

Full Length Research Paper

Integration of post-harvest management in agricultural policy and strategies to minimise post harvest losses in Lesotho

Brian Muroyiwa*, Liako Shokopa, Puselesto Likoetla and Montoeli Rantlo

Department of Agricultural Economics and Extension, National University of Lesotho, Roma, Lesotho.

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Despite global efforts to increase food availability and curb high incidence of malnutrition in Africa, there are concerns with regard to high post-harvest losses in Africa. Lesotho like most countries in sub-Saharan Africa faces documented challenges with food insecurity and nutrition. Food availability could be increased by reduction of post-harvest losses without further exploitation of resources. Mitigation of post-harvest losses is seen as a possible antidote for increasing food availability and nutritional status in countries experiencing high food losses. This study investigated the extent of integration of post-harvest management in agricultural policy in Lesotho and strategies to minimise post-harvest losses. Purposive sampling was utilised in order to select a sample of twenty-five respondents on which interviews were conducted. Thematic analysis was used to identify a set of overarching themes that can be used to describe the policy environment and strategies to reduce post-harvest losses. The analysis suggests that there is absence of a direct policy to guide post-harvest management activities in Lesotho, it is only referred to indirectly in other policies with the exception of dairy products sector which has a direct post harvest management policy. Strategies to curb post-harvest losses were also identified. The study concludes that there is need for a direct policy to address post-harvest management in Lesotho.

Key words: Lesotho, post harvest management, natural resources, food policy, agricultural development.

INTRODUCTION

Lesotho is largely a rural economy although it is rapidly urbanising with over 70% rural population dependent mainly on agriculture related activities for their livelihoods (Government of Lesotho, 2018). Lesotho for years has experienced successive frequent climate shocks such as dry spells, floods and recurrent droughts with dire consequences on the food security of the population

(Government of Lesotho, 2018). Therefore, in all practical terms Lesotho is generally regarded a food deficit country and it is highly dependent on its neighbour, South Africa for supplementation of its food requirements. Furthermore, expansion of Lesotho agricultural sector is prone to severe challenges such as land degradation, limited land and water resources, increased weather

*Corresponding author. E-mail: bmuroyiwa@gmail.com

variability and difficulty in adapting to climate change (Aulakh and Regmi, 2013; Wikle, 2015). It is imperative that post-harvest management principles be inculcated into local farmers so that post-harvest losses from the produce realised are minimised. Global food loss and waste is estimated at 32% (FAO, 2011a). In sub-Saharan Africa (SSA), the estimated food loss and waste is roughly 37% (Sheahan and Barrett, 2017; Kaminski and Christiaensen, 2014). Food loss mitigation strategies present opportunities that suggest an urgent need for greater attention to post-harvest loss (PHL) in addressing the world's food challenge (World Bank, 2011a; World Bank et al, 2011b). FARA (2006) asserts that sub-Saharan African agriculture productivity and per capita value of agriculture output is the lowest in the world. World Bank et al. (2011b) opines that despite the low total agricultural productivity, post-harvest losses of the food being produced are significant. The enormous magnitude of food losses has prompted experts to agree that investing in post-harvest losses reduction is a quick impact intervention for enhancing food security (GIZ, 2013).

Post-harvest management has been around for decades; however, there has been renewed interest in investment in agriculture since 2008 which has also put post-harvest management practices at the forefront of agricultural sector development debate (Kiaya, 2014). In addition to the renewed interest in investment in agriculture, in September 2015, the United Nations (UN) ambitiously announced a goal of halving worldwide food waste and substantially reducing the global food loss by 2030 as part of Sustainable Development Goals (SDGs) agenda (Sheahan and Barrert, 2017). This has been largely in line with the global goal of ensuring food security for the growing world population and at the same time ensuring that production of food for consumption is sustainable. Despite major investments in improved and increasing climate smart crop and livestock production practices, one of the most significant and unaddressed sources of food insecurity is post-harvest losses due to ineffective post-harvest management. Obviously, one of the major ways of strengthening food security is by reducing these losses (Affognon et al., 2015).

A food self-insufficient and food insecure country like Lesotho needs to take a pragmatic approach in terms of addressing challenges emanating from post-harvest losses. Efforts to improve farmers' welfare through increasing yields for major crops in Lesotho will be futile if a substantial proportion of the crops produced is lost during and/or after harvesting due to inappropriate crop handling, processing, marketing activities and storage technologies (Abass et al., 2014). Postharvest Loss (PHL) is defined to include any loss in quality or quantity that occurs between the time of harvesting and the time it reaches the consumer (Grolleaud, 2002). The postharvest sector includes all points in the value chain from production in the field to the food being placed on a

plate for consumption. In this regard, postharvest activities include harvesting, handling, storage, processing, packaging, transportation and marketing of agricultural products.

Postharvest management determines food quality and safety, competitiveness in the market, and the profits earned by producers. In most developing countries, postharvest management of produce is far from satisfactory (Tadesse et al., 2018). The major constraints include inefficient handling and transportation; poor technologies for storage, processing, and packaging; involvement of too many diverse actors; and poor infrastructure. Apparently, farmers and farm produce handlers, especially women, lack adequate information on proper crop harvesting and handling methods, leading to significant damage by insect pests during storage and marketing (Rugumamu, 2009; Kereth et al., 2013). The high postharvest losses have a negative impact on the income, livelihoods and motivation to expand production among farmers. Inadequate storage which is among the important causes of postharvest losses, constitutes a public health threat when people consume spoiled food, causes supply fluctuations and exacerbates the problem of high food prices.

In order to mitigate food losses multi-stakeholder cooperation is required since the food losses can have a high impact on the nutritional and income status of the producers, market operators and the consumers. Lesotho has a great challenge with malnutrition and stunting which was last reported to be 33.2% (Government of Lesotho, 2018). Quality and quantity of crops produced in Lesotho have to be preserved in order to address these two twin challenges. There is an increasing interest in effective intervention for post-harvest losses reduction in sub-Saharan Africa and other developing countries. Chegere (2018) asserts that food losses in developed countries are as high as in developing countries. Nonetheless, in developing countries the largest proportion of food is lost during post-harvest handling processes and storage; while in developed countries the food losses occur mostly at retail and consumer levels (FAO, 2011b). Abass et al. (2014) concur with Chegere (2018) asserting that post-harvest losses in the developed countries are lower than in the developing countries because of more efficient farming systems, better farm management and effective storage and processing facilities that ensure a larger proportion of the harvested foods is delivered to the market in the most desired quality and safety.

Post-harvest management is believed to have an enormous potential in assuring the quality and safety of crops, addressing on the-farm and post-farm losses (Kader and Rolle, 2004). In order to ensure sustainable use of economic resources wastage and losses should be minimised and at best eliminated. Loss of quality and quantity also has implications nutritionally and in terms of food security. Kiaya (2014) states that food losses are

mainly due to poor infrastructure and logistics, lack of technology, insufficient skills, knowledge and management capacity of supply chain actors and lack of markets (these factors are largely common amongst poor small-scale farmers). Hence, most food losses are experienced by poor farmers who become greatly disadvantaged due to the losses as this has financial implications (Tadesse et al., 2018). Therefore, it is of paramount importance to interrogate the extent to which national policies in Lesotho integrate post-harvest management practices. Abass et al. (2014) argue that it is a priority of most African countries to identify best practices and innovative arrangements for increasing agricultural productivity to improve income and nutrition of farm households. Policies offer direction and certainty for concerned stakeholders, and if there are no clear-cut policies, the operation and business climate become less appealing. Lesotho has limited arable land (Forum for Food Security in Southern Africa, 2002; FAO, 2005), therefore a strong post-harvest management policy is important to ensure that losses are minimised so that food and nutritional security is achieved self-sufficiently. Reduction of food losses offers an important pathway of availing food, alleviating poverty, and improving nutrition (Affognon et al., 2015).

Reduction of both post-harvest losses and quality deterioration are essential in increasing food availability from the existing production. Food availability can be increased without further exploitation of natural resources if food losses are curbed. Tadesse et al. (2018) assert that increasing the food availability is therefore not only increasing the productivity in agriculture, but also lowering losses. Minimizing this loss has a great significance for food security, economic growth and welfare of the society (Kasso and Bekele, 2018). In Lesotho, post harvest management is practiced informally, however, there has not been a study on integration of post-harvest management in the national strategic plans and strategies to the best of author's knowledge. This particular study seeks to understand the extent of integration of post-harvest management in policies in Lesotho. It would also be important to understand the challenges faced by various key actors in post-harvest management in Lesotho and strategies to overcome those challenges.

MATERIALS AND METHODS

A descriptive qualitative research design is used to explain post-harvest management strategies and policy environment in Lesotho. The actors were asked to describe the policy environment whether it is conducive for post-harvest management activities. Furthermore, the study solicited strategies to overcome post-harvest losses from the respondents. The study purposively used the experience and views of actors who are involved in the post-harvest activities rather than review national policies. The study collected primary data from key actors in the Lesotho agricultural sector that are involved in the postharvest activities. The actors included officials from the Ministry of Agriculture and Food Security which has a

number of departments (Table 1), Non-Governmental Organisations (NGOs), Farmer Association Representatives, Smallholder Agriculture Development Lesotho (SADP), and Members of Academia (Agriculture Colleges and Universities). Table 1 summarises and profiles the participants of the study in terms of organisation (affiliation), years of experience and job title. The study used purposive sampling approach where the respondents were selected after careful consideration of their experience, knowledge and role in post-harvest management. The respondents were included in the study after careful consideration of the role that they play in post-harvest management activities in Lesotho. The study had a sample of 25 respondents who were interviewed using an interview schedule which was composed of open ended questions.

The data was analysed using thematic analysis, a qualitative data analysis approach. Nowell et al. (2017) postulated that thematic analysis is an apt qualitative method that can be used in analysing qualitative dataset. The study used thematic analysis because a rigorous thematic analysis can produce trustworthy and insightful findings (Braun and Clarke, 2006). Thematic analysis was used to analyse the data collected from the respondents to the study and thereafter a report of the findings of the study was produced. Braun and Clarke (2006) argue that thematic analysis is a method for identifying, analysing, describing and reporting themes found in a dataset. The data analysis for this study was done following the six steps first given by Braun and Clarke (2006) illustrated in Figure 1.

RESULTS AND DISCUSSION

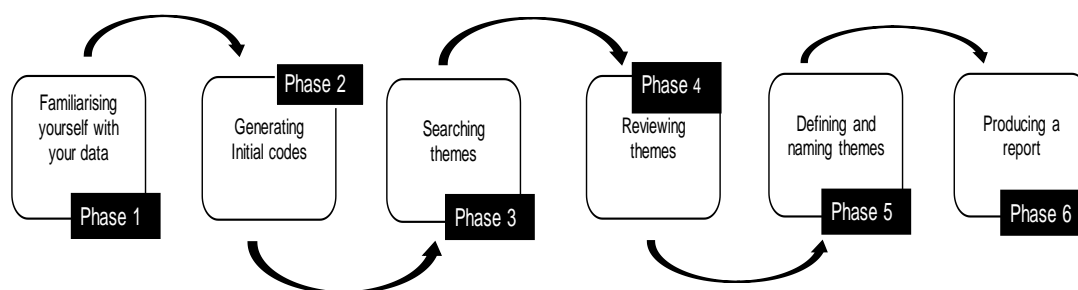
Word Bank (2011) asserts that despite a number of endeavours to counter PHLs, there are few success stories implying that the strategies and approaches for mitigating PHLs have not yielded compelling impacts in SSA. A good understanding of the agro-ecological and socioeconomic drivers of post-harvest losses is important in order to inform policies targeted at its reduction (Kaminski and Christiaensen, 2014). In Lesotho, through this study, the following factors have been highlighted by the respondents to the study (Figure 2). The respondents represented a broad base of stakeholders directly and indirectly involved in post-harvest management activities. Each of the main factors identified are as shown in Figure 2 which shows the main factors identified by the respondents as the major drivers of PHL in Lesotho. Each of these factors was based on the themes which were extracted from the responses given by study participants and these themes would be discussed in the following.

Absence of direct PHM policy and regulations

Questions that were linked to the extent towards which post-harvest management was integrated in policy were largely directed to the government officials, United Nations agencies and other non-government organisations. The officials revealed that there was a dearth of policy at the national level crafted by government to address issues to deal with post-harvest management. The policies that are currently available deal with post-harvest management indirectly and sometimes in

Table 1. Profile of the study respondents.

Participant	Organisation	Position	Years of experience in the field
1	Rural Self Help Development Association	Agronomist	4 months
2	World Vision Lesotho	Technical Program Manager	6 years
3	Catholic Relief Services	Technical Officer Agriculture	12 years
4	LENAFU	Crop Scientist and Agronomy Consultant	5 years
5	SADP	Senior Technical Officer	8 years
6	UNDP	Programme Assistant	21 years
7	Basotho Poultry Farm Association	Head of Institution	10 years
8	Exclusive Piggery Network of Lesotho	Committee Member	1 years
9	Lesotho National Dairy Board	Supervisor	12 years
10	Maseru Piggery Association	Head of Institution	1 years
11	Department of Marketing	Senior Marketing Officer	12 years
12	Department of Livestock	Principal Livestock Officer(Cattle)	10 years
13	Department of Crops (Horticulture)	Technical Officer	5 years
14	Department of Research	Senior Research Officer	10 years
15	Department of Planning and Policy Analysis	Assistant Economic Planner	4 years
16	Department of Research	Senior Research Officer	8 years
17	Department of Field Service	Director	28 years
18	Department of Crops (Agronomy)	Crop Production Officer	10 years
19	Department of Research	Research Officer	10 years
20	Lesotho Agricultural College	Lecturer	10 years
21	Lesotho Agricultural College	Lecturer	12 years
22	National University of Lesotho	Lecturer-Crop Science	12 years
23	National University of Lesotho	Lecturer-Animal Science	2 years
24	National University of Lesotho	Lecturer-Nutrition	9 years
25	Lesotho College of Education	Lecturer	2 years

**Figure 1.** The six-phase thematic analysis.

Source: Adapted from Nowell et al. (2017) and Braun and Clarke (2006).

a shallow manner. The dearth of policies that directly address PHM results in challenges with regards to implementation of post-harvest management activities since lack of clear policy direction impede such efforts. Parmar et al. (2017) argue that effective government policy at institutional and regulatory levels should complement efforts and interventions aimed at reducing post-harvest losses.

Government officials, non-governmental organisations and some members of the private sector who were target

respondents for questions related to regulation of post-harvest handling practices. The respondents highlighted the lack of regulations for post-harvest handling as well as lack of technical standards. The market rejects the farmer's products sometimes as a result of poor quality due to lack of technical standards leading to increased postharvest losses. This is confirmed by Affognon et al. (2015) asserting that in many SSA countries quality standards are not enforced or do not exist. The absence of technical standards compromises quality and the

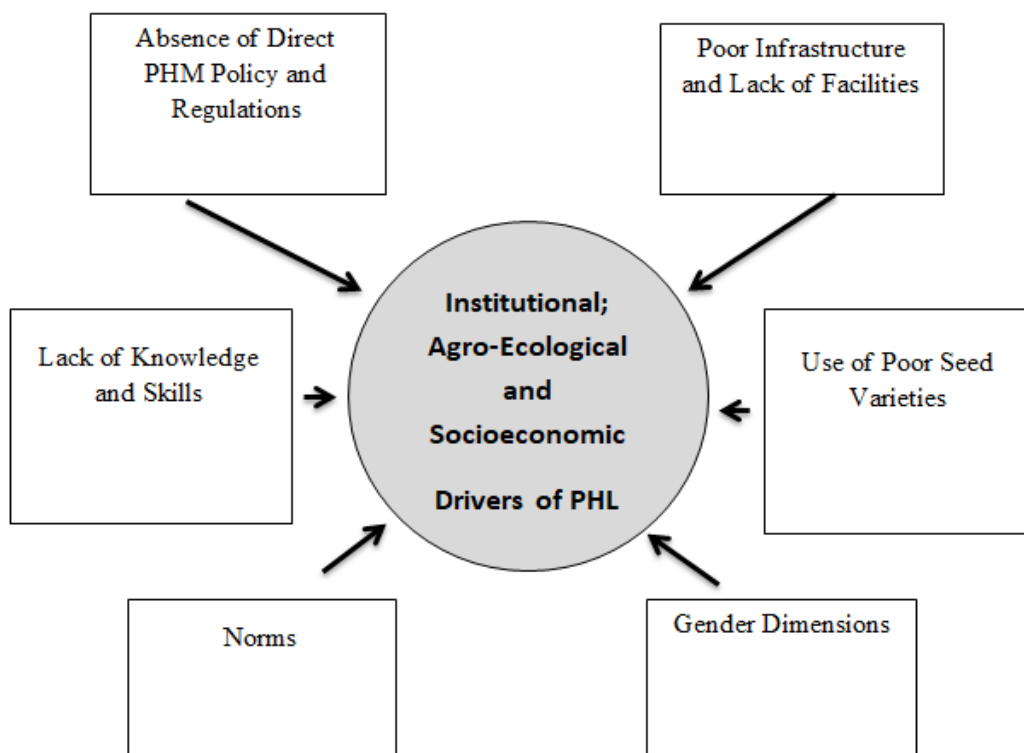


Figure 2. Institutional, Agro-ecological and Socioeconomic drivers of PHL in Lesotho. Source: Author Survey and Compilation (2019).

safety of the foodstuffs when they reach the final consumer. Technical and quality standards are important in order to ensure food safety for consumers as well as to ensure good farmers are rewarded. Swinnen et al. (2015) assert higher product standards signalled as a result of investment in food safety may lead to increased opportunities for exports and access into international markets for SSA producers and processors. The respondents encouraged government to develop international and national standards for Lesotho farmers' produce.

Dairy production was the only agricultural produce sector of Lesotho which was identified to have in place a direct policy, regulations and standards. It is regulated by the Distribution of Dairy Products Act of 1991 and also the Milk Hygiene regulation. These national policies regulate the marketing, standardisation and milking of cows. GPLP Project (2014) argues that having a policy alone, though necessary is not sufficient to address the problem of high postharvest losses. This is mainly due to the fact that having a well-designed policy in terms of contents and implementation strategies is one thing and having the policy implemented successfully is a different matter. Lack of successful implementation of the policies was identified as a challenge in the dairy produce industry. The policies are also old and need to be reviewed.

Poor infrastructure and lack of facilities

Majority of policy makers and implementers who responded to the study indicated that access to markets, poor infrastructure and in some instances absence of infrastructure hinders postharvest management activities. Some of the missing critical facilities for post-harvest management in Lesotho include market centers, silos, abattoirs and slaughter houses. Kasso and Bekele (2018) reported that in Dire Dawa town in Ethiopia farmers did not have suitable storage facilities and marketing sites. World Bank et al. (2011b) confirms that in low-income countries processing, storage infrastructure and market facilities are either not available or are inadequate. All categories of stakeholders specifically mentioned poor storage, lack of storage facilities, poor road network and lack of market information as key challenges that lead to high postharvest losses.

Inadequate storage facilities is a common challenge as suggested by Tedesse et al. (2018) who found that farmers raised concern over the lack of storage facilities. Education stakeholders stated that they do not have adequate facilities and hence they are unable to perform certain postharvest management practicals during the course of student instruction. The respondents representing stakeholders from the poultry and piggery associations raised concern over lack of abattoirs and

slaughter houses. Electricity shutdowns were also singularly raised as a major concern by meat producers as power cuts lead to compromise on the quality of meat. The frequency of load shedding and power cuts should be reduced so that quality of meat is preserved when it is in storage. Governments in low income countries have to consider investing in good storage facilities so that the quality of produce is preserved before it is taken to the market.

Kaminski and Christiaensen (2014) stated that the use of improved storage technologies reduce post-harvest losses, with the use of modern storage technologies reducing post-harvest losses more than the use of traditional storage technologies. Traditional facilities used for storage attract pests and diseases which destroys the produce. These challenges are very common in Lesotho. Lesotho is a low-income country and farmers have difficulty in accessing modern technology, the farmers use poor storage facilities such as plastic bags, in house or ceiling storage, unprotected piles, open drums and sacks. The poor storage and processing techniques are associated with increase in post-harvest losses (World Bank et al., 2011b; Kasso and Bekele, 2018; Gardas et al., 2017). World Bank et al. (2011b) state that losses are aggravated by poor post-harvest handling, infrastructure, harvesting methods, distribution, sales and marketing policies. Abass et al. (2014) claim that post-harvest losses in developed countries are limited by more efficient farming systems; better transport infrastructure, effective storage and processing facilities.

Lack of knowledge and skills

Farmers' associations revealed that lack of postharvest management knowledge and skills increase post-harvest losses. This is similar to findings by Tedesse et al. (2018) that farmers in Southwest Ethiopia lack skills of pre and post-harvest management. Tedesse et al. (2018) argued that training in pre and post-harvest management is one of the important factors in reducing post-harvest losses. Lesotho farmers would therefore need to be equipped with skills and knowledge of post-harvest management. Rugumamu (2009) and Kereth et al. (2013) highlighted the challenge of lack of adequate information on proper crop harvesting and handling amongst most farmers and crop handlers in Africa. Educational status of household members is of importance as it may affect PHL directly since more educated households may have a better understanding of how to avoid PHL (Kaminski and Christiansen, 2014). Household heads who had acquired post primary education experienced lower rates of PHL (Kaminski and Christiaensen, 2014). Farmers acquire knowledge and skills from institutions of learning as well as from extension workers. Transmission of knowledge and skills to farmers through training and other extension services would ensure that farmers know the right

varieties to plant so that they avoid plant varieties with high pre-harvest and post-harvest losses. There are maize varieties which are highly susceptible to pest attack on the field and during storage while others are resilient. Such information if provided to farmers will curb post-harvest losses. This is besides the fact that households have indigenous knowledge which is passed down from generation to generation, which is also vital.

Abass et al. (2014) assert that dissemination of improved agro-processing technologies and training of the smallholder farmers is necessary to achieve food security and improved nutrition. Through training, farmers acquire knowledge and skills which are necessary for effective conduct of post-harvest management activities. Maize farmers in semi-arid Central and Northern Tanzania had limited knowledge in relation to the proper harvest management methods especially pest control and storage (Abass et al., 2014). This is similar to the findings of this study which also found there was limited knowledge of proper harvest management techniques and technologies, in other cases lack of awareness of post-harvest losses. Training is necessary to bridge this gap in knowledge and skills; extension officers who are meant to advise and interact with farmers are trained in vocational training centers, colleges and universities. In Lesotho, the agricultural vocational training colleges revealed that their curriculum directly supports post-harvest management. However, the depth of post-harvest management is weak in non-agriculture vocational training colleges since it is offered under sub-topics. It was suggested that there has to be a curriculum review so that these colleges can offer independent post-harvest management courses. The current curriculum in the agricultural vocational training colleges is deep, offering both theory and practicals as part of training, with independent post-harvest management courses. Furthermore, the courses cover most components of post-harvest management such as harvesting, on-farm handling, post-harvest handling, preservation, storing, processing, packaging, transporting and marketing. The students are trained on how to handle fruits, vegetables and cereals.

Lack of proper facilities is an issue however, therefore the colleges are not able to do post-harvest management of meat. In the university, postharvest management courses are not all independent as postharvest management is taught as course topics in some departments with certain crops and animals. In contrast to the vocational college curriculum at the university level, the curriculum covers theory with limited practicals, however, the curriculum covers most aspects of post-harvest management. The academic staff have an overwhelming desire to offer more practicals if equipment and facilities are made available in the university. There is also an intention to revise the curriculum so that post-harvest management is offered as an independent course. Kitinoja et al. (2011) stated that postharvest

management should be integrated in the curriculum to increase the postharvest loss reduction efficiency. This should be done to ensure future young farmers and extension officers know all components of postharvest management, the importance and benefits of postharvest management so that they can be able to practice it.

Use of poor seed varieties

Good quality seeds, favorable climate and good soil quality have a prominent role to play in increasing agricultural production (Gardas et al., 2017; Afadhali, 2015; Mwendwa, 2015). Sheahan and Barret (2017) concur stating that one of most important means of mitigating losses in the field is the cultivar selection and development. The officials from the Department of Research and Department of Crops expressed concern over the use of uncertified seed. Farmers often use the maize seed from harvest of the previous season as seed in the upcoming season. The challenge with uncertified seeds is the lack of capacity to resist pest attacks. PHL interventions that aim to reduce PHL while crops are still in the field are arguably more effective than deploying strategies that only start after harvest (Ippolito and Nigro, 2000). These interventions have grown in popularity because of the compounding effects of pests and deterioration accumulated before harvest. Lesotho needs to invest in accessibility of improved seed varieties for pre and post-harvest loss reduction. Such interventions have potential to increase agricultural production while minimizing post-harvest losses.

Norms

Farmers should desist from common practices such as mono-cropping which was identified to be a common practice with Basotho farmers. Monocropping results in hardening and multiplication of certain pests and weeds in a field. Pest control becomes a challenge over time which would increase pre and post-harvest losses. Lesotho is ranked first in Africa and sixteenth in the world on bridging the gap between the sexes and has passed as well as adopted several gender sensitive laws since 2011 (Millennium Development Goals Status Report, 2013). Despite this however, there is really not much that has changed on the ground it is believed that policy and practice are not consistent. Millennium Development Goals Status Report (2013) asserts that achieving gender equality in Lesotho is a complex matter due to the highly patriarchal nature of Lesotho's society and culture. Government officials and non-government organizations reported norms and beliefs of Basotho which include, mono-cropping, wife is the property of her husband and women are not allowed to walk into or near the cattle kraal as this is regarded a male designated role to hinder

the implementation of postharvest management while other stakeholders reported that norms and beliefs do not hinder farmers in urban area to practice postharvest management. This would only be prominent in male headed households; however, there is a significant percentage of female headed farming households in Lesotho. The results of the study are logical since they confirm that norms and beliefs compromise efficiency of postharvest management as postulated by Honfoga et al. (2014).

Gender dimensions

Affognon et al. (2015) contend that gender issues in post-harvest management have not been well researched. The few studies that are found in literature focus on appraisal of participation levels across gender in post-harvest management (Rugumamu, 2009) and challenges encountered by women in adoption of technologies (Morris et al., 2002; Okorley et al., 2001). In most least developed countries post-harvest systems perform below expectations due to lack of the resources and opportunities they need to access technologies and services to help transform agricultural production. Majority of the respondents in this study said post-harvest management practices are not gender biased, although men and women at times have certain designated roles which are largely based on tradition. For example, livestock postharvest management related issues are done by men, and poultry and piggery postharvest management issues are done by women. These findings are inconsistent with the literature as it has shown that gender is a problem in the chain of activities in postharvest management.

It has been argued elsewhere that women face more severe constraints than men in accessing productive resources and markets (Affognon et al., 2015). FAO (2011a) asserts that based on evidence from large scale comparative studies, gender inequalities are costly and inefficient. Lesotho has a big challenge of unemployment, with the largest employer being the Chinese owned textile industry where women are the major employees (Lesotho Country Analysis, 2017; Central Bank of Lesotho, 2016). Therefore, the greater proportion of the male adult population often migrates to South Africa in search of opportunities, especially working in mines. The bulk of the unemployed women have to look for opportunities elsewhere and agriculture is one of such avenues (Lesotho Country Analysis, 2017; Kingdom of Lesotho, 2018). As a result of this, Lesotho has significant proportion of female headed farming households (Kingdom of Lesotho, 2018).

Since Lesotho has significant proportion of female headed farming households women conduct post-harvest management activities freely, this is a possible explanation for the inconsistency of the findings of this

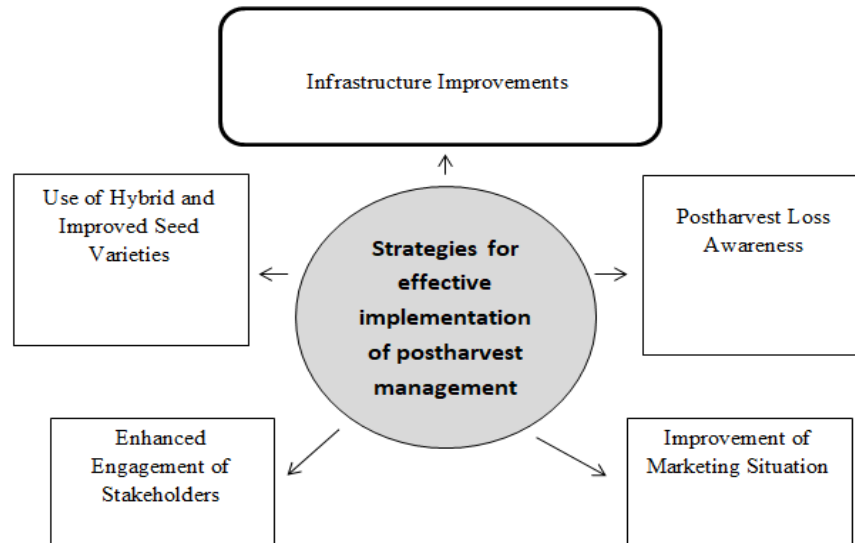


Figure 3. Strategies for effective implementation of postharvest management. Source: Author Survey and Compilation (2019).

study to literature. Okorley et al. (2001) argue that in many SSA countries, postharvest systems under perform because women lack the resources and opportunities they need to access technologies and services to help transform agricultural produce. Since awareness of post-harvest losses management is still in its infancy stages in Lesotho, acquisition of technologies to curb such losses may not be a priority. Therefore, the argument that women lack resources and opportunities is of little consequence with regard to post-harvest management in Lesotho. However, it is still acknowledged that few activities are designated to a particular gender due to culture and norms of the Basotho.

Strategies for effective implementation of postharvest management

The twenty-five (25) respondents to the study were also asked to identify and suggest strategies that could be used to effectively implement postharvest management in Lesotho. The responses that were provided by the respondents to the study were coded analysed and were organised into themes which are discussed in detail subsequently. Figure 3 shows a summary of the various themes identified in a diagram.

Infrastructure Improvements

Infrastructure upgrades are necessary in least developed countries since poor infrastructure is a recurrent challenge highlighted in literature. The majority of policy makers, implementers and agriculture stakeholders who responded to this study expressed concern over the poor

infrastructure and advised that government should be deliberate and decisive in upgrading infrastructure. Post-harvest losses could be significantly reduced if farmers have access to proper storage, processing, packaging, loading and unloading facilities at the farm and market place (Gardas et al., 2017). The farmers in Lesotho need good roads for easy access to markets, access to electricity and access to facilities such as abattoirs, silos, slaughter houses and access modern post-harvest management technologies. Policy makers and implementers should encourage government, development partners, donors and farmers to invest in improved in storage technologies. The respondents felt that government should do more to assist in the provision of good storage facilities. Kaminski and Christiaensen (2014) argue that the use of improved storage technologies reduce PHL, with the use of modern storage technologies reducing PHL more than the use of traditional storage technologies. Since concerns were raised over the lack of storage facilities like silos which result in increase in post-harvest losses public and private investment should address this challenge. Access to appropriate storage technology is a critical need for the smallholder producers, and officials who are responsible in government and also private sector players can intervene.

Use of hybrid and improved seed varieties

Abass et al. (2014) assert that farmers considered changes in weather, pest damage in the field and storage pests as the major factors that exacerbate post-harvest losses. These factors are to some extent within the control of the farmer. There are hybrid seeds available

which are resistant to certain climatic conditions, resistant to pest attack on the field and also have a high tolerance to storage pests. Efforts should be made to ensure awareness, accessibility and availability to farmers, they should also be made aware of benefits of using the improved seed varieties.

Postharvest loss awareness

Ministry of Agriculture departments and other ministries representative insisted that farmers should be made aware of postharvest losses that usually occur on the farm and off the farm. The reality in Lesotho is that awareness of post-harvest losses and how they can be avoided is an area which requires attention. Some farmers are aware of the post-harvest losses but have no knowledge of how they can be controlled (Abass et al., 2014). Some of losses that the farmers suffer they bring upon themselves with misplaced norms and cultural beliefs which are detrimental to their farm enterprise. The results were found consistent with FAO (2011a) which suggested that making farmers aware of the losses they incur after harvest can actually help reduce them.

Enhanced engagement of stakeholders

Enhanced engagement of farmers in the plans and strategies was raised by government officials and United Nations representatives. Farmers most of the time are excluded in the planning and formulation of strategies of programmes and interventions which are directed towards them. Although the assumption is that the experts, consultants and specialists know so much, farmers have indigenous knowledge which must not be undermined. In addition, the input of farmers is invaluable as the interventions are meant for their use and benefit. Government officials and United Nations officials highlighted the need for more research to be undertaken to address the emerging issues, and inclusion of research and extension services in post-harvest management activities. These results are consistent with Cerna (2013) findings which showed that involving other stakeholders, specifically farmers can result in effective implementing. Stakeholders also stated that there should be advocacy to influence opinions and decisions of people and organizations through media as was said by GPLP Project (2014). This can assist in assuring stakeholders that they are on top of issues and in some cases stakeholders can be used to solve problems (Jeffery, 2009).

Improvement of marketing situation

Kasso and Bekele (2018) argued that market situation is a major cause of post-harvest loss and quality

deterioration. Kaminski and Christiaensen (2014) contend that post-harvest losses decline with better market access. In Lesotho the challenge is made worse due to low prices, lack of proper means of transportation and a poor road network infrastructure. Affognon et al. (2015) highlight that at times markets are unrewarding, unavailable and inaccessible; when produce is not graded and is of poor-quality, farmers would reject it leading to losses. Lesotho has no regulations on technical and grading standards for most agricultural produce. This has the potential of increasing post-harvest losses. Accessibility to markets also involves transportation in other instances which increases when there is poor road network connectivity. Cunguara and Darnhofer (2011) reported infrastructural impediments to market access in Mozambique. Distance to markets has the potential of increasing post-harvest losses as such produce require special storage facilities in order to retain quality and freshness. In such cases when markets are far there are high chances of increased post-harvest losses. Furthermore, in Lesotho there is a challenge of lack of proper and organised formal market centres for produce. Establishment of such market centres will assist in linking farmers to consumers which would reduce post-harvest loss and curb quality deterioration. There is also no formal market information system in Lesotho and privileged farmers depend on the South African market information system. More efficient markets and value chain would reduce post-harvest losses in Lesotho.

CONCLUSION AND RECOMMENDATIONS

The government of Lesotho needs to ensure that it drafts a deliberate post-harvest management policy. Policy and implementation strategy are crucial as a starting point in mitigating post-harvest losses. The unique circumstances Lesotho finds itself calls for a concerted effort in curbing post-harvest losses so that the country would ensure it has both food and nutritional security. The policy should address standards and regulations in handling Lesotho agricultural produce after harvest. Poor infrastructure and lack of adequate post-harvest management facilities requires the government to forge private and public investment partnerships to upgrade infrastructure and post-harvest management facilities. Lack of proper storage facilities was listed among major impediments of post-harvest management activities in Lesotho. From the policy perspectives, national agricultural development strategies need to guarantee the availability of effective community-based storage infrastructure. Community-based storage infrastructure would have a positive effect on the food security situation and food prices. Market centers should be established and also a proper and functioning market information system to assist with up to date market information. The private partnerships in market infrastructure investment can reduce losses and improve economic efficiencies of the value chain.

The Lesotho government need to put in place a stand-alone post-harvest management policy with sound implementation measures and follow up on the implementation strategy. Policy alone would not be effective if there is no implementation strategy and supervision of the implementation process. The Policy should ensure that food safety, nutritional value and economic value of produce is not compromised since there would be regulations on safety and standardisation of produce. A good post-harvest management will foster agribusiness in Lesotho since farmers' income would improve, and hence provide employment and other opportunities such as export of produce. The poor state of available post-harvest handling infrastructure and farmers' inadequate knowledge on proper postharvest handling methods in Lesotho seems to further aggravate the already fragile food insecurity. In addition, losses during manual processing and during storage deprive the farmers the opportunity to gain from increased market prices of processed products, thereby worsening poverty. Processing offers farmers an advantage to diversify their incomes and food by processing their agriculture commodities into different products. Tertiary institutions in Lesotho should refocus the curriculum so that it equips future farmers with the skills and knowledge to fulfill the multiple roles in post-harvest management, so that postharvest losses can be effectively reduced. Private sector, government and donors should assist tertiary institutions with acquisition of technologies and facilities needed for practicals since other institutions have inadequate facilities.

CONFLICT OF INTERESTS

The authors have not declared any conflict of interests.

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