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The Impact of Improved Grain Storage Technology on Marketing Behaviour and Livelihoods of Maize Farmers: A Randomized Controlled Trial in Ethiopia

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Abstract : Farmers in Ethiopia produce most of their own food during one agricultural season per year. Therefore, they need to use on-farm storage technologies to bridge the lean season and benefit from price arbitrage. Maize stored using traditional storage bags offer no protection from insects and molds, leading to high storage losses. In Ethiopia access to and use of modern storage technologies are still limited, restraining farmers to benefit from local maize price fluctuations. We used a randomized controlled trial among 871 maize farmers to evaluate the impacts of Purdue Improved Crop Storage (PICS) bags, also known as hermetic bags, on storage losses, and especially on behavioral changes with respect to consumption, marketing, and income among maize farmers in Ethiopia. This study builds upon the limited previous experimental research that has tried to understand farmers' grain storage and post-harvest losses and identify mechanisms behind the persistence of these challenges. Our main hypothesis is that access to PICS bags allows farmers to increase production, storage and maize income. Also delay the length of maize storage, reduce maize post-harvest losses and improve their food security. Our results show that even though farmers received only three PICS bags that represent 10percent of their total maize stored, they delay their length of maize storage for sales by two weeks. However, we find no treatment effect on maize income, suggesting that the arbitrage of two weeks is too small. Also, we do not find any reduction in storage losses due to farmers' reaction by selling early and by using cheap and readily available but potentially harmful storage chemicals. Looking at the heterogeneity treatment effects between the treatment variable and highland and lowland villages, we find a decrease in the percentage of maize stored by 4 percent in the highland villages. This confirms that location specific factors, such as agro-ecology and proximity to markets are important factors that influence whether and how much of the harvest a farmer stores. These findings highlight the benefits of hermetic storage bags, by allowing farmers to make inter-temporal arbitrage and by reducing potential health risks from storage chemicals. The main policy recommendation that emanates from our study is that postharvest losses reduction throughout the whole value chain is an important pathway to food and income security in Sub-Saharan Africa (SSA). However, future storage loss interventions with hermetic storage technologies should take into account the agro-ecology of the study area and quantify storage losses beyond farmers self-reported losses, such as the count and weigh method. Finally, studies on hermetic storage technologies indicate positive impacts on post-harvest losses and in improving food security, but the adoption and use of these technologies is currently still low in SSA. Therefore, future works on the scaling up of hermetic bags, should consider reasons why farmers only use PICS bags to store grains for consumption, which is usually related to a safety-first approach or due to lack of incentives (higher price from maize not treated with chemicals), and no grain quality check.

Keywords : arbitrage, PICS hermetic bags, post-harvest storage loss, RCT
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