	57.5	53.8
Own	%	27.9	37.6	20.7	30.7	18.8
Both	%	3.5	3.2	3.3	4.9	0.0
No	%	14.7	14.4	19.8	6.8	27.4
Combine-harvester						
Hired	%	46.7	26.7	41.8	71.9	17.2
Own	%	1.4	0.8	1.2	2.0	0.9
No	%	52.0	72.5	57.0	26.0	81.9

Source: Authors' calculations based on MAPS, monsoon season 2023.

Table 8 shows how input use and adoption practices of major agricultural technologies in paddy cultivation have changed over the last four monsoons. Seemingly linked to the price declines of fertilizer (as well as higher paddy prices), we see a substantial increase, of 20 percent on average, in the amount of chemical fertilizer used between the two last monsoon seasons. Fertilizer use is now almost back to the level of 2020. We also note substantial changes in seed use and rice seedling technologies over time. It is concerning that farmers increased their reliance on their own saved seeds, with improved seeds delivered by private or public institutions becoming much less important. The high prices of paddy rice have seemingly led to the increasing dis-adoption of the labor-saving - but yield reducing - direct seeding (broadcasting) technology. It was in 2023, 7 percentage points lower than in 2020. Finally, little change is seen in the use of tractors for plowing, but we note a substantial reduction in the use of combine harvesters in the last two years (60 percent of the paddy farmers 2020 but only 48 percent in 2023.

Table 8: Changes in input use and management practices in paddy cultivation on largest rice plot, monsoon 2020 to 2024

	Unit	2020	2021	2022	2023
Saved (harvested) seed from last year	%	43.8	50.3	55.4	61.1
Chemical fertilizer use	kgs/acre	68.0	59.3	55.4	66.5
Broadcasting	%	43.9	44.8	43.6	36.8
Tractor for plowing	%	85.3	85.8	82.4	85.3
Combine-harvester	%	59.8	59.9	49.4	48.0

Source: Authors' calculations based on MAPS, monsoon season 2023, 2022, 2021.

Finally, we assess overall (commercial) input expenditures on paddy rice. Commercial input expenditures might give a good indication of the intensity of input use in rice production.[7] Table 8 shows that input expenditures per acre increased on average by 26 percent, and by 24 percent using the median, during the 2023 monsoon compared to the previous one. The highest input expenditures per acre were noted in the Hills and Mountains and the Dry Zone (Table 9). Input expenditures were lowest in coastal areas.

Table 9: Monetary input expenditures (MMK/acre) on paddy rice

	Monsoon 2022	Monsoon 2023				
	National	National	Hills	Dry	Delta	Coastal
Mean	306,019	384,718	408,742	408,515	374,795	285,140
Median	270,000	335,000	350,000	375,000	333,333	250,000

Source: Authors' calculations based on MAPS, monsoon season 2023 (round 5) and monsoon season 2022 (round 3).

5. NATURAL AND OTHER SHOCKS

Agriculture is a risky business. Climatic shocks are generally important risks in agricultural production.[8] When asked about the incidence of natural or other production shocks, 34 and 30 percent of the rice farmers indicated that they were negatively impacted by at least one of these shocks in 2022 and 2023 respectively. Weather events were therefore seemingly not favorable for agricultural production in 2022 and 2023 in general. However, the shocks reported over these two years were different. Drought negatively impacted 12 percent of rice farmers in 2022 while 5 percent were impacted in 2023. There were more complaints in 2023 of floods (7 percent in 2023; 3 percent in 2022) and heavy rains (8 percent in 2023; 4 percent in 2022). Incidences of pests, diseases, and weeds have the highest frequency overall. They were mentioned by 13 percent of the rice farmers in 2023, similar as in the previous monsoon.

Shocks have impacted rice farmers differently across agro-ecological zones and states/regions (Table 9). Cyclone Mocha – a category 4 tropical cyclone – made landfall in Myanmar in the middle of May 2023, causing widespread damage especially in Rakhine, Chin, Magway, Sagaing, and Kachin. While this cyclone hit Myanmar before the onset of the monsoon of 2023, some of these areas were still affected by the aftermath of that cyclone during rice cultivation in 2023. Moreover, heavy monsoon rains in August and October 2023 caused severe flooding in several states and regions in the country. It is estimated that about 100,000 acres of paddy were destroyed due to the flooding in Bago (OCHA 2023). The impacts of floods and heavy rain were worse in the coastal zone where 15 and 13 percent respectively of the farmers were negatively affected. As a comparison, only 6 and 5 percent respectively of farmers in the Hills and Mountains were negatively affected by floods or heavy rain. In the Dry Zone, 15 percent of farmers were negatively impacted by drought during the monsoon of 2022 and 9 percent during the monsoon season of 2023 (Table 9).

[7] There are likely a number of issues with the measurement of input expenditures in MAPS. First, we only rely on monetary input expenditures. This is an imperfect way of assessing inputs into rice production as there are a number of non-monetary inputs going into rice production as well, such as family labor, organic fertilizer, and animal traction. Second, monetary input expenditures were approximated by farmers asking for a simple measure of what they spent on their largest rice plot. This might have been complicated to answer for farmers given that a number of inputs are bought in bulk and getting at the exact costs for a plot might therefore have been wrongly evaluated. Coming with a single number at once – combining all costs of fertilizer, agro-chemicals, mechanization, and hired labor – might also have been problematic. It is therefore likely that there is measurement error in this variable and a caveat for further analysis.

[8] It is expected that such climatic shocks will increase in the future. Myanmar is seen as one of the countries most affected by climate change globally (IFRC 2022).

Table 10: Natural and other production shocks faced by rice farmers

	Unit	National	Hills	Dry	Delta	Coastal
			Monsoon 2022			
Crop negatively affected by any shock	%	33.7	28.7	32.0	37.5	39.6
If yes, which one?						
Drought	%	12.2	6.5	14.8	10.7	25.7
Poor access to irrigation water	%	1.1	1.1	1.6	0.4	3.1
Irregular rain	%	5.7	3.7	4.5	8.1	5.9
Heavy rains	%	4.2	6.9	3.6	3.6	1.0
Floods	%	3.2	4.5	2.1	3.0	4.8
Flash floods	%	0.2	0.4	0.1	-	1.2
Extreme temperature	%	0.5	0.2	0.2	0.4	3.0
Pest, diseases, weeds	%	13.3	9.6	11.7	18.2	9.9
Damage by animals	%	1.7	2.4	0.0	2.9	1.3
Damaged by rats	%	3.1	1.9	4.8	2.8	0.7
Storm	%	0.5	0.4	-	1.0	1.3
Others	%	1.0	1.5	0.8	0.7	1.8
			Monsoon 2023			
Crop negatively affected by any shock	%	29.6	25.4	29.3	29.7	40.4
If yes, which one?						
Drought	%	4.8	3.3	9.0	3.1	0.9
Poor access to irrigation water	%	0.6	0.2	1.4	0.4	-
Irregular rain	%	2.8	2.0	3.3	3.6	0.2
Heavy rains	%	7.6	5.1	8.0	7.4	13.3
Floods	%	7	6.2	4.7	8.3	14.9
Flash floods	%	0.7	0.3	0.4	1.3	0.7
Extreme temperature	%	0.1	0.2	-	0.1	0.2
Pest, diseases, weeds	%	13.3	11.5	10.7	13.8	25.0
Damage by animals	%	2.0	1.4	0.8	3.6	1.3
Damaged by rats	%	1.3	1.0	1.5	1.7	-
Storm	%	1.7	1.1	1.1	0.6	9.3
Others	%	0.7	1.5	0.2	0.5	0.7

Source: Authors' calculations based on MAPS, monsoon season 2023.

6. RICE PRODUCTIVITY AND PROFITABILITY

National yields – based on reported yields of the largest plot – averaged 1,240 kgs per acre or 3.1 tons per hectare for the monsoon of 2023 (Table 10). Compared to the monsoon of 2022, we note an increase in yields of 7 percent on average. We see big increases in yields in Ayeyarwady (+11 percent) and Nay Pyi Taw (+17 percent). The biggest increase is noted in Rakhine state where productivity increased by 28 percent. However, the state had a large drop last year and is now back to the yield levels of two years ago. For the Dry Zone and Delta overall, we note a yield increase of 6 and 7 percent respectively. Yields stayed low in Chin and Kayah, two states with high levels of conflict. Rice farmers in Mon State saw a substantial decrease in yields in 2023. The highest yields, along with notable increases over the past three years, are observed in Nay Pyi Taw.

Table 11: Paddy rice yields on the largest plot (kgs/acre), monsoon 2020 to 2024

	2020		2021		2022		2023	
	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Kachin	1,496	1,568	1,319	1,254	1,228	1,254	1,263	1,254
Kayah	1,092	948	1,014	941	902	652	921	836
Kayin	1,232	1,254	1,264	1,254	1,190	1,045	1,173	1,045
Chin	988	896	845	980	810	557	832	752
Sagaing	1,404	1,393	1,406	1,393	1,280	1,359	1,371	1,393
Tanintharyi	1,129	1,150	1,060	1,045	1,098	1,087	1,015	1,045
Bago	1,401	1,393	1,343	1,359	1,203	1,254	1,307	1,314
Magway	1,470	1,463	1,503	1,463	1,322	1,359	1,403	1,428
Mandalay	1,465	1,463	1,450	1,463	1,341	1,393	1,338	1,359
Mon	1,106	1,045	1,212	1,150	1,026	1,045	834	836
Rakhine	1,251	1,115	1,275	1,189	940	836	1,199	1,045
Yangon	1,198	1,115	1,172	1,069	1,132	1,045	1,123	1,080
Shan	1,172	1,045	1,165	1,045	1,181	1,045	1,145	1,045
Ayeyarwady	1,201	1,045	1,142	1,045	1,139	1,045	1,270	1,254
Nay Pyi Taw	1,355	1,463	1,408	1,393	1,442	1,493	1,691	1,672
Hills	1,216	1,170	1,187	1,087	1,174	1,045	1,151	1,045
Dry	1,429	1,418	1,438	1,463	1,312	1,372	1,391	1,428
Delta	1,277	1,254	1,232	1,229	1,158	1,115	1,240	1,254
Coastal	1,224	1,115	1,229	1,176	967	836	1,173	1,045
Area-weighted national average*	1,285		1,257		1,169		1,240	

*: Using the cultivated areas of MoALI of 2020.
Source: Authors' calculations based on MAPS.

To understand associates of paddy rice yields, we run a regression in which we try to explain differences in yields between paddy farmers based on the quality of the soil, inputs used in the production process, shocks that the farmer faced, location of the farmer, as well as the characteristics of the farmer. The results are presented in Table 12. We use the logarithm of yields as the dependent variable, allowing interpretation of dummies as percentage effects. The major findings are the following.

First, land quality is a major associate of paddy yields. Paddy grown on lowlands has the highest yields while paddy grown on very steep upland slopes have the lowest. Yields on the former were 72 percent higher in 2023 compared to very steep plots. Lowland yields are 10 percent higher than deepwater fields and 15 percent higher than (flat) upland plots. Poor quality soils – as reported by farmers - show yields that are 25 percent lower. Salinity problems are associated with yields that are

17 percent lower while acidity and iron toxicity – as judged by the farmers – have no significant effect on paddy yields.

Second, input expenditures – such as fertilizer, mechanization, agro-chemicals but also other commercial inputs - used in the paddy production process matter enormously. A doubling of input expenditures is associated with 22 percent higher yields. More working members in the household also increase yields. Direct seeding techniques are significantly associated with six percent lower yields, ceteris paribus.

Third, weather shocks have enormous negative impacts. A reported drought by the farmer reduces yields by 51 percent while floods reduce them by 32 percent. As found in previous assessments in Myanmar, it seems that droughts have especially devastating effects on paddy yields (MAPSA 2022). Heavy rain, and pests and diseases reduce yields by 16 percent and 13 percent respectively.

Table 12: Associates of paddy rice yields on the largest plot – log (kgs/acre), monsoon 2023

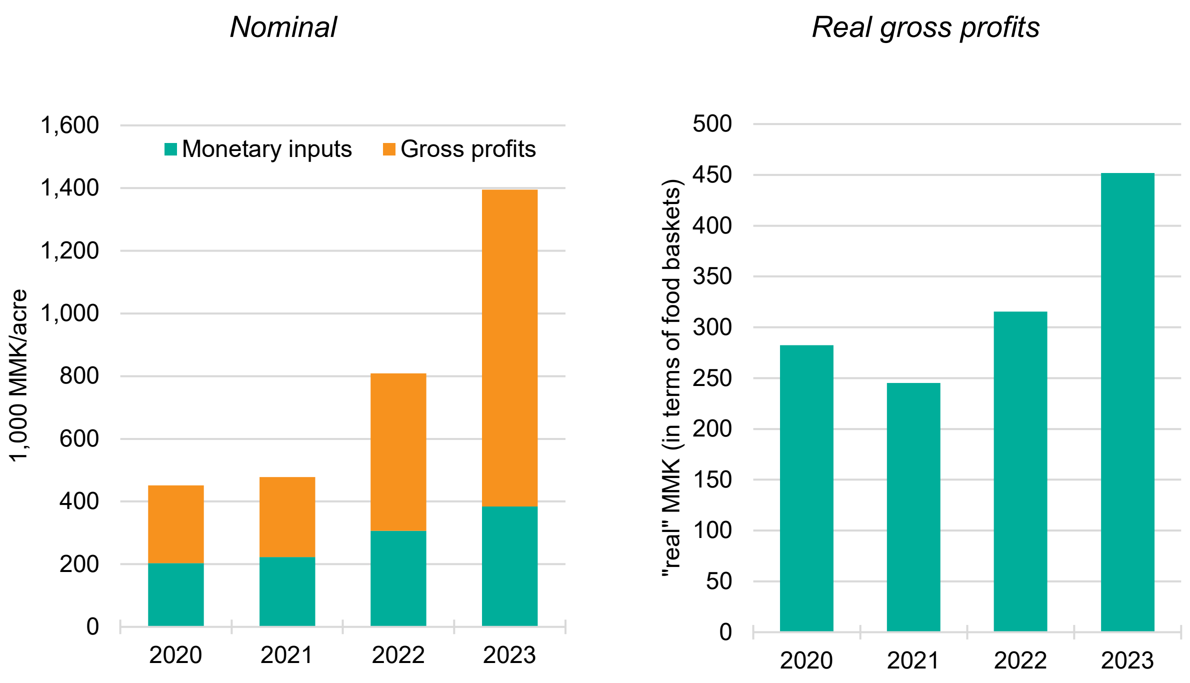
	Unit	Coefficient	t-value	Significance
Land quality				
Land type (default=very steep)				
Upland gentle slope	yes=1	0.51	2.64	***
Upland – flat	yes=1	0.57	3.06	***
Low land	yes=1	0.72	4.05	***
Deepwater	yes=1	0.62	2.87	***
Fertility soil (default = good)				
Fair	yes=1	-0.09	-3.61	***
Poor	yes=1	-0.25	-4.91	***
Soil problems				
Salinity	yes=1	-0.17	-2.37	**
Acidity	yes=1	0.04	1.15	
Iron toxicity	yes=1	0.02	0.49	
Inputs				
Direct seeding	yes=1	-0.06	-2.48	**
Working household members	Log (number)	0.06	1.66	*
Input expenditures	Log (value)	0.22	11.18	***
Weather shocks				
Drought	yes=1	-0.51	-7.37	***
Flood	yes=1	-0.32	-5.22	***
Heavy rain problem	yes=1	-0.16	-3.16	***
Pests and diseases	yes=1	-0.13	-3.27	***
State/region dummies included		yes		
Household characteristics included		yes		
Intercept		3.49	11.02	***
Number of observations		2,737		
R2		0.26		

Significance: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$
Source: Authors' calculations based on MAPS.

In MAPS, we do not have good data on changes in rice area cultivated during the monsoon of 2023 per state or region and therefore rely on alternative area estimates of rice production at the national level. Using area assessments, relying on satellite data, by the Asian Disaster Preparedness Center (ADPC) for all major rice producing areas in the country - the states/regions Chin, Kachin, Nay Pyi Taw, and Tanintharyi are not included in their assessment - and yield data from the MAPS data[9], rice production is estimated to have increased by 5 percent (ADPC 2024). USDA (2024) estimates a national production increase of 1 percent.

We also assess how gross profits have changed over the last four monsoons, combining data from average yields, paddy prices, and commercial expenditures per acre over these periods. We see a significant improvement for (nominal) gross revenues per acre in the most recent monsoon (2023): they increased by 73 percent compared to 2022 and are three times as high compared to 2020 (Figure 3). As commercial expenditures increased by 28 percent over the last year, gross profits - reflecting rewards for family farm labor and the use of land - for rice farmers doubled from 2023 to 2022. While profits doubled in nominal terms, price inflation has however been high in the country (MAPSA 2024b) and real profit increased by much less. Real – in terms of the costs of an average food basket (MAPSA 2024b) – profits from rice farming during the monsoon of 2023 increased by 43 percent compared to the monsoon of 2022 and by 84 percent compared to 2021 (Figure 3).

Figure 3: Gross nominal revenue and real - in terms of the cost of an average food basket - profits per acre in paddy production, monsoon 2020, 2021, 2022, and 2023



Source: Authors' calculations based on MAPS, monsoon season 2023 (round 5), monsoon 2022 (round 3), and monsoon season 2021 and 2020 (round 1).

[9] However, it is to be noted that we lack good data on yields on all rice plots and caution in interpretation is therefore needed.

7. CONCLUSIONS AND IMPLICATIONS

We have analyzed rice productivity and profitability data for the 2023 monsoon season from the Myanmar Agriculture Performance Survey (MAPS), conducted at the beginning of 2024. This survey encompassed plots managed by 2,840 rice producers, distributed across all states/regions of the country. Our findings reveal:

1. **National rice productivity exhibited an average increase of 7 percent during the 2023 monsoon compared to the previous year**, reversing the decline witnessed in the 2022 monsoon. This year's heightened productivity primarily stems from increased input usage (particularly fertilizer), greater labor inputs (with more farmers adopting transplanting), and reduced occurrences of natural shocks, notably droughts.

2. **The Ayeyarwady region, the country's principal rice-producing area, experienced an 11 percent increase in rice productivity.** Conversely, rice yields remained low in Kayah and Chin, two states affected by severe conflict. The highest yields, along with notable increases over the past three years, are observed in Nay Pyi Taw.

3. **Significant changes in input costs for rice cultivation were observed between the two seasons:**

    3.1 Prices of urea, the most important chemical fertilizer used by rice farmers, decreased by 16 percent.

    3.2 Mechanization costs surged by a notable 42 percent, raising concerns, especially in light of escalating rural labor scarcity. Particularly pronounced increases in mechanization costs were noted in coastal areas where fuel prices were high, or fuel was not available at all.

4. **Substantial changes in technology adoption and input utilization compared to the previous monsoon were noted:**

    4.1 Fertilizer use on rice increased by 20 percent.

    4.2 Use of self-preserved seed – instead of obtaining it from the market - increased by 6 percentage points compared to last monsoon, and 17 percentage points compared to 2020.

    4.3 Transplanting increased by 5 percentage points while broadcasting declined by 7.

    4.4 The use of combine harvesters on rice was reduced by 1 percentage points compared to last year but was 12 percentage points lower than in 2020.

5. **Thirty percent of paddy farmers reported being impacted by climatic or other production shocks during this monsoon**, with floods (reported by seven percent of farmers) and droughts (reported by five percent) having significant adverse effects on yields. When affected, paddy yields decreased by 32 and 51 percent, respectively.

6. **Substantial changes in input usage and technology adoption were observed in paddy cultivation within coastal areas (Rakhine and Tanintharyi), seemingly linked to insecurity, mobility constraints, and fuel accessibility issues:**

    6.1 Fertilizer use declined by one-third.

    6.2 The utilization of combine harvesters plummeted by 26 percentage points.

7. **Paddy prices at the farm level surged by 64 percent**, reflecting changes in international rice prices as well as the depreciation of the MMK.
8. **Real – in terms of the cost of an average food basket – profits from rice farming during the monsoon of 2023 increased by 43 percent compared to the previous year.** While nominal profits doubled since the previous monsoon, high price inflation tempered the increase in real profits.
9. **The paddy sector has proven resilient in 2023**, with improved pricing incentivizing farmers to intensify production through increased usage of chemical fertilizers and labor inputs.

The outlook for paddy production in 2024 appears promising yet uncertain due to the following factors:

1. **Weather conditions:** Adverse weather, as witnessed during the 2023 monsoon, can significantly impact yields. Most models predict the El Niño conditions - with drier-than-average rainfall conditions - to continue weakening.[10]
2. **Evolution of insecurity:** Insecurity correlates with reduced access to inputs and, when accessible, higher costs, thereby lowering profitability for farmers.
3. **Labor scarcity:** Labor availability is expected to become increasingly constrained in the next monsoon due to significant out-migration linked to the Military Service Law.
4. **Fuel availability:** A quarter of Myanmar's farmers reported limited access to fuel during the post/pre-monsoon season of 2024, complicating irrigation, and agricultural mechanization, which is typically relied upon by most rice farmers.

These findings underscore three primary implications for Myanmar's rice sector:

1. **Ensuring adequate access to mechanization for rice farmers:** Despite benefiting from increased mechanization over the past decade, there is a concerning trend of dis-adoption in combine harvester usage, attributed to mobility issues and fuel accessibility problems. This is particularly worrisome given the anticipated rise in rural labor scarcity.
2. **Emphasizing access to climate-resilient seeds:** While farmers are increasingly relying on self-preserved paddy seeds, there is a pressing need for the adoption of improved, high-yielding, and stress-resistant varieties. As evidenced by our results, farmers affected by floods and droughts experience significantly lower yields than unaffected farmers. Given an expected increase of weather shocks, higher adoption of adapted seeds is required.
3. **Addressing the impact of high rice prices on food security:** While beneficial for farmers, elevated paddy prices contribute to high rice prices in the country, posing a significant concern, especially for the most vulnerable segments of the population.[11] The most effective means of mitigating the adverse effects of high rice prices on poor consumers is through expanded safety net programs, providing additional liquidity directly to them.

[10] http://asmc.asean.org/asmc-el-nino#Seasonal_Outlook

[11] The high paddy prices are associated with high rice prices (which increased by 62 percent in early 2024 compared to a year earlier), leading to significant food price inflation in the country. It is estimated that the cost of a commonly consumed diet increased by 37 percent in the beginning of 2024 compared to a year earlier, increasingly exacerbating food security problems in the country.

REFERENCES

Belton, B., Win, M.T., Zhang, X. and Filipski, M. 2022. "The rapid rise of agricultural mechanization in Myanmar." *Food Policy*, *101*, p.102095.

ADPC (Asian Disaster Preparedness Center). 2024. Rice Area and Production Estimates for the 2023 Monsoon Season. Downloaded on May 15th, 2024 from https://servir.adpc.net/publications/

CSO (Central Statistical Office), UNDP (United Nations Development Programme), WB (The World Bank). 2019. "Myanmar Living Conditions Survey 2017: Technical report". Yangon, Myanmar.

Denning, G., Baroang, K., Sandar, T.M., et al. 2013. Rice Productivity Improvement in Myanmar, Paper prepared for USAID/Burma under contract GDG-A-02-000921-0 with Michigan State University (MSU) as background for the "Strategic Agricultural Sector and Food Security Diagnostic for Myanmar."

DoP (Department of Population at the Ministry of Labour, Immigration, and Population), UNFPA (United Nations Population Fund). 2020. The 2019 Inter-Censal Survey: Key findings. December 2020.

Hebebrand, C., Laborde, D. 2023. "High fertilizer prices contribute to rising global food security concerns". IFPRI blog. April 22nd, 2023. https://www.ifpri.org/blog/high-fertilizer-prices-contribute-rising-global-food-security-concerns

Lambrecht, I., Mahrt, K. and Cho, A. 2022. *Women and youth in Myanmar agriculture.* International Food Policy Research Institute Working Paper no 2071. Washington DC: International Food Policy Research Institute

Lambrecht, I., Van Asselt, J., Headey, D., Minten, B., Meza, P., Sabai, M., San, T.S., Win, H.E. 2023. Can phone surveys be representative in low-and middle-income countries? An application to Myanmar. Plos One, 18(12), p.e0296292.

MAPSA. 2022. "Rice productivity in Myanmar: Assessment of the 2021 monsoon and outlook for 2022". MAPSA Working Paper 19.

MAPSA. 2023. "Monitoring the Agri-food System in Myanmar: Mechanization service providers – July 2023 survey round". MAPSA Research Note 98.

MAPSA. 2024a. "Livelihoods and Welfare: Findings from the sixth round of the Myanmar Household Welfare Survey (June – November 2023)". MAPSA Working Paper 53.

MAPSA. 2024b. "The rising costs of diets and declining purchasing power of casual wage laborers: December 2021 – November 2023". MAPSA Research Note 105.

OCHA. 2023. Myanmar Humanitarian Update No. 34, 10 November 2023.

Rice, B., and Vos, R. 2024. Who is afraid of high fertilizer prices? IFPRI Blog at https://www.ifpri.org/blog/whos-afraid-high-fertilizer-prices.

Spielman, D.J. and Kennedy, A. 2016. Towards better metrics and policymaking for seed system development: Insights from Asia's seed industry. *Agricultural Systems*, *147*, 111-122.

USDA (United States Department of Agriculture). 2024. *Burma: Grain and feed annual*. Report number BM2024-0005. Washington, DC: USDA.

World Bank. 2023. *Myanmar Economic Monitor: Challenges amidst Conflicts.* Washington DC: World Bank.

ACKNOWLEGEMENTS

This work was undertaken as part of the Feed the Future Myanmar Agricultural Policy Support Activity (MAPSA) led by the International Food Policy Research Institute (IFPRI) in partnership with Michigan State University (MSU). This study was made possible by the support of the American people through the United States Agency of International Development (USAID), under the terms of Award No. AID-482-IO-21-000x. This publication has not gone through IFPRI's standard peer-review procedure. The opinions expressed here belong to the authors, and do not necessarily reflect the views of USAID, IFPRI, MSU, or the United States Government.

INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE

1201 Eye St, NW | Washington, DC 20005 USA
T. +1-202-862-5600 | F. +1-202-862-5606
ifpri@cgiar.org
www.ifpri.org | www.ifpri.info

IFPRI-MYANMAR

IFPRI-Myanmar@cgiar.org
www.myanmar.ifpri.info

The Myanmar Strategy Support Program (Myanmar SSP) is led by the International Food Policy Research Institute (IFPRI) in partnership with Michigan State University (MSU). Funding support for Myanmar SSP is provided by United States Agency for International Development (USAID). This publication has been prepared as an output of Myanmar SSP. It has not been independently peer reviewed. Any opinions expressed here belong to the author(s) and do not necessarily reflect those of IFPRI, MSU, USAID, or CGIAR.

IFPRI is a CGIAR Research Center | A world free of hunger and malnutrition.