MYANMAR

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Maize Residue Management in Myanmar

This note provides an overview of maize residue management practices in Myanmar based on interviews conducted in June 2024 with a sample of 599 maize farmers in the primary maize growing region.

Key Findings

- Burning maize residues is not the most common practice in Myanmar, and the share of farmers burning fell from 44 percent in 2013 to 34 percent in 2023 as farmers have adopted alternate approaches, such as retaining residues in the soil.
- The broader maize sector evolution over the last decade has brought several changes, some of which likely increase the relative benefits of burning – e.g., decline in labor availability, decline in livestock ownership.
- Access to markets for maize residues has improved, though still less than one fifth of farmers can sell their maize residues.
- Soil fertility is important to farmers. Soil fertility improvement was the most common reported benefit to both burning and retaining residues. However, most farmers that do not burn disagree that soils are improved by burning, while most farmers that burn agree.
- Most farmers are aware of the human health effects of burning, but more than a quarter strongly disagree that burning residues negatively affects the health of others.
- The majority of farmers that burn agree that their community expects them to.

Recommendations

- Farmer education and extension are leading candidates to reduce maize residue burning in Myanmar. Key topics where there are evident knowledge gaps include highlighting the large relative gains in long-term soil health from retaining the residues compared to burning, and the high external health costs of burning.
- Interventions to reduce burning are critical to reducing environmental and health externalities, and in light of the planned Thai bans in the importation of maize from countries using burning as a residue management practice. However, the Thai government should adapt their strategy and consider other methods to reduce residue burning in neighboring countries including supporting education, or providing price incentives or reduced tariffs for not burning as opposed to outright bans which would likely have limited effects on burning decisions at the farm level.
- More research is needed to better understand the driving factors behind maize residue management decisions.

LIFT Livelihoods and Food Security Fund

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Introduction

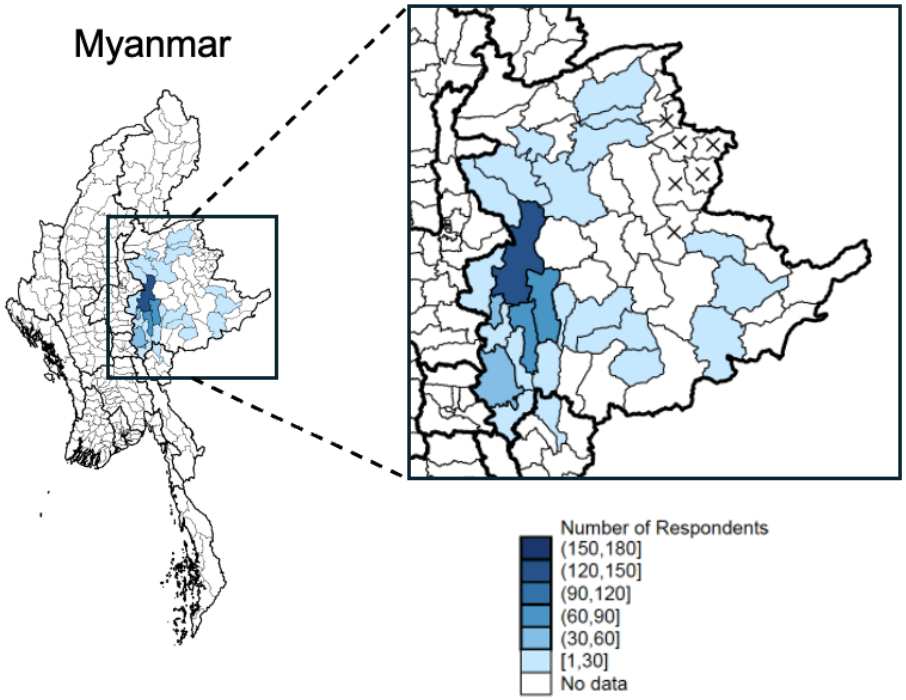
Crop residue burning has large environmental and human health costs. It contributes to air quality degradation and pollution which cause health issues including heart disease, stroke, chronic obstructive pulmonary disease, and lung cancer (Raza et al., 2022; Chaturvedi & Mansi, 2022). At the farm-level, burning crop residues is shown to deteriorate the quality of the soil, heighten the susceptibility to erosion, and elevate the soil temperature, causing a significant reduction in soil microorganisms and negatively affecting agricultural production (Lin & Begho, 2022).

For farmers however, there are benefits to burning residues. It can clear the land quickly and at low cost to prepare for the next planting season, and other management practices are expensive – e.g., incorporating, collecting, transporting, and processing residues. Burning also has some limited benefits to soils. Some factors that impact farmers' decisions to burn crops residues include labor shortages, market availability for residues, and the short time between harvest and following cropping seasons (Lin & Begho, 2022). Burning residues has remained a common practice in many countries around Southeast Asia, especially for rice and sugarcane production (Reddington et al., 2021), but also for maize which has high biomass and can produce large amounts of pollution if burned.

Recently, the cabinet of Royal Thai Government endorsed a strategy to prohibit maize imports from regions where farmers burn their maize fields to reduce the yearly smog, which the government mostly attributes to neighboring countries (Bangkok Post, 2024). While the details of implementing this policy are not yet clear, the target is to start enforcement in 2024. This is concerning news for Myanmar which exports more than one million metric tons of maize to Thailand annually (USDA, 2024). The Thai policy reinforces the need for countries such as Myanmar to review their farm practices in managing crop residues. However, very little is known about maize residue management in Myanmar.

This research note provides descriptive information on maize residue management practices in Myanmar. A sample of 599 maize farmers located in the primary maize growing area of Myanmar, (Shan State and northern part of Kayah State) was interviewed by phone in May-June 2024 (Figure 1). The survey collected information on (i) maize residue management practices over time, (ii) factors associated with residue management decisions, (iii) farmer knowledge and perceptions about burning, and (iv) major disruptions for farmers. This study aims to shine light on maize residue management in Myanmar through a descriptive analysis of practices over time and the factors thought to influence management decisions including farmer access to essential agricultural services, such as labor, mechanical harvesting, and drying services.

Figure 1. Map of the sample location

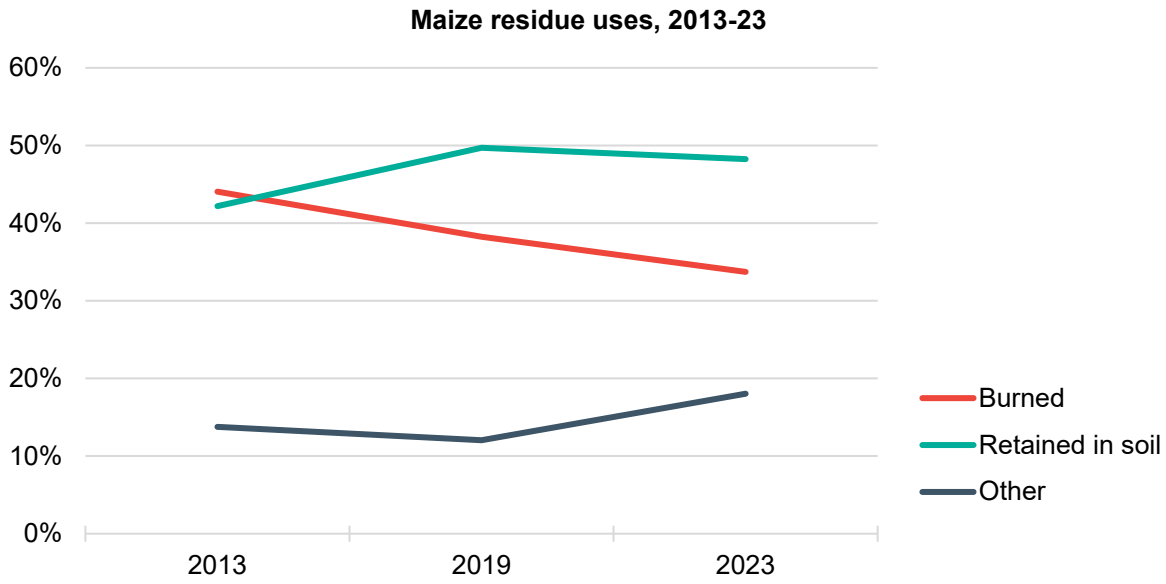


Source: Maize Residue Management Study Survey (June 2024)

Maize residue management practices

Maize is the second most important cash crop in Myanmar and it is in high demand in neighboring countries (e.g., Thailand and China). Myanmar exports over two million MT annually, about 80 percent of total production in 2023 (USDA, 2024). However, management of maize residues post-harvest presents challenges for farmers and has implications for soil composition, crop yield, and ecological sustainability.

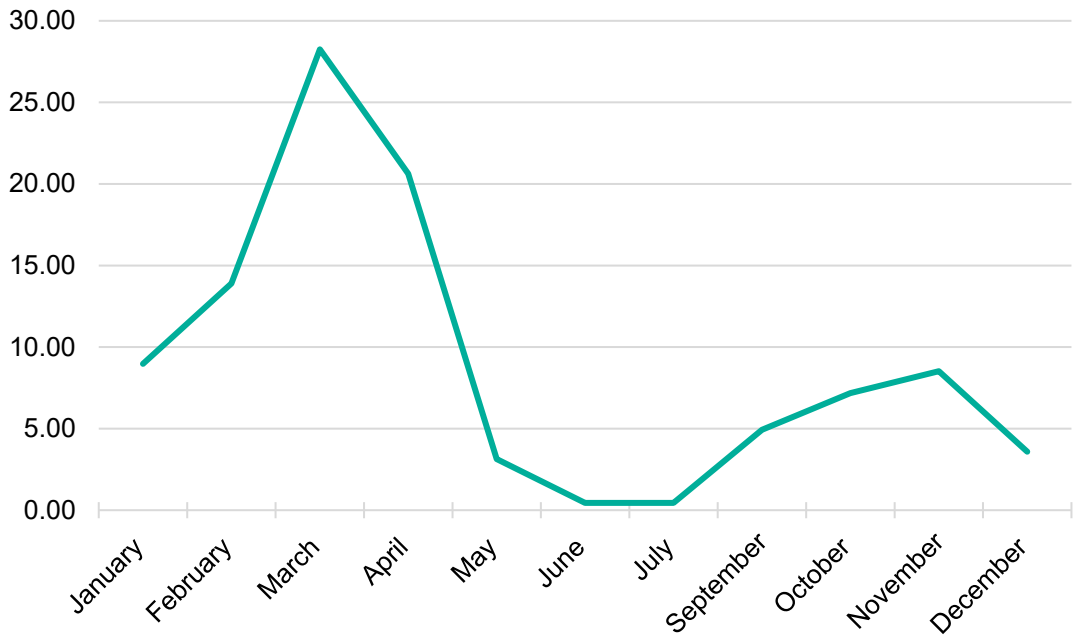
Figure 2. Maize residue management practices over time



Source: Maize Residue Management Study Survey (June 2024)

Figure 2 presents maize residue management practices from 2013 to 2023. Even ten years ago, less than half of maize farmers burned their residues, and the share has declined to approximately one-third during the recent growing season. As an alternative method of managing residues, the share of farmers who retained maize residues in the soil has increased from 42 percent of maize farmers in 2013 to about 50 percent in 2023. Smaller numbers of farmers practice other residue management strategies such as removing from the field and using as livestock feed, fuel for cooking and others.

Figure 3. Timing of maize residue burning among farmers that burn



Source: Maize Residue Management Study Survey (June 2024)

Figure 3 presents the monthly pattern of maize residue burning following the cropping calendar. Burning maize residues starts gradually after harvest from September to December. Most farmers that burn do so between February and April, when biomass is fully dry. From April onwards with the gradual arrival of monsoon rains burning declines sharply hitting its lowest point in June and July.

Evolution of influencing factors

To understand the co-evolution of residue management practices and related factors, we asked farmers about land preparation methods, livestock ownership, and access to services over time. Over the last decade, there has been a large shift away from plowing with animal traction to two- and four-wheel tractors and a steep decline in ownership of draught animals (Table 1). More than half of the farmers owned draught animals a decade ago (2013) and only 15 percent owned them in the recent crop season (2023). Labor availability has also declined which can drive decisions to burn as alternative maize residue managements strategies typically require more labor, making burning an attractive option for labor- (and cash-) constrained farmers.

Each of these factors likely increased the probability of burning which clears the field quickly in preparation for plowing, removes a potential feed source for livestock, and requires little labor. Though, as noted above, fewer farmers burn residues now compared to 10 years ago. Availability of combine harvesters have also increased. Combines shred residues, making them simultaneously easier to incorporate in the soil and harder to gather and remove. Farmers that burn reported slightly

lower access to combine harvesters. Interestingly, access to markets for selling maize residues has expanded from a low base of 10 percent in 2013 to 17 percent in 2023.

Table 1. Residue management influencing factors over time

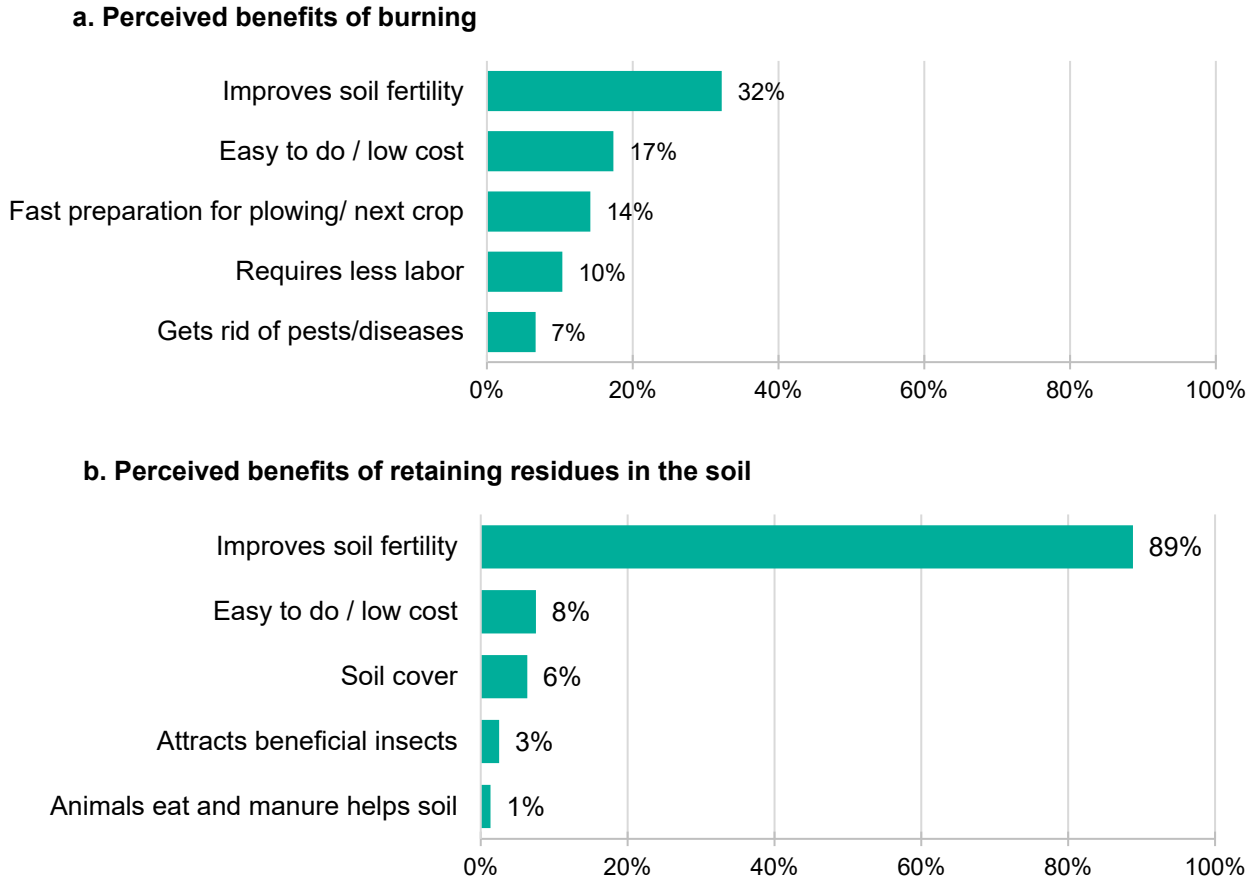
	2013	2019	2023
Land Preparation (main method)			
Animal traction (%)	43	9	7
2- wheel tractor (%	34	44	30
4-wheel tractor (%)	16	42	63
Others (%)	7	4	0
Draught animal ownership			
Share owning (%)	52	29	15
Number owned (cond'l mean)	5.04	5.34	2.51
Availability of services and markets			
Hired labor			
High (%)	77	68	49
Low or unavailable (%)	23	32	51
Hired tractor service			
High (%)	38	72	76
Low or unavailable (%)	62	28	24
Mechanical drying service			
High (%)	15	31	46
Low or unavailable (%)	85	69	54
Combine harvesting service			
High (%)	28	51	63
Low or unavailable (%)	72	49	37
Market for maize residues			
Yes (%)	10	13	17
No (%)	90	87	83

Source: Maize Residue Management Study Survey (June 2024)

Farmer knowledge and perceptions

Residue management decisions are likely influenced by the relative perceived benefits of burning and retaining residues in the soil. The main perceived benefit of burning is an increase in soil fertility and productivity (32 percent) (Figure 4a). While the soil health benefits are limited, burning residues does return some nutrients to the soil. There are several perceived benefits associated with burning being easy, low cost, and fast. These include that it is easy to do / low cost (17 percent), requires less labor (10 percent), fast preparation for plowing or next crop (14 percent). A smaller portion of farmers (around seven percent) believe that burning helps eliminate pests and diseases from the soil and very few farmers reported other benefits for the decision to burn residues.

Figure 4. Farmer perceived benefits of (a) burning and (b) retaining residues



Source: Maize Residue Management Study Survey (June 2024)

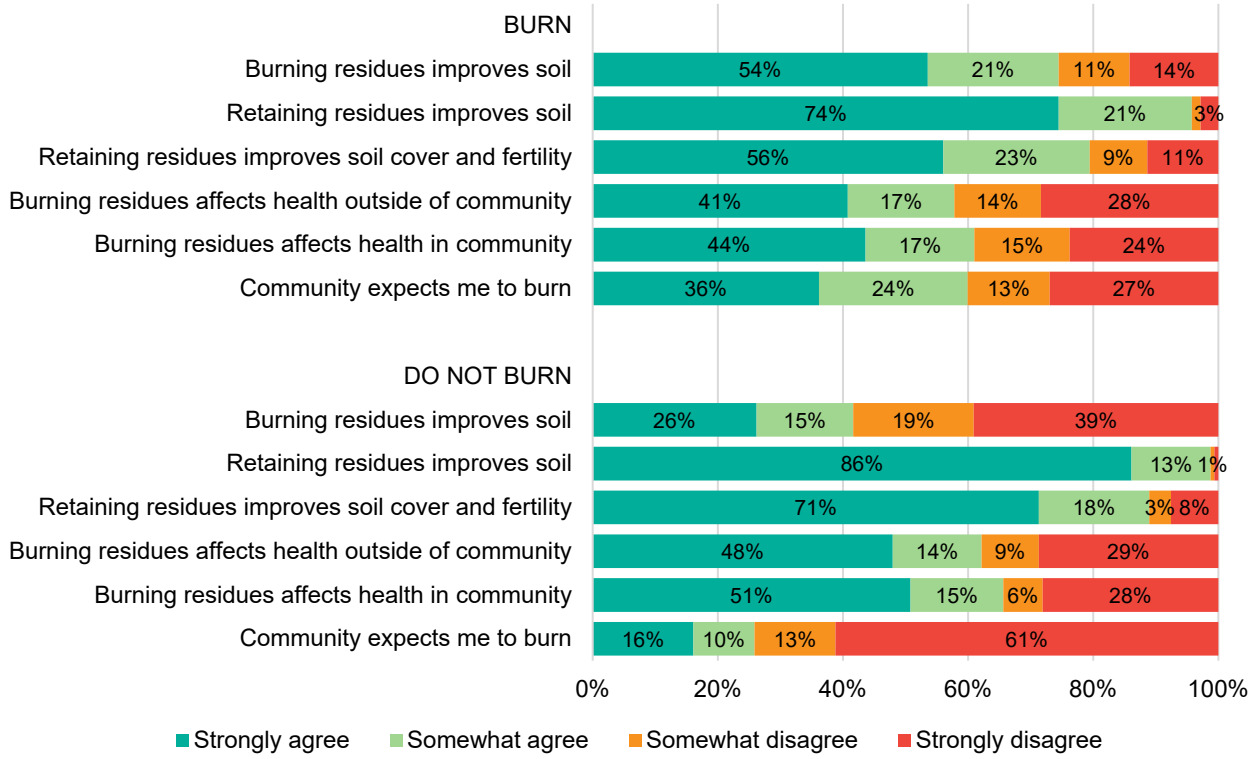
Instead of burning, many farmers retain maize residues in the soil. The most common perceived benefit of this practice is improved soil fertility (89 percent, Figure 4b). Indeed, retaining maize residues in the soil can recycle nutrients, build organic matter, and improve soil health. Other perceived benefits are reported by much smaller shares of farmers. About eight percent of farmers say that retaining residues in the soil is easy or low cost while six percent perceive benefits in soil cover, which helps retain moisture and regulate soil temperatures. Only small percentages of farmers reported that retained residues attract termites and other beneficial insects (three percent) or that retained residues provide food for animals and that the resulting manure helps improve the field (only one percent).

Farmer knowledge of the impacts of residue management practices is likely another important factor in decisions to burn. Figure 5 shows the degree to which farmers agree or disagree with several statements about burning or retaining residues, split by the farmers that burn and those that did not. A clear majority of farmers agreed that retaining residues improve soil fertility. While the share strongly agreeing is higher among those that do not burn (86 percent) than those that do (74 percent), very few disagree suggesting a generally solid understanding that retaining residues helps soils. However, the majority of farmers that burn agree that burning also improves soils (75 percent) compared to just 41 percent of farmers that do not burn.

Most farmers agree that retaining residues has benefits in providing soil cover, and while the share strongly agreeing is higher among those that do not burn (71 percent) than those that do (58 percent), the share disagreeing, even among the farmers that burn, is small (just 20 percent). Farmers generally agree that burning residues have negative effects on human health, both in their communities and outside (e.g., in other regions or countries). While there are only minor differences

across decisions to burn, between 24 percent and 29 percent of farmers strongly disagree with these statements.

Figure 5. Knowledge and perceptions, those that burn and those that do not burn



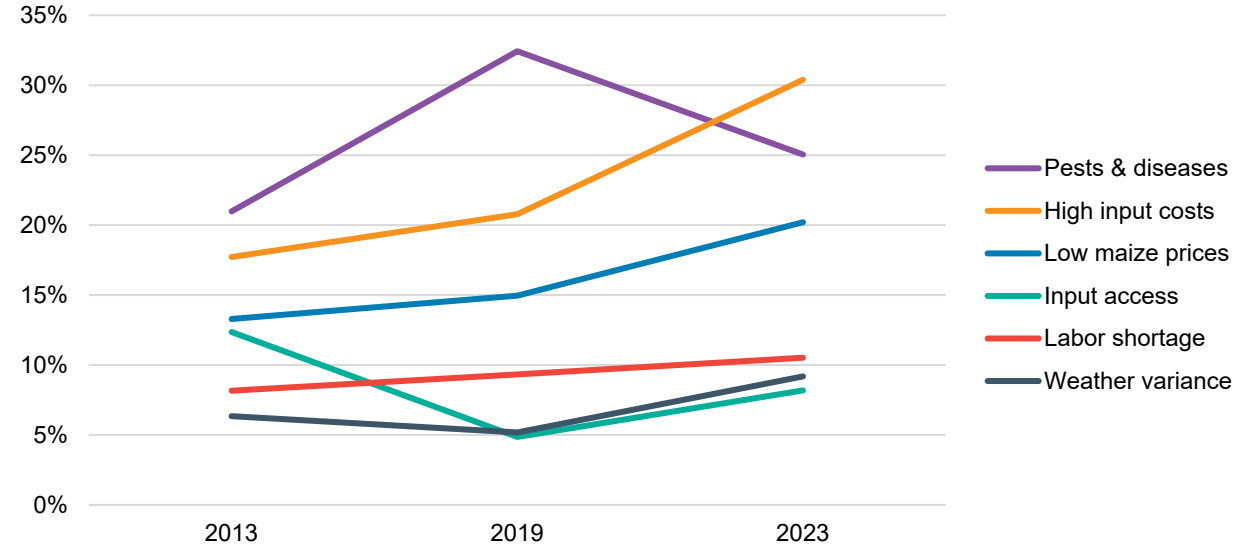
Source: Maize Residue Management Study Survey (June 2024)

We observe interesting differences in perceived social pressure to burn residues The majority of farmers who burn residues feel that there is an expectation from their community to continue the practice, which likely reinforces the behavior. Farmers who do burn the maize residues, on the other hand, feel less social pressure to burn, just 16 percent strongly agree, and 61 percent strongly disagree with this statement.

Main challenges experienced by farmers

To understand the challenges in maize farming more generally, we asked farmers about their main challenges in maize production in 2013, 2019, and 2023. Over the past decade, farmers in the region have faced a variety of disruptions that have significantly impacted their agricultural practices and productivity (Figure 6). Key challenges identified across time reveal evolving concerns, particularly in the areas of input costs, pests, and diseases, and fluctuating market prices for maize. The cost of inputs has been a growing concern for farmers, with the percentage of farmers citing it as a major challenge increasing from 18 percent in 2013 to 30 percent in 2023 (Figure 6). Yet, input availability has been a lesser concern though it has increased slightly since 2019.

Figure 6. Main disruptions/challenges experienced by farmers



Source: Maize Residue Management Study Survey (June 2024)

Pests and diseases have persistently been a significant challenge, peaking at 32 percent in 2019 (with the arrival of fall armyworm in Myanmar) before slightly declining to 25 percent in 2023. Maize prices are an important challenge for farmers. Although global maize prices increased between 2019 and 2023, they declined after 2022, while the local conditions in Myanmar (e.g., exchange rate and transport costs and disruptions) likely further affect concerns about prices. The percentage of farmers highlighting low maize prices as a key issue has increased steadily, from 13 percent in 2013 to 20 percent in 2023. Labor shortages have also been a consistent issue for farmers, with 11 percent reporting it as a challenge in 2023, up from 8 percent in 2013.

While the percentage of farmers citing weather variance as a key challenge has remained relatively low compared to other issues, it has risen from 5 percent in 2019 to 9 percent in 2023. This increase suggests growing concern over unpredictable weather patterns, likely exacerbated by climate change, which can lead to crop damage, delayed planting, and overall reduced agricultural output. The ability to access critical farming inputs has also fluctuated over time. While the issue was less pressing in 2019 (5 percent), it has since increased to 8 percent in 2023, indicating renewed difficulties in sourcing the necessary materials for farming.

Conclusions

Maize residue management decisions are complicated as farmers weigh important tradeoffs in soil health, labor, other farm and livestock management practices, and economic viability. Our analysis provides the following five key insights into maize residue management practices in Myanmar.

First, while burning residues is a prevalent practice due to its low cost and efficiency, it is not the most common practice, and there has been a gradual decline in the share of farmers burning from 44 percent in 2013 to 34 percent in 2023 as farmers have slowly adopted alternate approaches, such as retaining residues in the soil.

Second, the broader maize sector evolution over the last decade has brought several changes, some of which likely increase the relative benefits of burning – e.g., decline in labor availability, decline in livestock ownership. Access to markets for maize residues has increased, though still less than one fifth of farmers can sell their maize residues.

Third, soil fertility plays a vital role for farmers, both in general and in their decision-making regarding residue management. Perceived soil fertility improvement was the most common reported benefit to both burning and retaining residues. However, there are important perception differences for the farmers that burn compared to those that do not. The majority of farmers that do not burn disagree that soils are improved by burning, while the majority of farmers agree. Interestingly, nearly all farmers irrespective of whether they burn or not agree that soil fertility is improved by retaining the residues in the soil.

Fourth, while the majority of farmers know about the human health effects of burning, more than a quarter strongly disagree that burning residues negatively affects the health of others.

Fifth, social dynamics in farmer communities might be an important factor in burning decisions. The majority of farmers that burn agree that their community expects them to.

More research is needed to better understand the driving factors behind maize residue management decisions. But, moving forward, farmer education and extension are leading candidates to reduce maize residue burning in Myanmar. Key topics where there are evident knowledge gaps include highlighting the large relative gains in long-term soil health from retaining residues compared to burning, and the high external health costs. Interventions to reduce burning are critical in light of the planned Thai import bans from burning countries. However, the Thai government should adapt their strategy and consider other methods to reduce residue burning in neighboring countries including supporting education, or providing price incentives or reduced tariffs for not burning as opposed to outright bans which would likely have limited effects on burning decisions at the farm level.

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