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Research Application Summary

Exploring Farmer' Practices and their Implication on Postharvest Losses among Smallholder Farmers in Uganda

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Abstract

In Sub-Saharan Africa and in particular Uganda, smallholder farmer experience high quantitative and qualitative losses in maize due to practicing poor post-harvest handling practices. The study explored farmer' practices and their implication on postharvest losses among smallholder farmers in Uganda using the case of Kakumiro district in Western Uganda. An exploratory study involving four focus group interviews complemented by 136 semi-structured interviews were conducted to gain information from maize farmers. While thematic-content analysis was applied to the qualitative data, quantitative data were analyzed using Statistical Package for Social Sciences (SPSS) version 18.0. Exploratory results indicate that postharvest losses occur mainly during harvesting, shelling, drying and storage. The findings imply that if the Post Harvest Losses (PHLs) are not mitigated at these crucial stages in the value chain, households are likely to remain food and income insecure. Therefore, any future interventions should target mitigating PHLs in maize that occur at these critical and interdependent stages. To achieve this calls for concerted efforts in using more robust and integrated methods and approaches such as Information and Communication Technologies (ICTs) that are re-known for changing mindset and fostering interactive learning among farmers about postharvest management.

Key words: Farmer practices, maize farmers, postharvest losses, quality, Uganda

Résumé

En Afrique subsaharienne et en particulier en Ouganda, les petits exploitants agricoles subissent des pertes quantitatives et qualitatives élevées de maïs en raison de mauvaises pratiques de manutention post-récolte. L'étude a exploré les pratiques des agriculteurs et leur implication sur les pertes post-récolte parmi les petits exploitants agricoles en Ouganda en utilisant le cas du district de Kakumiro dans l'ouest de l'Ouganda. Une étude exploratoire comprenant quatre entretiens avec des groupes de discussion complétés par 136 entretiens semi-structurés a été menée pour obtenir des informations auprès des cultivateurs de maïs. Alors que l'analyse thématique-contenu a été appliquée aux données qualitatives, les données quantitatives ont été analysées à l'aide de SPSS (Statistical Package for Social Sciences) version 18.0. Les résultats exploratoires indiquent que les pertes post-récolte se produisent principalement pendant la récolte, le décorticage, le séchage et le stockage. Les résultats impliquent que si les pertes post-récolte ne sont pas atténuées à ces étapes cruciales de la chaîne de valeur, les ménages sont susceptibles de rester en situation d'insécurité alimentaire et de revenus. Par conséquent, toute intervention future devrait viser à atténuer les pertes post-récolte de maïs qui se produisent à ces étapes critiques et interdépendantes. Pour y parvenir, des efforts concertés sont nécessaires pour utiliser des méthodes et des approches plus robustes et intégrées, telles que les technologies de l'information et de la communication (TIC), qui sont réputées pour changer les mentalités et favoriser l'apprentissage interactif des agriculteurs en matière de gestion post-récolte.

Mots clés : Pratiques des agriculteurs, producteurs de maïs, pertes post-récolte, qualité, Ouganda

Introduction

Globally, meeting the food demand of a rapidly increasing population is a cardinal challenge (FAO, 2017).. For example, the population is expected to grow up-to 9.1 billion people by the year 2050 (FAO, 2014), requiring about 70% extra food production to meet the global demand. World Food Program special operation summary report notes that post-harvest losses (PHLs) are some of the largest contributing factors to food insecurity in developing countries including Uganda (FAO, 2014). In African countries, and in Uganda particularly, these losses have been estimated to range between 20% and 40%, which is highly significant in leading to household food and income insecurity (Ssebaggala *et al*., 2017). In Sub-Saharan Africa (SSA) about, 13.5% of the total cereal production including maize is lost during postharvest handling and distribution (FAO, 2011). Thus, reduction in PHLs requires implementing interventions that promote better practices by farmers in order to mitigate the effects of food and income insecurity (Wichern *et al*., 2017). Affognon *et al*. (2015) and Ssebaggala *et al*. (2017) report that investing in PHL reduction is a quick impact intervention for enhancing food security.

Earlier scholars report that the highest proportion of PHLs occur at farm gate given the nature of practices employed by the farmers including; harvesting, drying, processing and storage of crop produce (Agol, 2017; Ssebaggala *et al*., 2017; Manandhar *et al*., 2018). Most of the PHLs reportedly occur at harvesting, shelling, drying, storing and transporting stages (Ssebaggala *et al*., 2017), the focus of this paper. Efforts to mitigate losses that occur at those stages require performing proper postharvest handling practices and technologies (PHHPT). How farmers perform those practices in the context of maize remains largely unknown. In the context of this paper, postharvest handling refers to all activities carried out by farmers right from harvesting to final consumption of the produce, in this case maize. In Uganda, for instance farmers experience PHLs perhaps due to the practices and technologies which they employ and due to lack of knowledge and skill in using better practices and technologies (Viola, 2017; Tibagonzeka *et al*., 2018). In Uganda, the forms of practices and technologies maize farmers employ to mitigate PHLs are not clearly known. This exploratory study was therefore carried to assess the farmer' practices and their implication on PHLs among smallholder farmers in Uganda, using the case of Kakumiro district in Western Uganda.

Materials and methods

In September 2018, the exploratory study was conducted in Kakumiro District. The district was selected because it is one of the major maize producing districts in Uganda and PHLs account for about 22% losses (UBoS, 2016). Maize is also the staple food security crop grown by farmers. The sole aim of the study was to conduct a farmer-based assessment of the status of practices and technologies and their implication in PHLs. The study was conducted in three sub-counties (i.e. Nalweyo, Katikara and Kitaihuka) which were purposively selected with guidance from the field extension staff. A total of 136 maize farmers were purposively selected based on their experience in maize production. Sunsequently, respondents were purposively selected from the nine villages of Kakoora, Igabura, Kyentale, Kyabeya, Katikara, Kabukurura, Kitabona, Kinunda and Kirira for the study.

Data were collected by trained research assistants using a pre-tested semi structured questionnaire. Farmer Group Disscusions (FGDs) comprising of 32 maize farmers were conducted to assess how PHLs occurred at harvesting, drying, storage and transportation. Thematic-content analysis was applied to the qualitative data generated through FGDs based on the variables of interest related to farmer practices and their implication on PHLs. Data from the semi-structured interviews were analyzed using Statistical Package for Social Sciences (SPSS) version 18.0 to generate percentages of socio-demographic features of maize farmers and the proportions of losses that occurred at harvesting,

shelling, drying, storing and transporting stages.

Results and discussion

Socio-demographic features of respondents. Table 1 summaries the profile of maize farmers who participated in the exploratory study where maize postharvest losses were assessed in Kakumiro district of Uganda. The results indicate that the sample comprised of relatively more males (62%) than females (38%) Possibly because of the nature of postharvest handling practices and activities that were mentored as being tiresome and heavy to conducted by women. This was a weakness of the study since women perform most of the agricultural activities (Karubanga *et al*., 2017). Table 1 further shows that most of the maize farmers who were interviewed belonged to the age category of 31-50 years (72%). This is a key age category for performing maize postharvest handling activities as they are still able bodied to perform those heavy and tiring activities. In a nutshell, this category is critical in providing labour required in postharvest management. (see also Ssebaggala *et al*., 2017).

Table 1. Socio-demographic features of respondents (n=136)

Variable	Percentage
Sex	
Males	62
Females	38
Age	
Below 30 years	16
Between 31-50 years	72
Above 50 years	12
Level of education	
No formal education	14
Formal education	
Primary	60
Secondary	22
Tertiary	04
Occupation of respondents	
On-farm activities	92
Non on-farm activities	8
Group membership	
Yes	30
No	70

Source: Exploratory study, 2019

About 14% of the respondents had not attained formal education; and this perhaps explained the poor practices farmers were performing on their farms as they lacked necessary knowledge and skills. Majority of the farmers interviewed (92%) were involved in farming as a business implying that if PHLs occur, the households are likely to be food and income insecure. This finding implies that provision of trainings about postharvest management to farmers is imperative especially to those already mobilized into farmer organization and groups. Such farmer organizations foster interactive learning and innovativeness by taking up new practices which are critical for reduction of PHLs (Bentley *et al*., 2014; Karubanga *et al*., 2019) and if the farmers are mobilized in groups it can trigger and foster interactive learning about mitigation of PHLs by as much 30% (Karubanga *et al*., 2019).

Farmer practices and their implication on PHLs

This sub-section describes practices and technologies which farmers were using in maize postharvest management. The key practices here PHLs occur include among others harvesting, shelling, drying, storage and transportation, as also earlier elucidiated by Ssebaggala *et al*. (2017). These practices are highlighted below.

Harvesting. Harvesting involves separating a well dried maize cob from its stalk. At this stage, the moisture content is expected to be ranging between 17-20% (Africa Postharvest Loss Information System [APHLIS], 2012). Over 80% of the farmers were harvesting maize prematurely as they wanted to sell maize at relatively better market prices. During FGDs, farmers however, acknowledged that too early harvesting of crop at high moisture content increases the drying cost, making it susceptible to mold growth, insect infestation, and resulting in high amount of broken grains and low milling yields. This accelerating PHLs. The domestic and other related demands such as paying for medical bills and school fess are some of the reasons why farmers sometimes harvested the maize before full maturity and dryness.

In circumstances where market prices were relatively low (i.e., 100 Uganda shillings per kilogram) farmers resorted to hoarding the maize either in the field or stores. For example, one farmer in Kakora village said 'in the first season of 2018, I left my maize in the garden to rot; why would I waste my time, money and energy harvesting maize for sale at lower prices?' Such practices and mindset triggered and accelerated PHLs even further. For example, leaving the mature maize un-harvested results in high shattering losses, exposure to birds and rodents attack, and losses due to natural calamities like rain and hailstorms and sometimes to theft. It was reported that harvesting of maize was done manually which tended to delay the harvesting activity and besides it is a labor intensive and slow process. At the peak of the harvesting season, there was reportedly shortage of labor, which results in delays in the harvesting, thus, leading to PHLs. Mechanical harvesting of maize would quicken the process of harvesting coupled. This is feasible through farmer groups.

Sorting and shelling. It is imperative that before the maize is shelled, it is properly sorted in terms of grain sizes and by removing dirty, rotten ones, those infested by insects, discolored grains and molded or physically damaged maize grains (APHLIS, 2012). The purpose of performing this practice is to ensure uniform and quality produced maize. Our study however, revealed that most farmers did not sort their maize prior to shelling which compromised the quality of maize produced. The farmers who were interviewed indicated that they used simple motorized shellers to separate maize from cobs. However, this did not refute the fact that some farmers did not used hands and beating using sticks to shell maize. This practice led to the scattering and breaking of grains leading to PHLs which was partly made worse by use of old tone tarpaulins bags for storage (Figure 1) of shelling maize.

Figure 1. Post-Harvest Losses due to use of old and torn tarpaulins

Drying. Focus group discussion with maize farmers revealed that farmers dry their maize using a variety of methods and technologies. For example, the exploratory study indicated that some of the farmers spread maize cobs for sun-drying and shelling using tarpaulins (55%) while 29% dried maize on bare ground (29%). Because farmers were conscious about incurring PHLs, they innovatively used mats to dry maize (Figure 2). However, this was possible only for smaller quantities of maize. The farmers who were producing maize in large quantities, opined that drying maize was a key challenge because of the costs involved in buying tarpaulins and paying for labour to perform the activity (Affognon *et al*., 2015; Ssebaggala *et al*., 2017). Because of challenges related to inadequate funds, PHLs, was reported to be higher among households that cannot afford to pay for labour. For example, one of the farmers during FGDs said 'drying shelled maize on bare ground is quite challenging because it leads to contamination of the grains with soils or dirt and the situation is worse when it is a rainy season' (FG interviews, September 2018). In the district where this study was conducted, there was a maize drying facility at Nalweyo Seed Company (NASECO). However, farmers mensioned that it was expensive to transport maize to NASECO for just drying the maize. The NASECO facility was only being used by farmers with subscribed membership to the company. This therefore calls for more sensitization among farmers on the importance of using driers to dry maize so as to achieve recommended moisture content and prolong the strorage life of maize produced. This however, requires linking farmers to the company through their extension staff. Farmers tested for dryness of maize by walking through the maize and biting grains using their teeth.

Fig. 2: Drying on a map for quality maize

Storage. Once the maize was dry it was either sold off or kept in stores in anticipation of higher market prices. Because farmers appreciated the important of ensuring quality of the maize kept in stores, about 77% of them kept maize seeds in sacks in their houses. This was also for purposes of ensuring safety of their maize from thieves. About 96% of the farmers kept maize grain in sacs before being taken to the store. Interestingly, most farmers either sold their maize in the garden or immediately after drying because of the losses associated with storage such as attack by termites, fire, molds and rotting (FAO, 2011; Ssebaggala *et al*., 2017). A few farmers constructed stores for their maize produce, but field observations indicated that stores were not properly managed (Figure 3), a precursor for pest infestation. Most of the losses occur at this stage partialy due to the mindset of the farmers as one of the farmers in Kabukurura village indicated during the FGDs: "During storage of maize, I do not mind about losing small amounts of maize grain. The losses are inevitable. Besides, how can I struggle to collect these few grains that have drooped on the ground yet I already have enough in the store" (focus group interview, September 2018).

Figure 3. A poorly managed maize store; a precursor for pest infestation

This finding means that with such mindset and farmers intuition about the PHL, PHLs will likely remain high. This calls for intensive awareness creation and trainings. This requires exposing farmers to robust and interactive learning approaches such as video which are known for creating awareness and changing mindset among the viewers (Karubanga *et al*., 2018).

Transportation. As earlier pointed out that farmers sell their produce while still in the garden or immediately after dying which acts as a strategy for mitigating against PHLs. In this case, the losses are incurred by the buyer. In the process, farmers also do not incur transaction costs related to paying labour for loading and offloading, and hiring trucks to transport maize produce to the market (Affognon *et al*., 2015). This implies that linking farmers to genuine buyers would help further in mitigating PHLs which the farmers are likely to encounter. The farmers who transport produce to the market either use motorcycles (59%), hire vehicles (18%) or carry the produce on their heads (16%), while 6% used bicycles to transport maize to the market. Depending on the mode of transportation, farmers during FGDs said that some PHLs occur but in varying amounts.

Conclusion

This study explored farmers' practices and their implication on PHLs among smallholder maize farmers in Uganda, using the case of Kakumiro district. Our results revealed that farmers employed inappropriate postharvest handling practices and technologies mainly at harvesting, shelling, drying and storage. Notably, delayed or early harvesting, poor storage handling practices, shelling method and improper drying methods, triggered and sustained PHLs. The study findings imply that if the PHLs are not mitigated against at these crucial stages in the value chain, households are likely to remain food and income insecure. Future interventions by the Government and other Non-Governmental Organizations (NGOs) should therefore plan to mitigate PHLs that occur at critical and interdependent stages of harvesting, shelling, drying and storage. This calls for more robust approaches for training and information dissemination such as use of Information and Communication Technologies (ICTs) such as video to equip farmers with the necessary knowledge and skills in postharvest management including changing their mindset.

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