Immature Crop Harvest: Implications on Post-Harvest Losses, Quality, Safety, and Food Security in Malawi

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Key Messages

- Premature maize harvesting has become increasingly common among smallholder farmers, driven by food insecurity, theft, economic pressures, and climate variability.
- Approximately 89% of surveyed farmers harvested early primarily to prevent theft.
- Harvesting maize before physiological maturity increases the risk of mycotoxin contamination, mold infestation, reduced nutritional quality, and lower market value—factors that directly compromise household food and income security.
- Therefore, a comprehensive, multi-pronged, evidence-based strategy is recommended. Key policy options include strengthening community policing and enforcing bans on green maize sales, promoting winter cropping, enhancing targeted agricultural extension services, designing effective social safety nets for cushioning farmers from food shortages, promoting community-based storage solutions, developing reliable and accessible markets, and investing in research to breed crop varieties resistant to pre- and post-harvest stress.

1. Setting the Context

Premature maize harvesting (PMH) has become a widespread and recurring practice among smallholder farmers in Malawi[3]. This involves harvesting maize before it reaches physiological maturity, often when the grain moisture content exceeds 30%[4]. Several factors drive PMH, including food insecurity, theft prevention, economic pressures, and increasing unpredictable weather patterns as visualized in Figure 1.1. Seasonal food shortages, particularly in the months leading up to the next harvest, often compel households to harvest early[5]. Compounding PMH is limited access to alternative food sources, weak market linkages, and poor financial inclusion services, all of which exacerbate the harmful effects of PMH, namely, post-harvest losses, poor grain quality, persistent food insecurity, and diminishing disposable household income. Theft of green maize has also influenced PMH, especially as the crop nears maturity[6], making farmers insecure about crop production, particularly in urban areas- of Blantyre, Lilongwe, Mzuzu, and Zomba.

Figure 1.1. Farmers reporting causes of PMH

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[3] Chegere, M. J., Eggert, H., & Söderbom, M. (2022). The Effects of Storage Technology and Training on Postharvest Losses, Practices, and Sales: Evidence from Small-Scale Farms in Tanzania. *Economic Development and Cultural Change*. https://doi.org/10.1086/713932
[4] Nji, Q. N., Babalola, O. O., Ekwomadu, T. I., Nleya, N., & Mwanza, M. (2022). Six Main Contributing Factors to High Levels of Mycotoxin Contamination in African Foods. *Toxins*, *14*(5), 318. https://doi.org/10.3390/toxins14050318
[5] Centre for Agriculture Research and Development. 2025. Value Chain and Markey Systems Development for Sorghum, Cowpeas, and Sesame in Malawi. World Food Programme & Lilongwe University of Agriculture and Natural Resources, Lilongwe.
[6] https://www.manaonline.gov.mw/index.php/business/item/2581-mcc-admonished-for-failure-to-enforce-ban-on-sale-of-green-maize?utm_source=chatgpt.com

Financial pressures, including school fees and domestic expenses, further affect PMH decisions and make households sell maize at lower prices, especially in the absence of credit and financial markets[7]. This practice undermines short- to medium-term food security ambitions and raises public health concerns about the population as they consume food contaminated with various mycotoxins[8]. This brief, therefore, dives deep into understanding the policy implications of PMH on post-harvest losses, grain quality, safety, and food security, thereby providing targeted policy interventions[9] for cushioning farm households from food insecurity and income losses.

2. Data

We collected data from 291 randomly selected smallholder farmers in Blantyre (32%) and Lilongwe (68%). The study was conducted in the first week of April 2025, between April 1st and 6th. Farmers were interviewed with structured questions to capture insights into PMH and related effects on post-harvest losses, grain quality, and food security. The brief further triangulated the findings with secondary data from relevant studies on post-harvest losses and grain quality issues in Sub-Saharan Africa (SSA) to enrich the primary data. Sixty-nine percent (69%) of surveyed respondents were female, whereas 47% and 37% of the respondents attended primary and secondary education, respectively. About 43% of the respondents were between 18 and 35 years old, suggesting a large share of youth participation in the agricultural sector. All surveyed respondents cultivated maize, while 36%, 29%, 19%, and 16% cultivated pigeon peas, ground nuts, soybeans, and common beans, respectively. About 38% of the respondents reported having experienced theft of crop produce, pest attack (33%), extended dry spell (27%), disease (12%), and animal damage (5%).

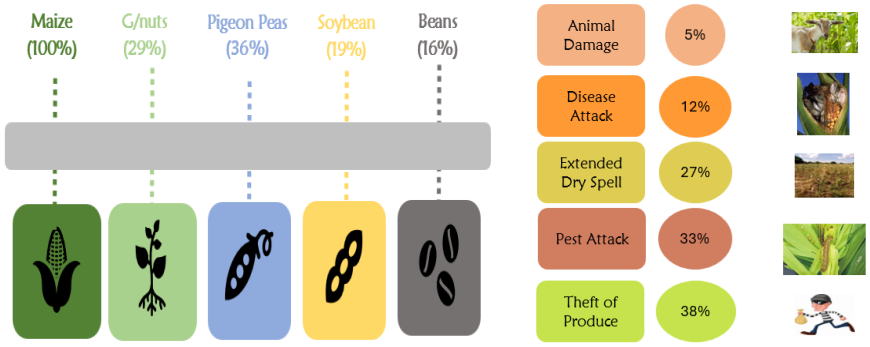

Figure 2.1. Farmers' reporting various crops cultivated, theft, pests, and weather-related shocks experienced.

3. What implications does PMH have on Post-Harvest Losses?

About 42% of farmers surveyed reported that PMH can lead to post-harvest losses, thereby increasing the cost of post-harvest management practices like drying, as shown in Figure 3.1. Farmers highlighted that PMH increases post-harvest losses through a variety of interrelated mechanisms, starting with the high moisture content of immature maize,

[7] Abdoulaye T, Ainembabazi JH, Alexander C, Baributsa D, Kadjo D et al. **2016**. *Post-harvest loss of maize and grain legumes in sub-Saharan Africa: insights from household survey data in seven countries.* Purdue Ext. Agric. Econ. EC-807-W Purdue Univ. West Lafayette, IN: https://www.extension.purdue.edu/extmedia/EC/EC-807-W.pdf
[8] Ng'ambi, J.T., Atehnkeng, J., Monjerezi, M. *et al.* Micro-climatic variations across Malawi have a greater influence on contamination of maize with aflatoxins than with fumonisins. *Mycotoxin Res* **39**, 33–44 (2023). https://doi.org/10.1007/s12550-022-00471-1
[9] Debebe, S. Post-harvest losses of crops and its determinants in Ethiopia: tobit model analysis. *Agric & Food Secur* **11**, 13 (2022). https://doi.org/10.1186/s40066-022-00357-6

weakened seed coat integrity, reduced storability, and increased handling losses, and this was in line with findings by Ambler et al.[10] where PMH led into post-harvest losses of 40-60%. Similarly, Logrieco et al.[11] and Suleiman et al[5]. indicated that lack of proper drying results in 40-80% post-harvest losses. Ambler et al.[8] also reported that 43% and 21% of post-harvest losses in maize were related to harvest and storage issues, respectively. Abdoulaye et al.[7] and Carter, P. R., & Hudelson[12] argued that the kernels of maize produce are often soft and underdeveloped, leading to a higher rate of breakage and yield reduction. For instance, harvesting maize by 15 days before maturity can result into 25% reduction in total yield as shown in Figure 3.2. Additionally, 19% of farmers (see Figure 4.1) reported that PMH is associated with grain damage, where immature maize lacks structural integrity, making it more prone to damage during shelling, transport, and processing.

Figure 3.1. Implications of PMH

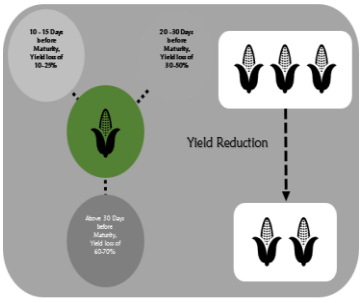

Figure 3.2. Yield reduction due to PMH[12]

4. What implications does PMH have for Grain Quality and Safety?

Understanding how grain quality and safety parameters change soon after harvesting is helpful as it informs farmers to plan for the effective and economical deployment of post-harvest management interventions[2]. About 34% of farmers interviewed highlighted that PMH reduces grain quality, as shown in Figure 3.1. Such grains are seen discolored, taste differently, and are easily damaged by rodents, as exhibited in Figure 4.1. Ricker-Gilbert et al.[13] unearthed that quality loss relates to insect damage, physical discoloration of grains, and odors from deterioration. For instance, PMH results in contamination as maize becomes highly vulnerable to microbial spoilage, leading to mold development and harmful mycotoxins like aflatoxins, which further render the grain unsafe for human consumption[4]. Immature and contaminated maize have degraded nutritional quality and pose serious health risks, contributing to weakened immune systems[14]. Also, immature maize will taste differently and has lower starch content, with a higher concentration of fermentable plant sugars, leading to a fast drop in pH, and inhibiting undesirable bacteria growth[6]. Food consumed with aflatoxins has also been linked to an increased risk of liver cancer and childhood stunting[15].

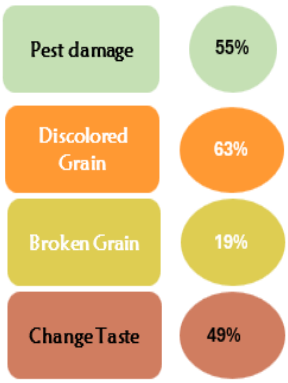

Figure 4.1. Farmers reporting PMH effect on grain quality

[10] Ambler, K., & Godlonton, S. (2017). Measuring postharvest losses at the farm level in Malawi. *Australian Journal of Agricultural and Resource Economics*, *62*(1), 139-160. https://doi.org/10.1111/1467-8489.12237
[11] Logrieco, A.; Battilani, P.; Leggieri, M.C.; Jiang, Y.; Haesaert, G.; Lanubile, A.; Mahuku, G.; Mesterházy, A.; Ortega-Beltran, A.; Pasti, M.; et al. Perspectives on Global Mycotoxin Issues and Management from the MycoKey Maize Working Group. *Plant Dis.* **2021**, *105*, 525–537.
[12] Carter, P. R., & Hudelson, K. D. (1988). Influence of Simulated Wind Lodging on Corn Growth and Grain Yield. *Journal of Production Agriculture*, *1*(4), 295-299. https://doi.org/10.2134/jpa1988.0295
[13] Jacob Ricker-Gilbert, Oluwatoba Omotilewa, and Didier Kadjo. 2022. The Economics of Postharvest Loss and Loss-Preventing Technologies in Developing Countries. Annual Review of Resource Economics, https://doi.org/10.1146/annurev-resource-111820-020601
[14] https://www.thecattlesite.com/articles/3331/effects-of-harvesting-immature-maize-crop/
[15] Andrews-Trevino JY, Webb P, Shively G, Rogers BL, Baral K et al. **2019**. Relatively low maternal aflatoxin exposure is associated with small-for-gestational-age but not with other birth outcomes in a prospective birth cohort study of Nepalese infants. *J. Nutr.* 149:101818–25

Additionally, immature maize stored in traditional facilities increases the likelihood of spoilage and loses nutrition content by 15-20% [16], with flour demonstrating reduced cooking qualities and starch. Moreover, immature seeds reduce the germination rate by 60-80%, perpetuating food insecurity[17].

5. What implications does PMH have for Food and Income Security?

A quarter of the farmers (25%) reported that PMH can intensify food insecurity. Based on Figure 5.1, the brief revealed that above half (66%) of the farmers interviewed will become food insecure by November 2025, while most farmers (96%) will become food insecure by December 2025. By January 2026, the brief noted that all interviewed farmers will be food insecure unless alternative sources of food are adopted. Studies by Amadu and McNamara[18] indicated that PMH creates a self-perpetuating cycle of food insecurity through post-harvest losses, accounting for direct physical losses and quality[19]. Furthermore, the brief found that PMH can lead to income losses (see Figure 3.1), further pushing more farming households into food insecurity statuses. Similarly, immature maize grain in Kenya commanded considerably reduced prices due to a drop in quality[20]. For instance, farmers apply price discounts[21] for visible insect damage in maize, resulting in income losses[22]. The brief revealed that 84% of farmers sold their maize between 500 and 900 Malawi Kwacha per kg of maize. Moreover, immature maize grains increase drying costs and require excessive pesticides after harvest.

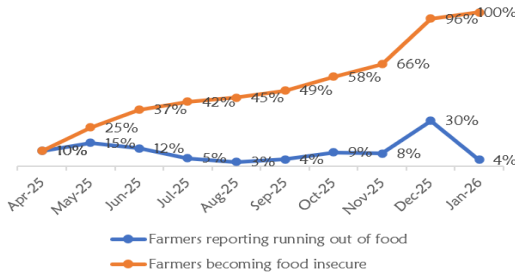

Figure 5.1. Farmers likely to experience food insecurity over the space of 12 months

6. What Policy Options should be promoted?

A holistic and integrated approach is, therefore, pivotal for effectively managing the effects of PMH [(1-21)]. Hence, the brief highlights seven evidence-based policy options aimed at reducing post-harvest losses, improving grain quality, and ensuring household food security in the short - long-term, as presented in Figure 6.1 and subsequently discussed:

Strengthening Security During Harvest Time: During the maize maturity and harvest period (March to June), local leadership should enhance community policing efforts to curb theft and illegal trade. Village leaders can play a central role by issuing stamped certification letters to farmers, verifying their ownership, and authorizing the sale of their produce. When accompanied by a national identity card, this letter would serve as a permit at roadblocks, allowing legitimate transport of maize to urban and peri-urban markets.

[16] Nkhata SG, Liceaga AM, Rocheford T, Hamaker BR, Ferruzzi MG. **2021**. Storage of biofortified maize in Purdue Improved Crop Storage (PICS) bags reduces disulfide linkage-driven decrease in porridge viscosity. *LWT* 136:1110262
[17] Madin, M. B., Nyantakyi-Frimpong, H., & Inkoom, D. K. B. (2021). Seed security among smallholder farmers in semi-arid Ghana. *Environmental Challenges*, *6*, 100438. https://doi.org/10.1016/j.envc.2021.100438
[18] Amadu, F.O., McNamara, P.E. Do Agricultural stakeholder panels enhance post-harvest loss reduction? Evidence from Malawi. *Agric & Food Secur* **13**, 30 (2024). https://doi.org/10.1186/s40066-024-00481-5
[19] Mutungi, C., Muthoni, F., Bekunda, M., Gaspar, A., Kabula, E., & Abass, A. (2019). Physical quality of maize grain harvested and stored by smallholder farmers in the Northern highlands of Tanzania: Effects of harvesting and pre-storage handling practices in two marginally contrasting agro-locations. *Journal of Stored Products Research*, *84*, 101517. https://doi.org/10.1016/j.jspr.2019.101517
[20] Hoffmann V, Moser C, Herman TJ. **2020a**. Demand for aflatoxin-safe maize in Kenya: dynamic response to price and advertising. *Am. J. Agric. Econ.* 103:1275–95
[21] Abbas, H., Zhao, L., Gong, X. *et al.* Environmental and economic influences of postharvest losses across the fish-food products supply chain in the developing regions. *Environ Dev Sustain* **26**, 28335–28366 (2024). https://doi.org/10.1007/s10668-023-03814-9
[22] Kadjo D, Ricker-Gilbert J, Shively J, Abdoulaye T. **2020**. Food safety and adverse selection in rural maize markets. *J. Agric. Econ.* 71:2412–38

Tightening roadblocks: Authorities at District Assemblies, City Councils, and the Malawi Police Service should strengthen regulations governing maize movement. This includes reinforcing roadblock inspections, banning the sale of green maize in urban areas, and preventing unauthorized transportation of maize.

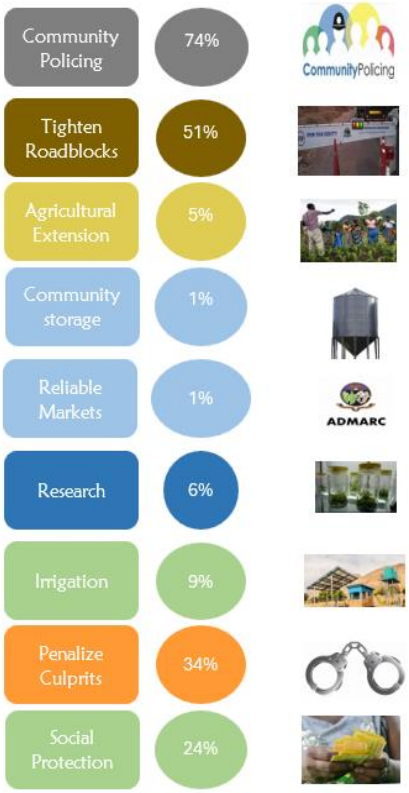

Figure 6.1. Farmers' Prioritized Recommendations

Social safety nets, viz., provision of work for food or cash will become very critical to cushion farmers from food shortages as farmers approach the next agricultural season.

Targeted Agricultural Extension Services: Agricultural extension officers should be strategically deployed to educate farmers on optimal harvest timing and monitor moisture content for proper storage and marketability. Extension officers should also provide farmers with climate information services to assist in making informed decisions about when to harvest, considering weather patterns and crop maturity.

Warehouse Receipt System: Building on the warehouse receipt system, farmers should be encouraged to store their maize in community grain reserves, allowing them to sell it at higher prices later. This approach not only maximizes profits but also smoothens food supply throughout the year. Warehouse receipt system, when linked to financial institutions, increases access to finance by the farmers by using the warehouse receipts as collateral. Warehouse receipt has great potential to minimize stress sale of produce soon after harvest as the loans obtained help the farmers deal with the most immediate needs as they await to sell their produce in the warehouse.

Value Chain and Market Development: Strengthen market linkages by developing formal channels that reward farmers for producing high-quality maize. Formal market channels should encourage better post-harvest management practices through quality incentives over quantity.

Encourage Winter Cropping: Given that some households will experience food shortages between August and October, farmers should consider winter cropping as a strategic measure to enhance food availability during the lean season.

Investment in Research Breeding Programs: Increased funding should be directed towards breeding programs to develop varieties with better post-harvest characteristics, considering moisture, pest resistance, and storage durability.

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