MYANMAR

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Rice productivity in Myanmar

Assessment of the 2022 dry season and farmers' expectations for the monsoon of 2022

Key findings

We analyze rice paddy input and productivity data for the dry seasons of 2021 and 2022 and explore farmers' expectations for the monsoon of 2022, based on the Myanmar Agriculture Performance Survey (MAPS) fielded in the period of August 22nd to September 15th, 2022. The survey covered plots of 678 rice paddy producers. It is found that:

- Prices for most inputs used in paddy production increased significantly between these two growing seasons. Paddy prices at the farm also increased by 42 percent, much in line and even higher than some input costs, giving relief to most paddy farmers. In the monsoon season of 2021, paddy prices did not follow the increasing trends in input prices, jeopardizing incentives and profitability of paddy production.
- Rice farmers increased input expenditures on paddy production by 15 percent compared to last year. Most input use was similar to a year earlier, e.g., fertilizer use on paddy only declined by 6 percent despite a 51 percent increase in prices. Because of the relatively small declines in input use, only relatively small reductions are seen in rice productivity during the dry season of 2022 on farmers' largest rice plot.
- The majority of farmers expect paddy production during the 2022 monsoon season to be lower this year compared to the previous year because of substantially lower fertilizer use. Prices have increased further due to the war in Ukraine. During the monsoon season in July 2022, urea prices were almost twice as high than a year earlier. This was coupled with worse weather conditions (especially higher incidences of floods).
- Farmers residing in insecure areas expect worse paddy production this monsoon as they reduced fertilizer use more substantially than the ones in more secure environments.

Recommended actions

- Paddy farmers are cutting back on fertilizer use. To assure further resilience of the paddy sector, farmers would benefit from support to their agricultural operations, potentially through agricultural cash programs and through expanded agricultural extension on the more efficient and appropriate use of fertilizer given the increasing prices and scarcity.

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Introduction

Rice is an extremely 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.[1] Large international changes in commodity markets and twin local crises – COVID-19 and political problems due to the military take-over – have raised doubts on the performance of the agricultural sector overall and the rice sector in particular. The assessment on farmers' rice productivity during the dry season of 2022 presented in this research note is based on data from the Myanmar Agriculture Performance Survey (MAPS) that was conducted with 678 rice producers, spread over all states/regions of the country, over the period August 2022 – September 2022. 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 dry season of 2021 and 2022.[2] This research note presents the results from that assessment.

Data

The Myanmar Agricultural Performance Survey (MAPS) is a sub-sample of 12,128 households interviewed by phone during the third round of the Myanmar Household Welfare Survey (MHWS) that was fielded in the middle of 2022 (MAPSA 2022a). 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 5,021 households that were identified as crop farmers in the MHWS. This survey was implemented by phone by Myanmar Survey Research (MSR) over the period August 22nd until September 15th, 2022. Of the 5,021 crop farmers interviewed in the second round of MAPS, a relatively small share of crop farmers - 13 percent of the interviewed crop producers or 678 farmers cultivated rice in the 2022 dry season (Table 1). The majority of the interviewed paddy farmers reside in the Ayeyarwady (226 farmers) and Bago (106 farmers) regions, reflecting the importance of these regions in paddy production during the dry season period.[3] Both regions combined produced about three-quarters of total paddy output in the dry season of 2021.[4]

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

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

[3] Covering the post- and pre-monsoon period, or winter and summer crops, typically crops that are harvested between February and July.

[4] As reported by the Ministry of Agriculture, Livestock and Irrigation.

Table 1: Sample rice farmers, MAPS

	Crop farmers	Rice Farmers 2021	2022
Kachin	159	8	5
Kayah	60	6	2
Kayin	150	29	25
Chin	95	3	4
Sagaing	794	76	99
Tanintharyi	101	5	5
Bago	487	104	106
Magway	511	33	36
Mandalay	609	74	63
Mon	113	8	9
Rakhine	270	3	3
Yangon	177	52	44
Shan	721	30	24
Ayeyarwady	683	235	226
Nay Pyi Taw	91	16	27
Hills	1185	76	60
Dry	2005	199	225
Delta	1460	399	385
Coastal	371	8	8
Total	5021	682	678

Source: Authors' calculations based on MAPS, round 2

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 (MAPSA 2022b). In this research note, we focus in particular on the information that was collected on the biggest rice plot of rice producers in the dry season of 2021 and 2022. 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 678 households, caution is warranted in interpretation and extrapolation to national and state/region-wide rice production as we only collected information on the largest rice plot.

We divide the country into four major agro-ecological zones that are commonly used in Myanmar and present (some of the) results at that level.[5] The average farm size of the interviewed rice farmers was 5.5 acres (Table 2). The biggest rice farms are seen in the Delta region (6.7 acres) while farms in the Hills and Mountains and Coastal agro-ecological zones are substantially smaller (2.9 and 3.0 acres respectively). Nationally, the size of the largest plot was on average 1.2 acres while the median was 1. The large majority of rice plots at the national level during the dry season are situated in the lowlands (96 percent).

Table 2: Descriptive statistics of rice farmers, MAPS

		Dry Season 2022				
	Unit	National	Hills	Dry	Delta	Coastal
Total number of rice farmers	Number	678	60	225	385	8
Background rice farm						
Average size rice farm - mean	Acres	5.5	2.9	3.7	6.7	3.0
Size largest plot - mean	Acres	1.2	1.2	1.2	1.2	0.5
Size largest plot - median	Acres	1.0	0.5	1.0	1.0	0.4
Land type largest plot						
Upland	%	3.6%	11.1%	5.5%	1.3%	31.0%
Lowland	%	96.4%	88.9%	94.5%	98.7%	69.0%

Source: Authors' calculations based on MAPS, round 2

[5] Delta (Ayeyawaddy, Bago, Mon, Yangon); Coastal (Rakhine, Tanintharyi); Central Dry (Mandalay, Magwe, NPT, Sagaing); Hills and Mountains (Chin, Kachin, Kayah, Kayin, Shan).

Incentives for rice cultivation – input and output prices

Input prices for rice farmers have changed substantially over the last two seasons (Table 3). First, chemical fertilizer prices – as measured by the price of urea, the most important fertilizer used by rice farmers - increased by 51 percent on average (the median by 50 percent) during the dry season of 2022 compared to a year earlier. These high fertilizer price increases were mostly driven by international price changes, by the depreciation of the local currency, and increased fuel and transportation costs locally.

Second, Table 3 also presents the prices for plowing 1 acre of land by a four-wheel tractor. Paddy farmers report that those costs have increased by 29 percent on average, mostly reflecting the higher costs of fuel in the country over these two seasons. However, a survey of mechanization service providers during the monsoon of 2021 showed that they faced financial challenges and fears of foreclosure on machinery loans due to the worsening demand in the country overall (MAPSA 2022c), possibly contributing to further price increases to farmers.

Third, average daily wages of hired labor – widely used by paddy farmers - of men and women increased by 16 and 14 percent respectively. While wages increased slightly in nominal terms, wages decreased in real terms given the high price inflation in the country (MAPSA 2022d).

We also see substantial increases in paddy prices. Table 3 shows that at the national level average prices for paddy increased by 42 percent (the median changed by 45 percent). In contrast to the most recent monsoon season (MAPSA 2022f), paddy prices increased significantly after the dry season and farmers' profit are therefore less squeezed than they were in the monsoon when paddy prices increased little while input costs raised substantially. This price development improves incentives and profitability of paddy farming compared to the monsoon season before.

Table 3: Input and output prices in paddy rice cultivation, dry season 2022 and 2021

		Dry Season		% change
	Unit	2021	2022	
Inputs				
Urea price (kg)	Mean	1,173	1,769	50.9
	Median	1,200	1,800	50.0
	Nr. Obs	592	590	
Costs plowing 1 acre (4-wheel)	Mean	32,005	41,435	29.5
	Median	34,000	40,000	17.6
	Nr. Obs	444	450	
Daily wage man	Mean	6084	7082	16.4
	Median	6000	7000	16.7
	Nr. Obs	678	674	
Daily wage woman	Mean	4,639	5,295	14.1
	Median	4,500	5,000	11.1
	Nr. Obs	676	672	
Output				
Paddy price (kg)	Mean	329	468	42.2
	Median	330	478	44.9
	Nr. Obs	634	623	

Source: Authors' calculations based on MAPS, round 2

Input use

Table 4 gives an overview of average fertilizer use on the largest rice plot in the two last dry seasons. During the dry season of 2022, rice farmers used 71 kgs of fertilizer per acre on average (Table 4). Despite the relatively large price increases of fertilizers, we only see a small decline, of 6 percent on average, in the amounts of chemical fertilizer used between the two seasons, suggesting that chemical fertilizer is seen by farmers as a priority input for rice productivity. The median declined by 11 percent. The lower than expected decline is seemingly because the majority of fertilizers used in

the dry season were already bought before the war in Ukraine started and the extra price increase therefore came after use in the dry season harvest.[6] It is also to be noted that fertilizer use is higher during the dry season than during the monsoon – e.g., paddy farmers used 59 kgs per acre on average in the last monsoon (MAPSA 2022f). As paddy production is often done under irrigated conditions in the dry season – and therefore more predictable given less uncertainty with rainfall patterns – returns to fertilizer use is typically more certain during that period and farmers therefore tend to use more.

Table 4: Chemical fertilizer use in paddy cultivation (kgs per acre)

		Dry Season	
	Unit	2021	2022
Urea - kg	mean	50.0	44.8
Ammonium sulphate - kg	mean	0.5	0.9
Other fertilizer - kg (compound 15_15_15)	mean	9.7	8.4
Other fertilizer - kg (other compound combined)	mean	7.4	8.9
Other fertilizer - kg (T super)	mean	6.3	5.6
Other fertilizer - kg (Potash)	mean	1.2	1.1
Other fertilizer - kg (Low quality - aukkone)	mean	0.2	0.9
Total fertilizer – kg	mean	75.3	70.6
	median	75.0	66.7

Source: Authors' calculations based on MAPS, round 2

The MAPS also captures the extent to which rice farmers relied on hired labor, draught animals, and mechanization during the dry seasons of 2021 and 2022 (Table 5). We see surprisingly few differences over time and most rice farms relied on similar labor arrangements over the two seasons. During the dry season of 2022, only 24 percent of rice farmers relied exclusively on their own family labor and 76 percent used outside help, indicating the importance of outside labor for paddy farms. Compared to the dry season of 2021, the share of rice farmers solely relying on family labor increased by 3 percent.

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 used only by 15 percent of rice farmers in the dry season. Nationally, 92 percent of farmers used a tractor for plowing plots and 86 percent combine-harvesters to harvest paddy, even higher than in 2021. Most rice farmers relied on mechanization service providers for plowing but it is noteworthy that 31 percent used their own tractor for plowing, a slightly higher percentage than a year earlier. Again, we see few changes over time, despite increases in prices of fuel and mechanization service providers' charges for plowing and harvesting services (MAPSA 2021c).

[6] The further fertilizer price increases, linked to the war in Ukraine, started in February 2022. In July 2022, prices of urea and compound fertilizer were 91 and 75 percent higher respectively than a year earlier (MAPSA 2022e).

Table 5: Labor use and mechanization in paddy rice cultivation

Use on largest rice plot	Unit	Dry Season 2021	Dry Season 2022
Non-family labor			
Hired	%	69.4	66.0
Exchange	%	2.4	3.2
Both	%	5.2	3.6
No	%	22.9	27.2
Draught animals			
Hired	%	11.0	15.1
Own	%	14.3	13.8
Both	%	1.2	0.7
No	%	73.5	70.4
Tractor for plowing			
Hired	%	62.6	58.5
Own	%	23.4	27.2
Both	%	5.7	5.8
No	%	8.3	8.5
Combine-harvester			
Hired	%	81.0	83.2
Own	%	2.6	2.9
Both	%	0	0.1
No	%	16.4	13.8

Source: Authors' calculations based on MAPS, round 2

Finally, we assess overall (commercial) input expenditures on rice as they might give a good indication of the intensity of input use in rice production.[7] Table 6 shows that input expenditures per acre increased on average by 15 percent during the dry season of 2022 compared to the previous one. Despite the significant reduction in credit from the government, micro-finance institutions, and the private sector and the reductions in income, farmers were - on average - somehow able to increase expenditures on their rice plots and (partially) compensate for the increased prices of most inputs.

Table 6: Monetary input expenditures (MMK/acre) on paddy rice

Use on largest rice plot	Dry Season 2021	Dry Season 2022	% change
Mean	265,318	306,360	15.5
Median	250,000	300,000	20.0

Source: Authors' calculations based on MAPS, round 2

Natural and other shocks

Climatic shocks generally constitute important risks for agricultural production. When asked about the incidence of natural or other shocks, 25 and 35 percent of the rice farmers indicated that they were negatively impacted by at least one of these shocks in the dry season of 2021 and 2022 respectively (Table 7). However, the shocks reported over these two years were different. Drought negatively impacted 4 percent of rice farmers in 2022 while only 2 percent were impacted in 2021. There were also more complaints by paddy farmers in 2022 of irregular rains (4.5 percent in 2022; 2 percent in 2021) and heavy rains (5 percent in 2022; 2 percent in 2021) but especially of floods,

[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.

affecting 6 percent of paddy farmers. Moreover, 15 percent of the paddy farmers complained of pest, disease, and weed problems this year.

Table 7: Incidence of natural and other shocks

	Unit	Dry Season 2021	Dry Season 2022
Crop negatively affected by any shock	% yes	24.6	34.6
If yes, which one?			
Drought	% yes	1.7	3.6
Poor access to irrigation water	% yes	1.0	2.3
Irregular rain	% yes	2.4	4.5
Heavy rains	% yes	1.8	5.4
Floods	% yes	1.0	6.0
Flash floods	% yes	0.4	0.6
Extreme temperature	% yes	0.3	1.4
Pest, diseases, weeds	% yes	15.1	15.1
Damage by animals	% yes	2.7	4.0
Damaged by rats	% yes	1.2	1.5
Storm	% yes	0.6	0.3
Others	% yes	1.0	1.2

Source: Authors' calculations based on MAPS, round 2

Rice productivity

Paddy rice yields at the national level averaged 1,657 kgs per acre (the median was 1,672 kgs per acre) or 4.1 tons per hectare for the dry season of 2022 (Table 8), significantly higher than during the monsoon when yields averaged 3.1 tons (MAPSA 2022f). We note a decline of 1.5 percent on average compared to last year. The biggest declines are noted for the Hills and Mountains areas where the average yield declined by 5 percent. We see a decline of 3 percent in the Delta, where the majority of paddy is grown in the dry season (the Bago, Ayeyarwady, Mon and Yangon regions combined made up 85 percent of total paddy production in the summer of 2021, as estimated by MoALI). As we only have data on the largest plot and have no good assessment of changes in paddy area cultivated, we shy away from making assessments of rice production at the national level.

Table 8: Paddy rice yields on the largest plot (kgs/acre), dry season 2022 and 2021

	2021			2022			Mean
	N	Mean	Median	N	Mean	Median	% change
Hills	76	1426.6	1337.6	60	1349.9	1254.0	-5.4
Dry	199	1693.2	1741.7	225	1701.6	1672.0	0.5
Delta	399	1726.4	1672.0	385	1680.5	1672.0	-2.7
Coastal	8	2063.6	2388.6	8	2064.5	2090.0	0.0
Total	682	1681.4	1672.0	678	1656.7	1672.0	-1.5

Source: Authors' calculations based on MAPS, round 2

Despite the substantial hurdles in production and marketing due to the political crisis and international market developments, the results of the Myanmar Agricultural Performance Survey overall show the resilience of rice production during the dry season of 2022.

Looking forward

We interviewed farmers in the second round of MAPS when they were in the middle of the monsoon growing season (August – September) and asked all crop farmers about expectations for the next monsoon season. The results are presented in Tables 9 and 10. Despite the multitude of problems in the country, we see only few area adjustments by farmers at the national level. The area of cultivated crops overall and of paddy in particular do not change very much between these two monsoon periods. There are even slight average increases seen, from 5.0 acres of crop area in the monsoon of 2021 to 5.1 acres in 2022, while there are no changes in the median. Similar stable cultivated areas for paddy are reported. Caution is warranted though as we under-sampled farmers in the most conflict-affected townships and might therefore have an over-estimate in areas cultivated for the next monsoon, given the large number of people that have been displaced recently, especially so in the Sagaing region (OCHA 2022).

Table 9: Cultivated area in monsoon seasons

		Monsoon	
	Unit	2021	2022
Cultivated crop area (acres)	mean	4.97	5.09
	median	3.00	3.00
Cultivated paddy area (acres)	mean	2.89	3.00
	median	1.00	1.00

Source: Authors' calculations based on MAPS, round 2

We see also relatively small changes in paddy management practices, with less reliance on purchased seeds for rice (dropping from 39 to 36 percent), no change in hired mechanization, and the share of paddy farmers using fertilizers going down from 83 to 79 percent. However, fertilizer use is overall reduced as almost 50 percent of farmers report that they reduced fertilizer use this monsoon compared to last one. However, 34 percent indicate that they will use the same quantities. A survey with agro-input retailers in July (MAPSA 2022e) - when farmers typically have bought fertilizers for the next monsoon – indicates that purchases of urea and compound fertilizer were down by 39 and 15 percent respectively this monsoon compared to the last one.

When asked about their expectations for the next monsoon harvest, almost half of farmers were not willing to express their opinion (Table 10). Of those that were willing to make an evaluation, more (22 percent) indicated a reduction in yield compared to stable yields (13 percent) and increases (11 percent). If a large decrease in paddy production is reported, this is mostly linked to a reduction in fertilizer use (61 percent) as well as bad weather (57 percent).

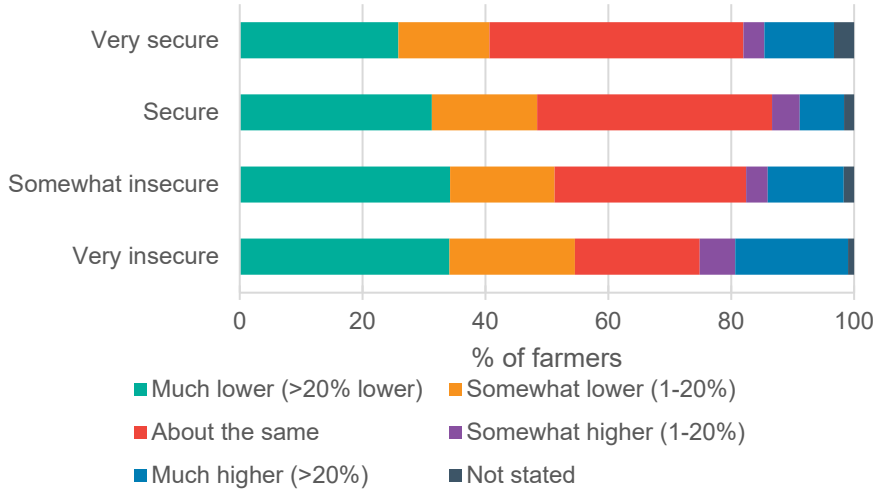
Table 10: Paddy production practices and expectations for the monsoon season of 2022 and 2021

	Unit	Monsoon 2021	Monsoon 2022
Main seed source			
Purchased from agri-input retailer or government	%	21.3	16.1
Purchased from other farmer	%	17.8	20.2
Left over (unused) purchased seed from last year	%	0.1	0.4
Saved (harvested) from last year	%	58.1	60.3
Other	%	2.7	3.0
Use mechanization for plowing on paddy			
Hired	%	56.0	56.0
Own	%	24.5	24.0
Both	%	6.0	5.6
No	%	13.5	14.5
Use chemical fertilizer (already done or expected) on paddy	%	83.4	79.3
If yes, quantities applied (already done or expected) of fertilizer on paddy compared to 2021 monsoon			
Much lower (>20% lower)	%		31.8
Somewhat lower (1-20% lower)	%		16.6
About the same	%		33.3
Somewhat higher (1-20% higher)	%		3.7
Much higher (>20% higher)	%		10.3
Don't know	%		4.2
Opinion on paddy harvest/yield in this monsoon compare to the production in the 2021 monsoon			
Much lower (>20% lower)	%		11.4
Somewhat lower (1-20% lower)	%		11.1
About the same	%		13.3
Somewhat higher (1-20% higher)	%		6.0
Much higher (>20% higher)	%		5.4
Don't know	%		52.8
Main reasons for a large decline			
Less use of chemical fertilizer	%		61.0
Worse quality of chemical fertilizer	%		0.7
Less use of other agro-chemicals	%		6.6
Worse quality of other agro-chemicals	%		0.2
Less use of mechanization	%		3.5
Less use of labor	%		3.2
Bad weather	%		57.2
Plant disease problems	%		11.3
Insecurity	%		3.2

Source: Authors' calculations based on MAPS, round 2

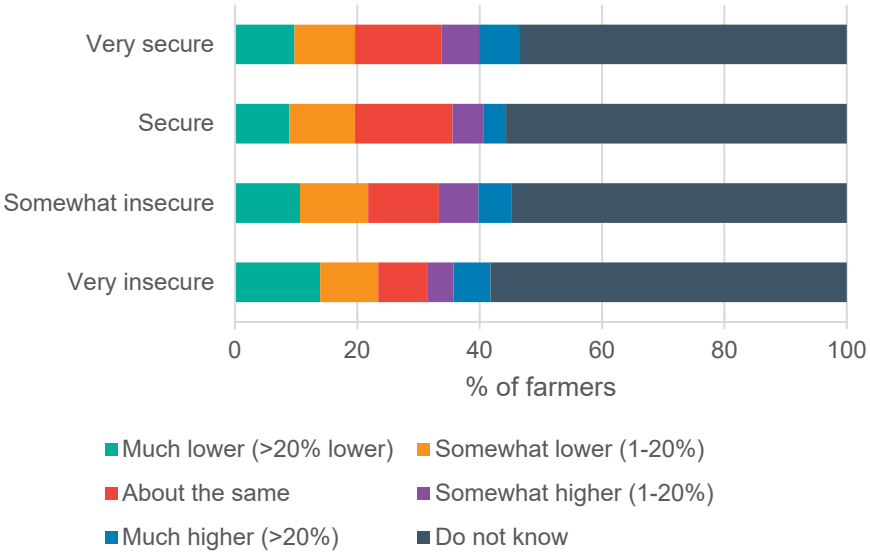
Finally, we split up paddy production assessments by the perceived security situation of the farmer (ranked between "very insecure" to "very secure"). We first look at changes in fertilizer use on paddy in this monsoon compared to a year earlier (Figure 1). Almost 55 percent of paddy farmers in "very insecure" areas indicated they reduced fertilizer use this monsoon. This compared to 41 percent in the "very secure" areas. While 41 percent of the farmers in the "very secure" areas report using the same amounts of fertilizer as before, this share is only 20 percent in "very insecure" areas. As a consequence of lower input use (not only fertilizer but also other agricultural inputs; e.g., access to labor is an important constraint in the more insecure areas (MAPSA 2022g)), we find that farmers in the most insecure areas expect to have worse paddy harvest levels this monsoon than those in more secure situations. For those that are willing to make a prediction, 48 percent expect a lower paddy output this monsoon compared to the last one at the national level (Table 10). However, for the most insecure areas, 56 percent of the farmers expect a lower output (Figure 2).

Figure 1: Fertilizer use on paddy in the monsoon season of 2022 compared to the previous monsoon, by perceived physical security of farmers



Source: Authors' calculations based on MAPS, round 2

Figure 2: Expectations of paddy production of the monsoon season of 2022 compared to the previous monsoon, by perceived physical security of farmers



Source: Authors' calculations based on MAPS, round 2

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