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Gender Analysis of Maize Post-Harvest Management in Zimbabwe: A Case Study of Shamva District

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Executive Summary

Research studies around the world over have focused on searching for ways to improve on yields of major food crops with little attention given to post-harvest management processes. Yet, it is of little use when crop genetics and yield gains are offset by post-harvest losses (Rugumamu, 2011). The Swiss

Agency for Development and Cooperation (SDC) realized this huge gap that has led to hunger and food insecurity in many parts of the world, including Africa. Subsequently, they funded the International Maize and Wheat Improvement Center (CIMMYT) to implement the Effective Grain Storage Management Project (EGSP-I) initially in Kenya and Malawi, then in Zimbabwe and Zambia. In Zimbabwe, the project is being implemented in Shamva and Makoni districts but the gender analysis study was only conducted in Shamva district because the intervention in Makoni district was still in its infancy stage.

The objectives of this study were four fold to: (a) understand how gender norms shape men and women's post-harvest practices and experiences across diverse family contexts in Zimbabwe; (b) investigate how effective current technology development, promotion and dissemination approaches are in ensuring gender equality in adoption and impact; (c) identify knowledge gaps in the area of gender and post-harvest management, and; (d) to develop a gender equality strategy that guides the implementation of the EGSP project to ensure equitable processes and outcomes for men and women farmers. The research questions answering these objectives are therefore centered on household level dynamics, technology design, technology promotion and gender knowledge gaps. This study was conducted in six wards in Shamva district within the Mashonaland Central Province of Zimbabwe using a case study approach. The study applied a case study approach which is ideal for a study of this nature considering the complexity, sensitivity and relativity of analyzing gender issues at household and community levels. This approach allowed for an in-depth investigation and analysis of this private, discreet and often secretive sphere of household grain harvest practices. The research team identified different household types and the unique roles of men and women in grain harvest management.

The study was mainly qualitative in nature, informed by interpretivism and an appreciation of multiple realities due to the fact that gender issues are lived experiences and realities wrought with diverse cultural meanings. In essence, it is expected that opinions, interpretations, and experiences of men and women could vary even within the same household or context. In this regard, data was collected through field based observations, focus group discussions with male and female farmers who are beneficiaries and non-beneficiaries of metal silos, in-depth interviews with the EGSP project team in Harare, local extension officers, Ministry of Agriculture officials, traditional and elected leaders were used to generate 'thick descriptions' of grain post-harvest management. Information on technologies, gender roles and norms and grain losses were investigated using these tools. Themes and patterns were

manually coded and analysed to draw insights especially across several focus group discussions. In spite of the strengths of the qualitative approach used and the triangulation of data, we acknowledge that this study may not have captured everything that relates to gender relations and outcomes within the household. In other words, the social realm may not be fully understood, explained, by qualitative or inferential statistics.

Owing to biological and social differences, men and women in the Korekore and Zezuru ethnic groups have roles and expectations that they are expected to fulfill using material (e.g. physical objects, resources and spaces) and non-material (e.g. norms, beliefs and values) culture. In male-headed households, both men and women have access to resources of production but men control certain key resources, particularly those that are normatively regarded as belonging to the household head. Children's access and control of resources varies with age and sex. The younger the children the less access and control they have over household resources. The reverse is also true. However, female children have less access and control over resources than male children of their age. Owing to the existing patriarchy systems and decision making processes often left to males in male-headed households. This scenario has consequences on the process of post-harvest management of grain.

A variety of crops are grown in Shamva district, namely, maize, tobacco, cotton, groundnuts, sunflower, finger millet (*rapoko*), *nyimo* bean (bambara nuts), sweet potatoes and cowpeas. Both the Zezuru and Korekore ethnic groups hold the cultural belief that there are women and men's crops. The notion of gendered cropping systems has been questioned in the literature. Doss (2002) using data from Ghana observes that both men and women are mostly involved in cash and food crop production. What may differ is the degree of involvement. In Shamva, however, research participants consistently expressed that certain crops were for men and others were for women. The classification of crops as men's and women's has implications on the investment dedicated to the crop and ultimately the importance attached to it. This investment includes size of land under cultivation, quality of seed, fertilisers, labor and even attention given to the crop. Women tend to their crops during their 'spare time' while men's crops take most of the household's resources including land under cultivation, time or labor, money and attention. The devaluation of women's crops has material implication when it comes to post harvest management. For instance, when and if multiple crops mature at the same time, priority is given to major cash crops such as cotton and tobacco – leading to greater post harvest losses for minor crops such as maize and others that are controlled by women. Study participants reported that post harvest -

losses was high in the studied wards. An increase in the size of the harvest was intrinsically linked to greater post-harvest losses owing to the need of hiring more laborers. Both male and female study participants concurred that hired laborers are less careful than owners of the grain because their objective is to complete the task and get paid – rather than reduce post harvest losses. Losses of post-harvest grains are incurred at different stages, owing to different factors that are as follows:

- Some crops are lost during harvesting when laborers do not notice certain plants during the cutting of stalks because of weeds,
- Late harvesting of crops due to shortage of harvesting tools and shortage of labor. The size of the household, in terms of number of people in it and their ages as well as their gender composition to provide labor has implications on post-harvest losses,
- Grain is lost to free range chicken as well as other wild birds during the process of drying,
- Women farmers reported that during the winnowing stage, grain is also lost particularly when children and men are involved. Women perceived men and children as being 'too impatient' to pick on grains that mix with soil,
- Some people lose crops to poor storage facilities such as sacks, bales and pole and dagga constructed granaries which are easily accessible to rodents, termites and weevils,
- Post-harvest losses are also as a result of poor mixing of chemicals as well as shortage of the pesticides for treatment of grain,
- During grain retrieval from the granary, losses are realized. It is the responsibility of children to retrieve grain from the granary owing to the small granary door,
- The type of seed and lack of knowledge about when to start harvesting significantly contributes to post harvest losses. Some seed varieties are prone to pests and need to be harvested early.

Locking the granary and keeping an eye on the storage facility are some ways of controlling grain retrievals and it is a responsibility assigned to both men and women Children's roles are limited to physically entering the granary for grain retrieval since the opening to the granary is left too small for an adult to enter.

There are defined gender roles that are assigned specifically to men and women according to the physical strength required to carry out the task and the tools to be used to complete the task well. There are activities that are done by all household members regardless of sex and age, yet other activities are specific to men, women and/or children. Women are responsible for making the ash and children for

looking for eucalyptus leaves and men are responsible for mixing the ash and eucalyptus leaves with the maize. Mixing ash and eucalyptus leaves are traditional storage practices still practiced by men and women farmers. Women can mix the maize with the ashes and eucalyptus leaves but they do so in small quantities, hence it takes a longer time than that used by men for the same quantity of maize. Owing to use of ash and eucalyptus leaves, the maize is left dirty and this has implications for women who play an important role in food preparation. Manual shelling of maize is also practiced by women and children but it is no longer common. For adults, manual shelling involves rubbing two cobs against each other. Shelling by machine is not widespread in the area but where it is practiced, it is done by men.

The granary is the most common grain storage facility in Shamva district. It is a symbol of abundance, security and wealth and a real farmer is known by the presence of a granary at the homestead. The location of the granary in strategic – and visible spaces – within the homestead is consistent with what sociologist's term 'conspicuous consumption' (Page, 1992). For instance, in the west, middle class people tend to place their vehicles or barbecue stands that are bigger and better in places where neighbors can see them. Similarly, in the African culture, the granary serves as a status symbol and therefore one opts to position it in places where they can be seen. Some respondents stated that in some instances individuals may even construct granaries that are larger than their normal expected harvest. The aim is to demonstrate abundance even if the granary is half full, or half empty – depending on one's perspective.

Evidence from Shamva district – from both male and female respondents, largely suggests that all household members have a role to play in the construction of a granary. Men and boys use machetes, trowels, shovels, axes to gather material for the construction of granaries. Women and girls are responsible for cutting thatch grass using sickles and men use scotch carts for transportation of the grass if it is in large quantities. Where the quantities are small, women use head loads to ferry the grass home. In addition to cutting thatch grass, women also plaster the floor of the granary with cow dung, a strategy that is meant to repel termites and weevils.

For individuals that can afford grain treatment chemicals such as acetylic dust, this aspect was reported to be collaborative in nature within households. For instance, when families harvest huge volumes, women carry out the winnowing using winnowing flat trays. Winnowing requires special skill to identify the wind direction and therefore guide stray and rogue particles away from the good grain. Once winnowing is complete, men apply the chemicals to the grain using shovels. Women and children may

assist with the bagging of grain before men ultimately store away the grain. This activity is often repeated mid-season for households that store their grain beyond 5-6 months. This is because weevils may begin to attack treated grain, households often retrieve all grain from the granary, winnow it, and apply chemical treatment for the second time.

Taking bagged grain to the storage facility is done by men. In male-headed households among the Korekore, when maize is stored in the granary, the keys to the granary are kept by the male head, while among the Zezuru the keys are kept by the woman. In *de jure* and *de facto* female-headed households, the female head of household keeps the granary keys. Those who do not have granaries keep bagged maize either in the bedroom or kitchen. The bedroom was most preferred because it promotes security and privacy of the grain while the kitchen was less preferred because it gives room for outsiders to see grain stocks and breeds the temptation to borrow.

Men and women in the studied wards use many strategies to control post-harvest losses. The strategies include:

- As stated above, farmers largely moved away from traditional ways of grain treatment to using Actellic Chirindamura dust and Copper Shumba,
- Ownership of cats to scare away rats,
- Use of rat killers,
- Mid-season retrieval and retreatment of grain,
- Use of new grain storage facilities like metal silos,
- Integrated pest management that is, combining traditional and modern grain management systems,
- Use of hired labor, where the challenge is shortage of labor,
- Placing bags on top of a layer of poles or brick with a metal covering to prevent moisture and termites, rather than putting them directly on the floor.

Community grain storage facilities were reported as uncommon in Shamva district. Study participants referred to the institutional framework termed *Zunde raMambo* (the chief's field) as an example of such a structure. *Zunde raMambo* is meant for support to vulnerable groups in the community. Households under that chieftaincy contribute labor for the production of grain. Once the grain is harvested, it is

stored at the chief's homestead and later distributed to deserving, vulnerable households upon recommendations from the village heads. Zunde raMambo is governed by a committee of village heads. All FGDs respondents reported that this structure has many problems associated with cooperatives. Both men and women were sceptical about communal grain storage facilities, citing management challenges that come with cooperatives.

In all the studied wards, the only improved grain storage technology that farmers made reference to was the metal silo. In all wards people had not seen the super bags, but some had heard about them. The metal silo was introduced by CIMMYT in Shamva in 2013. Three metal silos were distributed to institutions for demonstration purposes. The total number of metal silos distributed in Shamva district is 112 and of these 32 (28 percent) were distributed to women. Both men and women preferred the metal silo to other grain storage technologies for the following reasons:

- Durability,
- The maize is kept clean and in its natural state for a long time,
- Saves on money because no chemicals are applied,
- Saves on labor previously used in mid-storage grain retrievals to re-apply chemicals,
- The material used and proper management of the silos does not allow moisture, pests, termites, weevils and rodents inside.

In addition, there were also gendered perspectives on the value of the metal silo. Women perceived the metal silo as promoting health and hygiene benefits. This is because no chemicals are applied on the grains and in addition, entry into the silos to retrieve grain is not necessary. Women also viewed the silo as a symbol of prestige in the community (for women) due to its shiny and imposing nature.

In addition, both male and female respondents reported that the metal silo should have a lock for the improved security of the grain. Women reported that the challenge with the metal silo is that they are not compartmentalized. As a result, men have monopolised the use of the silo for maize, while women's crops, such as groundnuts, are stored in the traditional granary. Both men and women reported that the metal silo is small to accommodate their grain reserves. On average most households, both male and female headed reported that metal silos stored an average of between one and two tonnes (except in ward 21 where they said metal silos stored an average of five tonnes) hence a silo which accommodates

only a tonne cannot benefit them much as they would still need to go back to the traditional granary to store surplus maize.

Both men and women recommended that the metal silo ought to be sold at an affordable price so that everyone can purchase the silo. Furthermore, there should be different payment terms including use of crops for payment for the silos. Information on post-harvest technology is provided by Agricultural Extension Officers as well as neighbors. Both male and female respondents in all wards preferred workshops as well as field days as platforms for sharing information and as a way of marketing new post-harvest storage technologies. This is because, these platforms provide for dialogue and direct interface with the technology and people can be allowed to seek clarity on areas that they do not understand unlike other strategies.

The artisans received training on business development skills and were expected to market the technology and consider the fabrication of metal silos as a business. However, they did not receive any gender training hence acknowledging the different needs of men and women in adopting metal silo was a missed marketing opportunity. A further challenge identified by one key informant was that, because one of the recruitment criteria for artisans was that someone had to be practising, this attracted people from the Johane Marange Apostolic sect owing to the fact that their sect encourages tinsmiths. This sect holds strong religious beliefs supporting the subordination of women. Therefore, patterns of inequality in terms of access to the business of metal silo fabrication go beyond gender aspects to include other drivers of social inequality such as religion.

Post-harvest management in Shamva district is characterized by salient and open negotiations of gender roles by both men and women to the benefit of each of the groups. Both men and women are exercising agency. Some gender roles are becoming blurred as households pursue a common goal of ensuring food security. However, due to cultural and societal expectations, some practices pertaining to ownership of resources still persist. The following recommendations are made:

- a) Technology development for agriculture needs to be embedded and be informed by the cultural context in which it is to be used. Evidence from Shamva suggests that impacts of introducing a new improved PHM technology in terms of women's access and control of grain differs across ethnic groups – Korekore and Zezuru. Therefore, it is important to understand, and anticipate these differences in ways that can inform mitigation measures.

- b) The development and promotion of the metal silos requires gender sensitivity on the part of the artisans. It is therefore important that gender training be mainstreamed in the artisans training programme. The success of this depends on the level of awareness of gender mainstreaming among the trainers in the Ministry of Agriculture and Mechanisation. It may call for gender training of the trainers themselves first. If well designed, gender training can cover aspects that may enable artisans to understand different roles played by men and women farmers, design preferences for both men and women, and potential strategies for targeting the technologies.
- c) There is need for continued technology promotion and awareness creation through use of field days which bring together many people, both men and women to sensitise the community on the effectiveness of the metal silo. Demonstrations can also be intensified and should also be done by women to show other women how user friendly the metal silo is to women. Testimonies from men and women who have benefitted from the silos will help to speed up the adoption rate. This strategy could be accompanied by distribution of pamphlets and digital video devices that are in vernacular which women and men can read and listen to at times convenient to them.
- d) Owing to the fact that the project needed to take off, selection of artisans as well as metal silo beneficiaries was not gender sensitive. Going forward, it is proposed that a deliberate attempt be made to target and train female artisans as well as target female-headed households as metal silo beneficiaries. Important lessons for the project will be learnt through this.
- e) Because metal silos provide a solution to storage related grain losses, it is important that other postharvest losses be addressed through raising awareness by extension workers. Such awareness campaigns should be in the form of workshops and field days which are accessible to both men and women of all ages.
- f) The project should help raise the awareness of farmers on storage for future sale rather than just for consumption. This awareness raising will enhance the involvement of men in grain storage and will make grain storage a household and shared responsibility, rather than a responsibility for women. It will further contribute to improved income streams to farmers, as they will have an option to sell their grain at a time the market is not flooded.

- g) Owing to the price of metal silos that farmers considered as prohibitive, it is recommended that super bags be introduced as well. Furthermore, the project can capitalise on its relationship with the Ministry of Agriculture and Mechanisation to seek partnerships with agriculture financiers for farmers to secure the silos at a subsidised price.
- h) The project needs a gender focal person to guide the project on gender mainstreaming and this recommendation should be applied to other three EGSP-II countries

Owing to the fact that the study was conducted in one district, conclusions herein can therefore not be broadly generalized beyond the localities within which these data were gathered. Similar studies could be conducted in other districts such as Makoni, which has people from a different ethnic group from Shamva. Additionally, because this study was done at a time artisans had just received training, and the metal silo beneficiaries had not used the technology and therefore were not in a position to evaluate the effectiveness of the technology, it is proposed that further research work be done with artisans as well as metal silo beneficiaries. This means that a gender analysis of the artisans' work is called for as well as household profiling showing the benefits of the metal silo to men and women.

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List of abbreviations

A1 MODEL	-	Small-scale farm units
A2 MODEL	-	Large-scale farms
AIDS	-	Acquired Immune Deficiency Syndrome
CEDAW	-	Convention on the Elimination of All Forms of Discrimination against Women
CIMMYT	-	International Maize and Wheat Improvement Center
EGSP-I	-	Effective Grain Storage Project Phase 1
EGSP-II	-	Effective Grain Storage Project Phase 2
FAO	-	Food and Agriculture Organization of the United Nations
FGDs	-	Focus Group Discussions
FTLRP	-	Fast Track Land Reform Programme
G11	-	Gender Parity Index
HIV	-	Human Immunodeficiency Virus
KIIs	-	Key Informant Interviews
Kg	-	Kilogram
LSCF	-	Large Scale Commercial Farmers
NGOs	-	Non-Governmental Organizations
PHL	-	Post-Harvest Loss
PHM	-	Post-Harvest Management
MAMID	-	Ministry of Agriculture, Mechanisation and Irrigation Development
UNDP	-	United Nations Development Programme
UN	-	United Nations
USD	-	United States Dollars
ZIMSTATS	-	Zimbabwe National Statistics Agency

List of local names and terms

Actellic Chirindamura	- Used to treat stored maize
Azadiachta indica leaves	- A tree in the mahogany family
Copper Shumba	- Used to treat stored maize
Dara	- Crib
Dagga	- Brick made granaries
Dura	- Granary dust
Korekore	- Ethnic group
	Gift to the mother as part of pride price upon marriage of her
Mombe yeumai	- daughter
Nyimo bean	- Bambura nuts
Pfimpu	- Underground work
Prostephanus truncates	- Larger Grain Borer
Rapoko	- Finger millet
Rusero	- Winnowing tray
Sitophilus zeamis	- Common weevil
Tseu	- Woman's land
Zezuru	- Ethnic group
Zunde raMambo	- Chief's field

1. Background

The gender analysis in post-harvest management of maize in Zimbabwe was conducted to inform the Effective Grain Storage Project phase-II (EGSP-II) implemented by the International Maize and Wheat Improvement Center (CIMMYT) in Kenya, Malawi, Zimbabwe and Zambia with funding from the Swiss Agency for Development and Cooperation (SDC). The second phase of EGSP seeks to provide equal opportunities to both men and women to participate in the intervention, provide clarity on how men and women are involved in controlling and accessing stored grain and to identify arenas of gender conflict and cooperation in post-harvest management within households.

Phase 1 of the EGSP was initiated in 2008 and completed in 2011 and was implemented only in Kenya and Malawi. ‘The project targeted training of farmers, trainers and artisans in metal silo fabrication in order to provide farmers with better alternative grain storage solutions’ (Project Completion Report, 2011). Building on the successes and lessons learnt from EGSP-1, the project was up-scaled under EGSP II (2012-2015) to include Zimbabwe and Zambia. The aim of EGSP- II is to improve food security and reduce vulnerability of resource poor farmers, particularly women farmers, in eastern and southern Africa, through the dissemination of effective grain storage technologies especially metal silos and super bags. The project has three components, that is, research, promotion and policy advocacy for metal silos and super grain bag technologies.

In Zimbabwe, the project works in partnership with the following: the Department of Mechanisation in the Ministry of Agriculture, Mechanisation and Irrigation Development and the University of Zimbabwe’s Faculty of Agriculture. The latter’s role in the project is on-station and on-farm testing of metal silos and hermetic bags while the role of the former is mainly to train artisans. This study focused on the dynamic nature of gender relations, not simply cataloguing gender differences but understanding the cultural and symbolic dimensions of gender and how they are invoked in specific postharvest actions, rights, responsibilities and power.

2. Literature review

Owing to persistent food insecurity in many parts of the world, research and technological interventions the world over have focused on improving farm-level productivity through the improvements in farming

practices and the introduction of high yielding varieties, fertilizers, conservation agriculture amongst other interventions. These interventions have not stalled food insecurity because it is of little use when crop production is increased by a big percentage yet post-harvest loss (PHL) risks are not directly addressed (Rugumamu, 2011). It is surprising how these losses have remained a forgotten dimension on food security matters, when in the early 1970s the United Nations (UN) brought to international attention the need to consider them with urgency (FAO, 1981). Post-harvest losses significantly contribute to food insecurity. In Eastern and Southern Africa alone, post-harvest losses are estimated to be about 13.5 percent of the total value of grain production worth USD 11 billion (World Bank, 2011).

Post-harvest risks and losses can be physical (volume shrinkage or deterioration of condition), nutritional (grain contaminated with aflatoxin), monetary (change in unit sales value), and/or economic (not being able to access certain markets). The losses may be caused by pest infestations, infections by pathogens and poor or inappropriate handling technologies (FAO, 1996). These post-harvest risks and losses are experienced at four different stages of post-harvest management process, that is, farm field; en-route; homestead and storage. The postharvest management process, like all other facets of life, is gendered, and interventions that do not address gender inequalities characterising this process are likely to hit a brick wall. Although it is widely believed that women are especially more likely to be socially and economically involved in post-harvest activities including grain storage than men (FAO, 2003; Creighton and Omari, 2000), it is important that gender analysis is conducted to establish the salient gender issues at household and community levels if post-harvest grain losses are to be effectively addressed. Additionally, introduction of technologies to address post-harvest losses should be guided by gender dynamics at household level. To understand decisions about technology adoption, there is need to understand which individuals are making the decisions on which technology will be adopted, the use of the technology and which specific constraints they face in adopting the technology.

a) The nature and extent of postharvest losses

Post-harvest management system of a crop is typified by a set of systematic handling activities in a complex sequence of interconnected field and homestead operations undertaken by smallholder farmers (Rugumamu, 2009) The systematic handling activities by men, women and children can be divided into four major phases: farm field-based which include de-sheathing and piling harvested maize cobs which takes place at physiological maturity; en-route-based when cobs are transported from farms to homesteads; homestead-based phase which constitutes drying and grading of cobs, shelling of cobs and

drying the grains, winnowing of grains, application of pesticides, packing grains at household level and storage based where grains are stored for later use (Rugumamu, 2011). The sequence and interactions of these operations contribute to the formation of a complex system called the post-harvest system. These losses can occur during any of the various phases of the post-harvest system (FAO, 1985). There are several causes of the losses in the post-harvest system including loss due to transporting on poor roads, lack of storage, poor quality of storage facility, impact of weather, spillage and pest infestation. A report by FAO (1990) indicated that there is an information gap on the true level of post-harvest losses owing to the following reasons:

- No universal mathematical methods exist for establishing a "model" for measuring the losses;
- The extent of losses may fluctuate considerably depending on weather conditions (rainy season, etc.), varieties, locations, etc.;
- Many national institutions deal negligently and superficially with the question of post harvest losses, considering it marginal in relation to the problems of agricultural production;
- It is difficult to make credible estimates of quantitative and qualitative losses, especially in situations where specific resources, strategies, and capabilities are all lacking and;
- The lack of adequate permanent national organizations makes it impossible to monitor the extent of post-harvest losses

Majority of the post-harvest losses are attributed to storage pests. Post-harvest storage pests cause an estimated loss of 30 percent and are mainly the common weevil (*Sitophilus zeamidis*) and Larger Grain Borer (*Prostephanus truncates*) (Bett and Guyo, 2007). The common weevil causes between 10 to 20 percent losses while the Larger Grain Borer causes between 30 to 90 percent of the harvested maize. In a study conducted by Rugumamu (2011) in Tanzania, losses were caused by insect pest infestations, damage by rodents, theft, negligence in cob collection, loss of grains from over dried cobs, germination of grains due to untimely onset of rains, cobs obscured by weeds. The estimated losses in Tanzania per household were estimated to be between 5 to 45 kg.

Post-harvest losses can be physical, nutritional, monetary or economic (World Bank, 2011). Governments and other agencies have responded to such losses via technological interventions at farm level, but the adoption of such technologies were very low owing mainly to social factors (World Bank,

2011). Understanding of the social factors including gender relations is intrinsically associated with low adoption levels and is therefore important. Available management strategies for minimising storage pest losses include: cultural and physical control, indigenous methods, legislative and biological control and the host plant resistance. Most of these novel strategies may not be available to farmers due to the high costs of pesticides, thus the need for technologies that are effective, affordable and safe for humans and the environment. Some farmers practiced integrated pest management by simultaneously applying industrial and traditional pesticides as well as keeping cats, a natural predator of rodents. Indigenous pesticides used by farmers include ashes from maize cobs, cow and goat dung, and *Azadiachta indica* leaves. Women were involved in applying these materials in Tanzania and Zimbabwe while men packed them in bags that were sealed by stitching. In rare instances, metallic or plastic drums were used for storage.

3. Rationale for this gender analysis study

This gender analysis study identified, analyzed and examined gendered vulnerabilities and underlying structural norms that affect post-harvest management. This process explored the gendered power relations between men and women, differences in their access to resources, priorities, needs, activities and constraints that they face in relation to each other; and the complex web of cultural and social norms that determine how men, women, boys and girls behave in post-harvest management. The study examined the different roles and responsibilities of women and men, their access and control of resources and their different but equally significant experiences, priorities and capacities (Table 1). Gender analysis answers 10 key questions as follows:

Table 1: Gender Analysis Questions and Answers

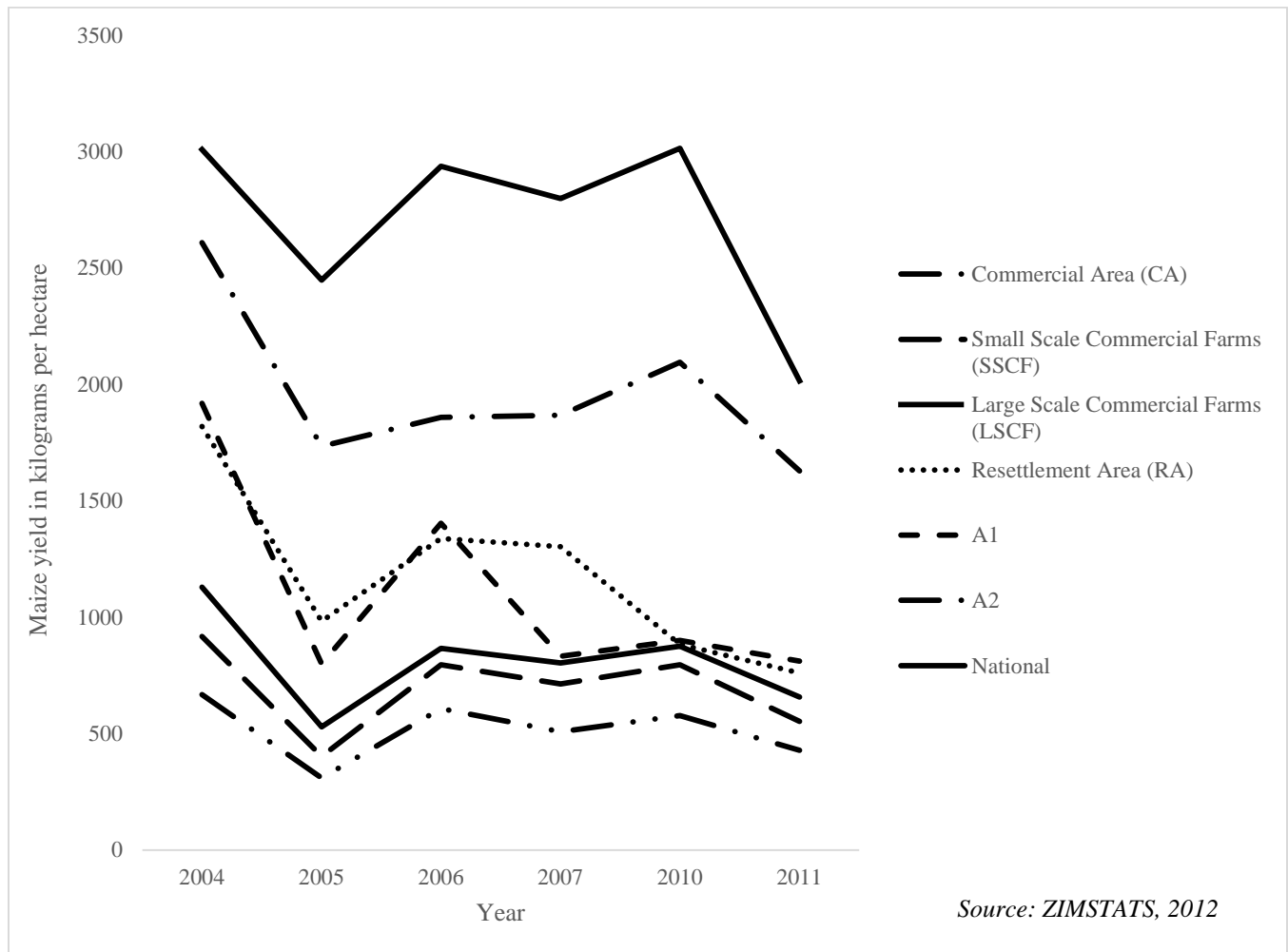
Questions	What the questions relate to
Who does what and why?	Activities
How and with what?	Access to resources
Who owns what?	Ownership of assets
Who is responsible for what?	Roles and responsibilities
Who is entitled to what?	Rights
Who controls what?	Income and spending power

Who decides what?	Power
Who gets what?	Distribution
Who gains, who loses?	Redistribution
Why? What is the basis for this situation?	Rules and laws/norms and customs

Gender analysis brings out key dimensions relating to adoption or non-adoption of improved post-harvest management technologies which this study tried to critically consider. In the context of this study, gender analysis also provided a framework within which an analysis of the work of artisans in the development, promotion and dissemination of information about metal silos could be analysed. Gender analysis also helped in the gender audit of the EGSP partners to determine the extent of gender mainstreaming internally and externally. This dimension of work sought to investigate the inherent capacity of implementing partners to reach, and target men and women equally with technologies, as well as with relevant information that is crucial for the effective management of the technologies.

The rationale for such an analysis in Zimbabwe is that maize is a staple dietary crop; however, production has declined over the years owing to shortage of inputs, lack of extension services, infrastructure and security of tenure hence resulting to importation of this special grain. Table 2 shows the maize yield in tonnes per hectare by land use sector.

Table 2: Maize yield in tonnes per hectare by land use sector (2004-2011)



Source: ZimStats, 2012

Since the Fast Track Land Reform Programme (FTLRP), the country has continuously relied on grain imports. Between 2000 and 2010, Zimbabwe produced 1.137 million tonnes of maize and 133, 000 tonnes of wheat, short of the expected national requirements; hence Zimbabwe has become a deficit grain producer and has relied on imports to fulfil domestic grain needs. On top of the reduction in the yield of maize, post-harvest losses have taken their toll on the crop as well. A study on post-harvest losses in Zimbabwe is timely owing to the fact that harvesting losses ranged between 5.8 and 9.5 percent in a context of declining yields. Studies have shown that platform drying which raises the maize off the

ground for longer term drying has been associated with losses of up to 4.5 percent. Threshing or shelling loss figures for maize for small-scale framers was 1to2.5 percent since the process is done by hand. The percentage loss for large scale farmers was 3.5 percent reflecting greater spillage associated with mechanical shelling (Hodges, 2011). Such percentage losses at various stages of post-harvest justified the need for a gender analysis of the process to determine who was responsible for the losses and how the losses happened. Gender analysis of post-harvest losses in grain management in Zimbabwe was necessary mainly because of the very important role grain production plays in the livelihoods of Zimbabweans. Furthermore, grain production and management is gendered and no in-depth gender analysis studies to date were carried out to examine the process of grain management, particularly, post-harvest grain management.

4. Study objectives

The objective of this study is to gain a deeper understanding than hitherto available of gender relations and roles in post-harvest management of grains, with particular reference to metal silos. Specifically, the study seeks to:

- (a) Provide a deeper understanding of how gender norms shape men and women's post-harvest practices and experiences across diverse maize farming contexts;
- (b) Investigate how effective current technology development, promotion and dissemination approaches are in ensuring gender equality in adoption and impact;
- (c) Identify knowledge gaps in the area of gender and post-harvest management;
- (d) Inform the development of a gender equality strategy that guides the implementation of the post harvest management strategies that ensure equitable processes and outcomes for men and women farmers.

5. Research Questions

The above objectives lead to a set of research questions about gender relations and roles in post harvest grain management, which this study seeks to tackle in pursuit of its overall objective. These research questions are as follows:

1. (i) What roles do men, women, and youth play in grain post harvest management?
 - (ii) In what ways do men, women, and youth as household members have both separate and joint activities, interests, rights, responsibilities and decision making power?
 - (iii) In what ways do social and cultural norms determine individual's roles, rights, responsibilities and claims over other members of the household?
 - (iv) What strategies do men, women, and youth use within households for grain and store management?
 - (v) What bargaining goes on between men and women in the area of stored grain management, marketing and control over resources?
 - (vi) What socio-cultural constraints do women and men in different household circumstances encounter in post harvest management?
 - (vii) How does an improved storage technology such as metal silos alienate or empower men, women and youth who have either individual or pooled storage facilities within a household?
 - (viii) In what ways do improved storage technologies such as metal silos meet men's, women's and youth's design needs and preferences?
2. What are the current approaches used by partners in technology design, development, and dissemination? How effective are these approaches in promoting gender equality? In what ways might these approaches be improved to promote gender equality at household level?
3. What gender knowledge gaps exist in the context/country of study?
4. What lessons can be drawn from this study to inform the development of a gender equality strategy for the implementation of post harvest management strategies for equitable processes and outcomes for men and women farmers.

6. Methodology

6.1 Conceptual Issues in Gender Analysis

The gender analysis study was guided by the Harvard Analytical Framework and Moser's Gender Analysis Framework that investigated the following core areas of: Gender Roles, Responsibilities and Time Used; Patterns of Power and Decision-Making; and Access to and Control over Assets and Resources.

1) Gender Roles, Responsibilities and Time Used

The study examined gender roles and responsibilities at household and community levels as influenced by gender norms. It further explored specific household duties as they present opportunities, constraints and status for individuals. The gender analysis examined how unequal responsibility for care, productive and reproductive work leads to time poverty among women. It also focussed on where the division of labor is shifted and the roles of older household members and potential entry points for the EGSP in terms of time-sharing and time-saving strategies.

2) Patterns of Power and Decision-Making

Within a society, power and decision-making varies from household to household and family members are affected by these decisions and practices. To ensure effective programming, it is critical to understand power dynamics; how decisions are made within a household and how the project might affect household decision making processes—either to achieve equitable relationships or reinforce gender inequalities at household level. The gender analysis examined the factors within the household that shape gender power dynamics and influence individuals' bargaining power.

3) Access to and Control over Assets and Resources

Access to and control of productive assets has implications on how individuals can pursue their aspirations and protect themselves from shocks. In the EGSP project, which aims to promote food security, it is important to understand how gender relations influence the control over and the benefits derived from productive assets. The gender analysis looked at the relationships and structures that determine unequal control over resources. Beyond the household the study also examined access

to relevant resources such as access to information, and capacity building opportunities related to improved post harvest management technologies. It was through the qualitative epistemology, which by nature gathers in-depth thick descriptions of phenomena that such nuances could be interrogated in great detail.

Zimbabwe made commitments towards the promotion of gender equality and women's empowerment by ratifying and signing international and regional conventions and declarations on gender. Domestically, a number of legislative reforms and policy frameworks were introduced as part of the national drive towards gender equality and women's empowerment. The country made commitments through the following:

- Ratification of the 1979 Convention on the Elimination of All Forms of Discrimination against Women (CEDAW). Article 3 of CEDAW provides for appropriate measures including legislation, to ensure the full development and advancement of women, for the purpose of guaranteeing them the exercise and enjoyment of human rights and fundamental freedoms on a basis of equality with men in political, social, economic and cultural fields;
- Signing of the 1995 Beijing Declaration and Platform for Action which addresses inequalities between men and women in the sharing of power and decision making at all levels. The declaration adopted gender mainstreaming as a strategy for achieving gender equality and attaining women empowerment;
- Signing of the 2000 Millennium Declaration and Development Goals where Goal 3: seeks to promote gender equality and empower women; and Goal 1: To eradicate extreme poverty and hunger;
- Adoption of the 2013 National Gender Policy which seeks to identify harmful laws, cultures and traditional practices that infringe on women's and girls' rights and that impede the gender equality objectives and lobby for their elimination.

Although significant progress was made in recent years by Government, International partners, NGOs and civic society also promote gender parity in the country. In the 2013 Human Development Report, Zimbabwe was ranked 116 out of 148 countries in terms of the Gender Inequality Index (GII) in the 2012 index. Drivers of gender inequality include culture, religion, socialisation, statutory and common laws that still perpetuate patriarchal values, gender-based violence and limited women economic empowerment.

With particular reference to agriculture, the country neither has an Agricultural Policy nor a Land Policy in operation. The former is in draft form. This position has affected the sector. According to FAO, (2010-11) it was stated that although women constitute 61.7 percent of the rural population and 53 percent of the agricultural workforce traditional practices have routinely restricted women from land ownership and equitably accessing productive resources. Women's access to land, (one of the most important productive assets for women considering that an estimated 65percent of women derive their livelihood from agriculture), is limited with average arable land holding for male-headed households being 2.73 hectares while that for female-headed households stood at 1.86 hectares (FAO, 2006).

At the conclusion of the Land Reform Programme, only 18percent of the beneficiaries under the A1 model (peasant farmers) were female-headed households while under the A2 model (commercial farmers), they constituted only 12 percent falling short of the gender parity ideal. Although the majority of labourers in the agricultural sector are women, only 20 percent are practicing farming as land owners as the majority are men. Other constraints faced by women in this sector include limited access to credit due to lack of collateral, lack of sustainable markets and limited security of tenure resulting from discriminatory customary laws. It is against this background that the gender analysis of post-harvest management was conducted in Shamva district in Mashonaland Central Province.

6.2 The Study Context

The study was conducted in Shamva district. Although in Zimbabwe CIMMYT is operating in the two districts of Shamva and Makoni, the former district was purposively sampled because it had progressed better than the latter in terms of the implementation of the EGSP. Implementing partners reported that delays in Makoni district were due to political interference in the project. Shamva district is one of the 10 districts in Mashonaland Central Province. It has a total population of 123,650 people. Of these 50.4

percent (62,290) are females while 49.6 percent (61,360) are males. The average household size in Shamva district is 4.1 (ZimStats, 2012). Like other districts in Zimbabwe, Shamva district has shouldered the effects of HIV and AIDS evidenced by the presence of female-headed and child-headed households. For example in ward 15 (one of the studied wards), there are a total of 185 households, 150 are male -headed, 30 female-headed and 5 child-headed. Shamva district is renowned for producing regular crop surpluses among Large Scale Commercial Famers (LSCF), communal areas and resettlement farmers (Moyo, 2000).

6.3 Selection of the Study Sites

The main sampling technique used was purposive. Purposive sampling is also referred to as judgmental sampling since it involves the researcher making a decision about who or what units of analysis to be involved in the study. With purposive sampling, the researcher uses their knowledge to determine who or what study units are the most appropriate for inclusion in the study, based on the potential study units' knowledge base or closeness of fit to criteria associated with the study's focus (Jennings, 2001). Users and non-users of metal silos were purposively sampled for the study. These were mobilised by Agritex officers in their respective areas. In Shamva district, CIMMYT is operating in 6 wards, wards 3, 5, 14, 15, 20, and 21 and of these 3 wards (15, 20 and 21) were purposively sampled. These wards were sampled taking into account different farming systems in them. Wards 20 and 21 are A1 areas while ward 15 is an old resettlement area. These wards also received a majority of the metal silos compared to the others. However, it is important to point out that the artisans that were trained were not from these wards.

6.4 Data Collection Tools and Respondents Selection

Data for this study was gathered using documents review, field based observations, participatory focus group discussions and in-depth interviews. Participatory focus group discussions generated information on the following themes:

- Cultural and Gender Practices in the Community and Vicinity,
- Agricultural Farming Systems and General Post-Harvest Loss Assessment,
- Gender Roles in Post-Harvest Management,
- Post-Harvest Storage Technologies and Practices,
- Post-Harvest Storage Technologies Ownership and Management Strategies,

- Community Storage,
- Improved PH Storage Technologies, Preferences, and Access to Information,
- Effectiveness of Improved Post-Harvest Technologies and,
- Recommendations on Improved Access to post-harvest technologies

Participatory FGDs were held with groups of people with characteristics that were almost homogenous taking into account age and sex. It is important however to state that although the FGDs were homogenous, the responses generated were not necessarily homogenous.

A total of eight sex disaggregated FGDs were held. Two focus group discussions were held in Ward 15 – one with men only and another with women only to allow for unfettered discussions. Another two focus group discussions were convened in Ward 20 – again one each with men only and women only. Finally, in Ward 15 a total of four focus group discussions were convened – two with adult men and women respectively and an additional two with young men and young women respectively. Focus group discussions brought together respondents from different household types, de-facto female-headed¹, de jure female headed² and male-headed. Each group consisted of 6-8 individuals.

The study also used in-depth interviews with key informants in the Ministry of Agriculture, Mechanisation and Irrigation Development (MAMID), the University of Zimbabwe, community leaders who include elected leaders, extension officers, and metal silo artisans.

A total of eleven in-depth interviews with officials in the MAMID and the University of Zimbabwe and artisans were conducted. Interviews with the MAMID and the University of Zimbabwe covered the following themes:

- Organizational Profile and Staffing Level and Structure,
- EGSP Project Summary,
- Testing, Promotion, and Information Dissemination Strategies,
- Knowledge on Gender and Post-Harvest Management,

¹ *De facto* female headed households are households headed by women because the husband has migrated for work.

² *De jure* female headed households are households headed by women because of divorce, death of husband or woman never married

- Knowledge of other PHM Technologies (Beyond EGSP Silos and Super Grain Bags),
- Gender Policy and Other Institutional Tools in place,
- Individual Staff Gender Capacity Assessment.

Interviews with artisans were meant to establish their level of awareness of gender in post-harvest management including technology preferences; attitudes and perceptions on different market segments; strategies that artisans use to foster access to information and improved technology among men, women, and youth, and challenges and opportunities that artisans face with gender responsive business development. The key informants were as follows:

Table 3: Names and positions of key informants

Name of key informant	Sex	Position
Rabson Gumbo	Male	Director, Ministry of Agriculture and Mechanisation
Tirivangani Koza	Male	Deputy Director, Ministry of Agriculture and Mechanisation
Brighton Mvumi	Male	Senior Lecturer, University of Zimbabwe
Daniel Mbeta	Male	Artisan
Francis Pokoti	Male	Artisan
Mrs Mujuru	Female	Agricultural Extension Officer (Ward 20)
Mr Ndabeni	Male	Agricultural Extension Officer (Ward 15)
Mr Jokoniah	Male	Ward Development Coordinator (Ward 20)
Mr Kachidza	Male	Councilor (Ward 15)
Lovemore Madondo	Male	Ward Development Coordinator (Ward 15)
Wellington Mhaka	Male	Agriculture Extension officer (Ward 21)
Mauline Masadza	Female	Agriculture Extension Officer (Ward 20)

The data collection methods mentioned above was complemented by observations. The camera was used as an information-gathering instrument to discover grounded theory (Harper, 2000). Photographs help to concretize the observations made and to support the data.

6.5 Organization and implementation of the fieldwork

The study team comprised of two gender specialists and two research assistants. This team worked closely with the CIMMYT Gender Specialist in the study design, data collection, and analysis. Consent was first sought from the District Administrator, which is a political office responsible for governing the district. At community level, consent was sought from traditional leaders as well as elected leaders (councillors) and at individual focus group level through signing of the consent form. Before signing of the consent form, the focus group participants were informed about the purpose of the research and were made to understand the nature and purpose of the research for them to consent to participate without coercion (Burns, 1997:18). In this study, participation was therefore voluntary, based on participants' knowledge of research processes and the consequences of such processes on their well being as well as the freedom to withdraw from the research process. Consent was also sought for use of recording devices for effective recording of discussions. All interviews, that is FGDs and in-depth, were therefore recorded with the consent of the respondents.

6.6 Data Analysis and Interpretation

Analysis of qualitative data took an inductive approach, beginning with coding at data collection stage to avoid erroneously forcing data into pre-set categories because a code already exists for them. Codes served to summarize, synthesize, and sort many observations made of the data. Codes are also fundamental for developing analysis as they pull together and categorize a series of discrete statements and observations in the data. After data transcription, data was reviewed line by line in detail and as a concept became apparent, a code was assigned. The codes and code structure was finalized at the point of qualitative isomorphs, which is the point at which no new concepts/data emerge from reviewing of successive data. To generate results, the thematic approach was used. Themes provide recurrent and unifying ideas from the data. Themes typically evolved from the conceptual codes and sub-codes and also from the relationship codes, which tag data that link concepts to each other. A comparative analysis of concepts coded in different participant groups or setting codes, that is, data coded with both a conceptual or relationship code and with a participant characteristic code was conducted.

6.7 Research Limitations

Owing to the fact that the study was conducted in a few wards in one district, the findings therefore cannot be generalised to the rest of Zimbabwe.

7. Findings – Cultural Context, Agricultural Farming Systems and Gender Roles

7.1 Introduction

This section covers cultural and gender practices in Shamva district, and agricultural and farming systems and post-harvest losses.

7.2 Cultural and Gender Practices in the Community

Culture is complex, encompassing explicit and implicit, visible and invisible elements. As defined by Tyler (1870:1) ‘culture is that complex whole which includes knowledge, belief, art, morals, law, custom and any other capabilities and habits acquired by man as a member of society.’ This section discusses some of these facets of culture with particular focus on material and non-material culture that governs relations between men and women.

Owing to biological and social differences, men and women in the Korekore and Zezuru ethnic groups have specific roles and expectations to fulfill. Culturally, both Korekore and Zezuru women are expected to perform reproductive roles such as cooking, washing, fetching water and firewood, and taking care of the children and husband. They perform these duties using feminine tools, which are labeled as women’s tools. These tools include all kitchen utensils, the pestle and mortar as well as the grinding stone. Men can not lend kitchen utensils to anyone in the absence of the woman. Women also own bedroom furniture such as wardrobes and beds. Among the Zezuru and the Korekore, the kitchen belongs to a woman together with the tools kept and used in the kitchen.

Unlike the Korekore who consider that the granary (*dura*) belongs to the men, for the Zezuru, the granary belongs to the woman. Upon her death, her relatives ask for keys to the granary and take with them the crops from the granary. One male respondent in ward 15 remarked:

“Mutsika dzechivanhu dura nderemukadzi uye kana mukadzi akashaya vanatezvava vanobvunza dura remwana wavo” (In our culture, the granary belongs to a woman and in case of death of a married woman the in-laws are entitled to the crops in their late daughter’s granary) (Male respondent)

However, when the woman is still alive the husband has the final say on the grain stored and its retrieval, particularly when the grain is for sale. In both ethnic groups the Zezuru and Korekore, all items

and assets that are regarded as women's, are usually distributed and shared following the demise of the woman. Although the Korekore say the granary belongs to the father, they mentioned that the father is just a custodian of family resources; hence it belongs to the entire household. Among the Korekore upon the death of a woman the crops remain with the man for the benefit of the household and upon the death of the man, the crops still remain with the woman for the benefit of the household

In both cultures, women are expected to respect their husbands and submit to them. Such respect is shown by kneeling before them as well as addressing them by their totems as well as respecting their decisions. Married women are also expected to put on long dresses and to always cover their heads. The respect that is expected of married women at home to their husbands is also expected of them in the community when they meet community men. In an FGD with men and women in ward 15, when the researcher expressed the need to separate men from women for separate discussions, women were quick to remark,

“Vanosara ndivanababa nokuti baba havasimudzwi” (Men will remain in the room because they cannot be ordered to leave) (Women respondents)

It was at the word of the men that women remained in the room while men looked for another place to discuss from. Among the Korekore, it is taboo for a married woman to give a hand shake to a man.

In both Korekore and Zezuru ethnic groups, culturally, men are the heads of the households. They are expected to ensure that the family is provided for materially and otherwise. In light of their roles, all cattle (except for the motherhood cow (*mombe yeumai*) which is given to the mother as part of bride price upon the marriage of her daughter) and cattle pens belong to men. Culturally, upon divorce or death, only the motherhood cow can be claimed by the woman's family. Other important assets such as land are registered in the name of the man. Men also own farming implements and other tools such as scotch carts, wheelbarrows, irrigation canes, shovels, knapsacks, harrows, ploughs, hoes, axes, pliers and spanners. Women cannot lend these assets in the absence of the man. After crop sales, among the Zezuru and Korekore male household heads involve their wives in decision making pertaining to use of the income, however, men have the final say. In de jure female-headed households, decisions are made in consultation with adult children, whether male or female. The de facto female household head decides in consultation with the husband.

The Zezuru and Korekore consider unmarried youths who are still under parental care as minors. They are expected to respect their parents and elders. They are assigned household chores by their parents. In most cases, girls are assigned tasks to perform by mothers while boys are assigned by fathers. Girls perform their tasks using tools and utensils that belong to their mother, while boys use their father's tools. Adult boys have authority in the household over their siblings, particularly female siblings. In the absence of their father, they have the authority even to discipline their female siblings even when the mother is there. An adult son is a father-figure in the absence of the father. He takes over the social roles of the father.

In male-headed households, both men and women have access to resources of production but men control certain resources, particularly those perceived to belong to them through patriarchy. Children's access and control of resources varies with age and sex. The younger the child, the less access and control they have to household resources. The reverse is also true. However, female children have less access and control over resources than male children of their age. The study established that Zezuru men are more liberal in their treatment of women and children on matters of access and control of resources than their Korekore counterparts. Both focus group discussions and key informant interviews data revealed that in Zezuru male-headed households, access and control of resources is by both men and women in most cases, whereas among the Korekore men dominate both access and control because of the belief that they are the custodians of the resources on behalf of the household. Majority of people in Shamva district belong to the Johane Marange Apostolic sect, which is well known for upholding values of polygamy. As a result, polygamy is still widespread in Shamva district.

7.3 Agricultural and Farming Systems

A variety of crops are grown in Shamva district and these include maize, tobacco, cotton, groundnuts, sunflower, rapoko, Bambara nuts, sweet potatoes and cowpeas. Both the Zezuru and Korekore hold the belief that there are gender specific crops. This belief owes itself to gender roles of breadwinner and food preparer for men and women respectively. It emerged that the definition of crops as men's or women's is derived from the use of the crop. Data shows that crops that are for household consumption and that bring little cash belong to women, whereas those that bring 'good cash' are men's crops. This classification tallies with the roles that are expected of men and women. Despite this classification of crops, it was revealed that after the sale of crops, among the Zezuru, women act as the household bank that reserves the money. This observation however differs from what Doss (2001) observed in Ghana

that crops are assigned to the gender of the person who kept the revenue from the plot on which it was grown. Data from an FGD with men in ward 15 revealed that classification of crops as belonging to men or women was just for purposes of ensuring that there is someone accountable for the crops.

Generally, the following were classified as women's crops because of their uses in Shamva: sugar beans (consumption), groundnuts (peanut butter), Bambara nuts (for consumption), sweet potatoes (for consumption), rapoko (for consumption and production of beer for sale to raise small amounts of cash), cow peas (for consumption), and sunflower (for cooking oil) while tobacco, cotton and soya beans were regarded as men's crops. Maize was considered the staple crop was regarded as a family crop. However, despite being labeled as a family crop, control of maize was in the hands of men among both the Korekore and the Zezuru, because household welfare which depends on this crop is the responsibility of the head of the household.

In female-headed households, the female head assumes the responsibility of a man, however, the extent of assuming these roles vary for de jure and de facto female headed households. In a de jure female headed household, the female head controls both men and women's crops and has independence on the decisions she takes. She juggles between her roles as the breadwinner and food preparer and by so doing it was revealed that her priorities become 'masculine'. She prioritizes cash crops which allow her to pay for needs that require cash and also to procure food if famine hits.

Data from focus group discussions and key informant interviews shows that the classification of crops as men's and women's has implications on the investment dedicated to the crop and ultimately the importance attached to it. This investment includes size of land under cultivation, quality of seed, fertilizers, labor and even attention given to the crop. Women tend to their crops during their 'spare time' while men's crops take most of the household's resources including land under cultivation, time, money and attention. The same scenario occurs in de jure and de facto female headed households. More attention is given to major crops, which ordinarily are labeled as men's crops with little attention being paid to minor crops owned by women. Even in post-harvest management, when crops mature at the same time, priority is given to major crops; hence more loss is incurred on minor crops. Income from women's crops is in the domain of women and hence women, decide for themselves on how to use the income. The sale and use of income derived from maize is different. Women in ward 21 remarked that in a de facto female headed household, the situation is not different from that in a male headed household:

“Unotanga wasuma, chibage chine zvirango” (You first of all have to seek permission, maize has protocols to be followed) (women respondent)

Women indicated that they mostly buy kitchen utensils with the money from their crops and keep some for household use, particularly to cater for emergencies.

Korekore men reported that they have to ‘treat women well’ when they get money from their crops otherwise they risk losing land and other support important for their crops. Among the Korekore, income from cash crops is kept by the husband and he has the final say on its use while among the Zezuru, it is kept by the wife and any use of the money has to be agreed upon by both the husband and wife. Despite the depiction of the Korekore women as weak and vulnerable, they reported that they derive their power from the labor they provide in the fields. When the husband behaves irresponsibly after sale of crops, they risk harvesting less the coming season owing to sabotage from women and children. Women seem to capitalise on the influence they have on children. Furthermore, they use informal positive sanctions such as gifts to their husbands in the form of money for beer or other items. It is this subtle power that the Korekore women use to influence decisions on use of income as well as other support they require from their husbands.

On prioritisation of crops, the family crop, maize, was prioritised by both men and women because of its contribution to food security. However, when it comes to amount of investment given to crops, female heads of households and males including male youth prioritised tobacco production. In a combined FGD of males and females in ward 20, women remarked:

“Rudo runopiwa kufodya nanababa rwakawanda’. Mvura ichingotanga kunaya vanamai vanotonzi nababa ngatirime fodya, chibage chinzosara chorimwa hacho asi fodya yatove mumunda” (The love that is shown to tobacco by men is too much. At the on-set of rains, women are told to plant tobacco, planting of maize follows after tobacco) (male and female respondents)

Generally, it emerged that women in male headed households and de facto female headed households prioritised food crops while men and de jure female heads of household’s prioritised cash crops. The amount of money that a crop fetches on the market determines its importance to men and de jure female heads of households. It emerged that at the time cotton used to fetch more money than tobacco, it was prioritised by men and female heads of households. Due to the fact that the price of cotton declined, the priority for men and female heads of households has shifted to tobacco.

a. Post-harvest losses

Post-harvest losses are high in the studied wards. Respondents reported that households lose between 10 to 50 kg of maize from the field to the granary. They reported that the bigger the size of the harvest, the bigger the post-harvest loss owing to use of hired laborers, who are sometimes careless when handling the harvest. For instance, some crops are lost during harvesting when people do not notice certain plants during the cutting of stalks because of weeds. This is particularly common when children are involved in the cutting of stalks.

Late harvesting of crops was cited as the major factor resulting in post-harvest losses. Households that harvest their crops late usually run the risk of losing crops to unseasonal rains. Unseasonal rains lead to rotting and germination of crops whilst still in the field as well as sweet potatoes stored in the underground bank. Late harvesting of crops affected all types of households, but was common among de jure female-headed and child-headed households due to shortage of harvesting tools and shortage of labor. Child and female-headed households and some male-headed households do not have enough harvesting resources so they have to wait for those with such resources to finish harvesting their crops before they can be assisted to harvest theirs. Two common harvesting resources that were in short supply for these households were cattle and scotch-carts to ferry crops from the field. This challenge was faced most by female-headed and child-headed households as one respondent in ward 20 remarked:

“Dzimba dzinotungamirirwa nanaamai nevana dzinoita matambudziko ekutoshaya midziyo inovabatsira panguva yekukohwa zvakaita sengoro nemombe” (Female-headed households have challenges in accessing post-harvest resources such as scotch carts and cattle) (female respondent)

When they hire such resources, the owners sometimes do not want to make many trips to the field so they overload the scotch-carts and grain is lost all the way home. A respondent in ward 20 reported that male hired laborers require close supervision particularly from fellow men; otherwise they take advantage of the absence of a male figure in female-headed households.

The size of the household, in terms of number of people in it and their ages as well as their sex composition has a bearing on post-harvest losses. Certain tasks can only be done by adults such as ferrying large quantities of grain home, some can be done better and faster by men due to the physique required such as grain treatment and yet others can be done best by women such as sorting and

winnowing hence in the absence of each of the specified groups of people, grain losses are high. Those households that do not have enough labor because of their small size (in terms of number of people and age) are also at risk of post-harvest losses even when they have money for hired labor. This is because the hired laborers themselves prioritise harvesting their crops before they offer their services to other people. From the focus group discussion in ward 15 it was evident that there are people that have lost crops because of procrastination and delay of the hired laborers who are pre-occupied with their own businesses.

Sometimes crops mature at the same time and households lack adequate labor to harvest all the crops at the same time. Households that were reported as facing this challenge most were de jure female-headed. Under such circumstances, households have to prioritise on the crops to be harvested first. Both men and women in all the wards reported that under such circumstances, households prioritise harvesting of cash crops, in this case tobacco at the expense of food crops such as maize. One respondent remarked:

“Tinokoshesa kukohwa mari first nekuti kana takohwa mari, chikafu chikaita chishoma tinozotenga nemari yefodya” (We put priority on harvesting money because when we do so, if there is food shortage, we can always buy the food using that money) (male and female respondents)

Other post-harvest losses are as a result of crops eaten by wild pigs, mice, termites and birds and peel off owing to over-dryness due to continued exposure to the sun whilst still in the field. Some grain losses may also occur during the process of drying. Grain is lost to free range chicken as well as other wild birds. At the winnowing stage, grain is also lost particularly when children and men are involved. It was reported that they are not patient enough to pick grains that mix with soil.

Some people lose crops to poor drying, shelling and storage facilities. These factors affected both male-headed and female-headed households. It was reported that when the grain is transported home it is heaped and shelled from a non-protected area causing termites and rats to attack it. Furthermore some people place and shell grain from a ground that is not plastered. A respondent in ward 21 remarked:

“Vanopurira pasina kudzurwa vanorasikirwa nekuti hapashaikwe chibage chinzongosangana nemavhu chongosiwa chakadaro” (We shell the grain from a non-plastered place, hence crops that mix with sand are lost) (male and female respondents)

Grain is also lost owing to poor storage facilities. Some farmers store their grain in sacks and bales while other farmers store their grain in pole and dagga constructed granaries. These storage facilities are vulnerable to rodents, termites and weevils and also to fire. Pole and dagga/brick made granaries are not strong enough so sometimes they allow moisture to percolate leading to loss of crops. Rodents have access to the granaries and feed on the grain and in the process contaminate the grains. Weevils also feed on the grain when it is in the granary. Sacks and bales have similar shortcomings as those of granaries as already discussed. Poor storage facilities particularly use of sacks and bales were reported to be most common with the youth, child-headed and female-headed households.

Post-harvest losses are also a result of poor mixing of chemicals as well as shortage of the pesticides for treatment of grain. Mixing of grain with pesticides requires more energy and that is why this task is usually performed by men. In the absence of men to perform this task, unless the grain is mixed in small quantities, it is sometimes not well mixed with pesticides and is therefore lost to pests. Owing to shortage of money to procure pesticides for treatment of grain, people resort to using traditional practices such as gum-tree leaves as well as ashes, which are not strong for grain treatment as the pesticides.

It was reported that during grain retrieval from the granary, losses are also incurred. It is the responsibility of children to retrieve grain from the granary owing to the small granary door. The type of seed and lack of knowledge about when to start harvesting significantly contributes to post harvest losses. Some seed varieties are prone to pests and need to be harvested early, so both male and female households that are not aware of the time to harvest such seed varieties lose their crops. The crops are attacked even before the maize stalks are cut. One female respondent in ward 15 remarked:

“Zvipfukuto zvamazuva ano zvinototangira mumunda chaimo asi izvi zvinoenderana nemhando yembeu inenge yadyarwa sePanner inotangira kupfukutwa ichiri mumunda” (Today’s pests start from the field, but this depends with the type of seed variety grown, Panner is affected whilst still in the field) (female respondent)

Some households reported that they lose grains to stray animals as well as to thieves. The effects of post-harvest losses are felt by women and men of different ages in different ways owing to their gender roles in food provision. Men and women reported that because women are responsible for preparing the

food and men for fending for the family they are affected by these losses. One male respondent remarked:

“Baba ndivo vanoriritira mhuri uye ndivo vanoshava. Vakadzi havatsvagi chibage kana chapera” (Men take care of the family so they are responsible for looking for the grain when in short supply, women do not look for grain for the family when it is not enough) (male respondent)

Due to grain losses during post-harvest processes, households do not have enough grain to take them through to the next season. Under such circumstances, both men and women have duties to ensure the available grain is well managed and to look for more grain.

Locking the granary and keeping a watchful eye on the storage facility are some ways of controlling grain retrievals. This responsibility is on both men and women who remarked that:

“Kana chibage chaita chishoma, ibasa remunhu wese, baba, mai nevana kuona kuti kupfachura kwaita kushoma. Munhu wese iziso padura” (when there is shortage of maize, it becomes everyone’s responsibility, father, mother and children to ensure wasteful behaviour is avoided. Everyone keeps an eye on the granary) (male and female respondents)

Despite this shared responsibility, the focus group discussions in all wards revealed that women, as managers of food security at household level, bear primary responsibility for maintaining household consumption. Men and women in all wards reported that men can disappear from home for a while and come back home late. The woman on the other hand would be at home with the children and has to ensure there is food on the table.

Men make efforts to supplement the grain reserves through piece jobs such as house, toilet and cattle pen construction. Male and female heads of households dispose assets such as goats and cattle. The households that produce cash crops sell these crops to procure extra maize. To supplement household grain, women engage like men piece jobs like performing some domestic chores, barter trade of second hand clothes and other household items for grain. They also sell peanut butter, sweet potatoes, cow peas,

bambara nuts and firewood in the market. Some even borrow maize from people in their social networks to sustain their families. Women also work in their gardens and sell their produce in markets.

7.4 Gender Roles in Post-Harvest Management of Maize

Post-harvest processes are classified into four major phases:

- Farm field-based which include de-sheathing and piling harvested maize cobs which takes place at physiological maturity;
- En-route based when cobs are transported from farms to homesteads;
- Homestead based phase which constitutes drying and grading of cobs, shelling of cobs and drying the grains, winnowing of grains, application of pesticides, packing grains at household level and;
- Storage based where grains are stored for later use

With particular reference to the above mentioned phases, it emerged that there are defined gender roles that are assigned to men and women according to the physical strength that is required to carry out the task and the tools to be used to complete the task well. There are activities that are done by all household members regardless of sex and age, yet other activities are specific to men, women and/or children.

In Shamva district, gender roles in post-harvest activities vary with ethnicity. Among the Zezuru cutting down of stalks is done by men, women and children while among the Korekore this activity is done by women and children. The Korekore reported that children perform the task much faster than women. As women participate in cutting down of stalks, their other role is to supervise the children. Both women and children use machetes and hoes to cut down maize stalks.

Among both the Zezuru and Korekore, stoking stalks with cobs in heaps in the fields and de-husking is done by children and women. The loading of maize cobs in the scotch carts is done by both men and women and transporting maize grain to homestead is done by men and boys. In situations where households do not have a scotch cart, women ferry the maize cobs using head loads of buckets and sacks. This in turn implies that several trips are made as the quantities ferried at a time are limited. The availability of a wheel barrow can be used by men and women to transport maize cobs. Some households with resources hire tractors with trailers for transportation of large amounts of grain.

Both the Zezuru and Korekore rely on the sun for drying the crops in preparation for storage. The head of the household (whether male or female) is responsible for checking the appropriate moisture content level of the grain for storage. Drying of maize before it is stored in the granary is done from the crib (*dara*). The crib serves as a shelling, drying and even temporary storage facility among the Korekore and the Zezuru. Construction of drying cribs requires poles and fence and procurement and these are the responsibility of men. Men use axes to cut poles which they use in the construction of cribs. Drying of maize grains at the homestead is the responsibility of women and girls because they are around the homestead most of the times. Smoking of cobs for seed for use in the coming season is done by women. This is done in the kitchen and a kitchen is a place for women.

Shelling of grains involves detaching grains from well dried cobs. There is gender division of labor when it comes to shelling. Men and women claimed that shelling is labor intensive, particularly the most common method of using wooden sticks, and it is the responsibility of men. Female heads of households indicated that they either hired male labor or relied on adult sons for this task. Men and adult sons use wooden sticks to strategically strike the sacks of maize on the shelling crib. Among the Korekore, a crib is in different forms depending on use, for example, the crib used for shelling is a wooden platform in a bed-like structure and underneath the crib is a polythene sheet, or sacks spread out to receive the grain.

As men shell the maize using wooden sticks, women will be winnowing and sorting the grains. The winnowing process separates and removes waste material from grains. They use buckets, dishes and the winnowing tray, *rusero* which is a reed woven tray. Respondents reported that women possess the art and science of raising and shaking this tray while capitalising on wind speed and direction for efficiency of this technology. Owing to the use of the tray, the winnowing tray is a woman's tool. Men in an FGD in ward 15 remarked:

“Ukaona murume avakubata rusero zvinenge zvisina kumira mushe mumba imomo” (If you see a man using a winnowing tray, something will be wrong in that household .This implies use of love concoction by the wife on the husband) (Men respondents)

Manual shelling of maize is also practiced by women and children but it is no longer common. For adults, manual shelling involves rubbing two cobs against each other. Shelling by machine is not a widespread practice in the area but where it is practiced, it is done by men. Only a few people in the

area, who plant maize on a large scale, own shelling machines. Sugar beans, groundnuts and Bambara nuts are shelled by women using the pestle, mortar and the winnowing tray.

While other grains and legumes such as soybeans, ground nuts, Bambara nuts and sugar beans are not treated, maize for household consumption (grain for sale is not treated) is treated after shelling. Treatment of maize using pesticides is done by men. This is because when hunger strikes owing to grain loss as a result of poor mixture of chemicals, the burden to fend for the household falls back on them. Furthermore, findings from male and female FGDs revealed that applying pesticides is labor intensive requiring use of shovels, hence the task is usually performed by men and adult boys, although some strong women can perform the task too. Both men and women reported that applying pesticides causes individuals to cough and is associated with chest pains hence men and women prefer that men handle the task because of their perceived physical strength. Poor mixture of pesticides with grain results in stomach aches, hence women do not want to shoulder the blame when such a thing happens.

Those who cannot afford to buy chemicals to treat maize use ash from maize cobs and eucalyptus leaves. Women are responsible for making the ash and children for looking for eucalyptus leaves and men are responsible for mixing the ash and eucalyptus leaves with the maize. Women can mix the maize with the ashes and eucalyptus leaves but they do so in small quantities, hence it takes a longer time than that used by men for the same quantity of maize. Respondents reported that as a result of use of ash and eucalyptus leaves, the maize is left dirty and this has implications for women who play an important role in food preparation. In an FGD in ward 20, a male respondent remarked:

“Zvekuti chibage chine tsvina inyaya yemadzimai, ndivo vanoda zvekuongorora kuti upfu hwakadii pakubika paya” (Matters to do with the cleanliness of maize is mostly a concern for the women, they want to see the state of the mealier-meal as they cook) (male respondent)

All FGD respondents and key informants revealed that the granary is the most common grain storage facility in the district. The granary is a symbol of abundance, security and wealth and a real farmer is known by the presence of a granary at the homestead. It is constructed facing the kitchen and with a small door for security reasons. The granary is raised up to keep crops such as maize, cowpeas, Bambara nuts, groundnuts and rapoko safe from rodents. Granaries have circular or square layouts. The granary

has compartments to allow storage of different types of crops. Among both the Korekore and Zezuru of Shamva, the traditional granary is made up of stones, pole and dagga with grass thatch. However, nowadays people have modified it by using bricks and asbestos roof.

All household members have a role to play in the construction of a granary. Men and boys use machetes, trowels, shovels, axes to gather material for the construction of granaries. Women are responsible for cutting thatch grass using sickles and men use scotch carts for transportation of the grass if it is in large quantities. Where the quantities are small, women use head loads to ferry the grass home. Apart from cutting thatch grass, the other role of women in the construction of granaries is to plaster the floor with cow dung. Plastering with cow dung is meant to repel termites and weevils. Women are also responsible for the maintenance of the granaries after their construction. Those who do not have granaries use sacks or bales to store crops like maize, cowpeas, Bambara nuts, groundnuts, rapoko, and sunflowers.

Cowpeas, Bambara nuts, and groundnuts are bagged with their shells and only shelled as per the need. While some people do not bag their maize before putting it in the granary, a majority bag the treated shelled grain. Both men and women concurred that bagging and stitching of the bags is done by men because they want to be sure how many bags were harvested that particular season for planning purposes.

Different maize varieties are bagged in different sacks. In ward 21 FGD respondents reported that they do so because the different maize varieties are not the same in terms of resilience to pests. They stated the following

“Mhando dzechibage dzakasiyana-siyana dzinochengetwawo mumasaga akasiyana nekuda kwekuti pane mhando dzinokurumidza kupfukutwa dzakaita sePanner” (Different maize varieties are bagged in different sacks because some varieties such as Panner are quickly attacked by pests) (male respondents)

Taking bagged grain to the storage facility is done by men. In male-headed households among the Korekore, when maize is stored in the granary, the keys to the granary are kept by the male head, while among the Zezuru they are kept by the woman. In de jure and de facto female-headed households, the female head of household keeps the granary keys. Men agreed that traditionally, in polygamous

marriages each woman had her own granary keeping her own keys because if a man kept them, he could not be careless with them as one would in a monogamous union. One male respondent remarked:

“Ane madzimai akawanda haatoisi makey pasi, anowana mudura musina chinhu”(In a polygamous union a man cannot afford being careless with granary keys otherwise he finds the granary empty) (male respondent)

In an FGD with men in ward 15, there were two men in polygamous unions who reported how they manage grain storage. They both reported that at the production stage, each wife with her children are given land to work on, but there is a common land regarded as the father's, which everybody contributes labor to. Regarding storage of grain, the first one reported that because he does not have a granary, each wife keeps her grain in her bedroom and maize from the father's field is kept in his junior wife's bedroom. Although he reported that he has not faced any problems with this type of arrangement, other respondents in the FGD remarked that the arrangement is problematic because the senior wife is not privy to knowing what happens to the household maize.

The other man in a polygamous union with a granary reported that each wife has her compartment in the granary then the main one is named as the father's but belongs to the whole household. The father's share is used after exhaustion of wives' stocks. The father keeps the keys so that he controls grain retrievals by all his wives. These two scenarios were reported to be risky compared to the traditional system where each woman had her granary. Men in a male FGD in ward 15 reported how one man who had two wives lost all his stored grain to his in-laws after the death of his wife leaving the other wife and the rest of the family to starve.

Although men keep the keys to the granary, they have to inform women and agree on any grain retrievals. Among both the Korekore and Zezuru, women are responsible for grain retrievals, but they do so with the full knowledge and consent of the male head. Sometimes men deny grain retrievals by women and women as well and this was associated with situations that force women or men to steal maize and this was common as reported by both men and women. Men reported that they steal the grain for sale to get money for beer. On the other hand, women mentioned that they steal keys, unlock the granary then steal maize for sale to meet personal and household needs. Thereafter, they return the keys to their original position so that they may not be implicated. De jure and de facto female heads of

households make decisions on grain retrievals both for household consumption and for sale but the later do so in consultation with the husband.

Those who do not have granaries keep bagged maize either in the bedroom or kitchen. The bedroom was most preferred because it promotes security and privacy of the grain while the later was less preferred because it gives room for outsiders to see grain stocks and brews the temptation to borrow. Both males and females in male headed households reported that use of the bedroom and kitchen were better than use of the granary to store the grain because with the later, one cannot see the grain in store since only children can enter the granary owing to the small doors. Furthermore, stealing from the granary by men is easier through making a hole underneath the granary than from the bedroom or kitchen because everyday everyone can check on the grain reserves. Grain in the granary attracts dirt from the grass thatch and from rodents. Moisture in granaries takes time to be detected and it is usually detected very late when the bulk of the grain is rotten. Although most people without granaries preferred use of their bedrooms to store the grain, they reported that it was unhealthy.

Both men and women reported that granaries have the advantages of accommodating large amounts of grain compared to houses that people stay or sleep in; they are permanent structures that require renovations once in a while compared to bags that have to be replaced almost every season; moisture is limited compared to kitchens and bedrooms where moisture can come from frequent use of water in these rooms. Use of the granary plus bags that are kept in kitchens and bedrooms were reported to be widespread in Shamva in the studied wards. Use of sacks and bales was widespread among the youth while the granary was common amongst the elderly. This was because the youth reported that they grew up hearing that granaries are where goblins and other witchcraft items are kept owing to the darkness in them.

It was reported that generally, grain is stored for a period between 6 and 10 months and it is mostly stored for household consumption. Grain for sale is bagged before treatment and is immediately sold. Farmers lose out because the prices will be depressed owing to the fact that the market will be flooded with grain at that time. However, the urgent need for cash as well as the fear to lose the grain due to poor storage facilities, forces them to dispose the grain soon after harvesting. Both male and female headed households reported that they store an average of between a tonne and two of maize per season for consumption.

Among both the Zezuru and the Korekore, sweet potatoes are stored in an underground bank, *pfimbi*. This bank is dug by men usually close to the homestead, next to the rubbish pit for it to continue receiving ashes from the rubbish pit for the protection of the sweet potatoes. After digging the bank, ash is smeared inside before sweet potatoes are taken in. Before sweet potatoes are put inside the bank, they are graded by women to ensure that those with cuts and of poor quality are left because they spoil the good ones. Furthermore, they avoid harvesting sweet potatoes to which fertilizer has just been put. Such sweet potatoes are believed to rot as soon as they get into the bank. After the sweet potatoes are put in the bank, a metal cover is used to cover the bank and on top of it rubbish is spread so as not to lure potential thieves and baboons. Because sweet potatoes are women's crops, they are responsible for the security of the bank and for retrievals of the sweet potatoes. Sweet potatoes can be stored for up to a year in this bank. The underground bank was reported to be risky to animals and prone to thieves. The Maoris of New Zealand traditionally stored sweet potatoes in specially constructed underground storage houses, dug on the side of the hill. The floor is covered with a layer of gravel and rotten wood and the tubers placed on top. The seed stock is placed in first at the back of the store with the food tubers in front, the two types being separated by fern leaves (Lancaster and Coursey, 1984).

Respondents from all the wards reported that the granary, the underground bank, smoking and use of ash are traditional storage practices that have stood the test of time. Generally, it was reported that female heads of households do most of the post-harvest tasks that are performed by men in male-headed households. In some cases they rely on their adult sons and hired male laborers. However, both key informant and FGD data shows that post-harvest gender roles and responsibilities in male headed households have changed over time with both men and women performing tasks that were traditionally not theirs for the benefit of the household.

8. Findings– Gender and Traditional and Improved Storage Technologies

8.1 Introduction

This section covers the following themes: Traditional Post-Harvest Storage Technologies and Practices, Improved Post- Harvest Technologies Awareness, Access and Preferences and Improved Post- Harvest Management Technology Management at Community Level.

8.2 Traditional Post-Harvest Storage Technologies and Practices

To control post-harvest losses, men and women in the studied wards are using many strategies. Many farmers, both men and women are moving away from traditional ways of grain treatment such as use of gum tree leaves and ashes which result in grain losses to modern ways of treating grain by using Actellic Chirindamura dust and Copper Shumba. Many households now own cats to scare away rats. Some use rat killers but because they are poisonous even to human beings this option is rarely used. Men reported that this option is rarely used because some women have committed suicide owing to the availability of rat killers in the home.

Both female and male-headed households reported that they practice mid-storage retrieval and retreatment of grain because the pests resist the chemicals. The grain is retrieved by women and children, winnowed and treated and taken back to the storage facility. A few households are using new grain storage facilities like metal silos. In addition, integrated pest management which entails combining traditional and modern grain management systems were reported to be common among both male and female headed households. Where grain storage losses are as a result of shortage of male and adult labor to treat the grain, such labor is hired. In some cases division of labor on certain tasks and gender roles are abandoned to avoid post-harvest losses. For example, to deal with the problem of absence of men on grain treatment, women and children are treating maize in small quantities.

Households without sufficient labor and harvesting tools hire these resources early when the demand for labor is still low while some pool resources together. In male headed households, men identify households to pool their labor with while in female headed households, it is the female household head as the following remark from a respondent in ward 15 shows:

“Pamusha pana baba, baba ndivo vanoronga mhuri dzekubatana nadzo pakushandiswa kwemidziyo yekurimisa uye yekukoheswa, pamusha panama chete, ndimai vanoronga” (in a

male headed household, men are responsible for identifying households to pool resources with for post-harvest processes. The same is true for female headed households) (female respondent)

It was revealed that both men and women are seeking knowledge about various seed varieties from extension workers. It is because of this that farmers are now aware that panner is prone to pests and so it needs to be harvested early. Agriculture Extension Officers are doing a good job of providing such knowledge to farmers at field days and also announce the onset of harvesting for farmers to start the process on time. To avoid moisture in bales and sacks, bags are placed on top of a layer of poles or brick with a metal covering to prevent moisture and termites, rather than putting them directly on the floor. Women and men also prepare grain drying places before drying of grain starts.

8.3 Improved Post- Harvest Management Technology Management at Community Level

Community grain storage facilities were reported as uncommon in Shamva district. Reference was made to the *Zunde raMambo* (the chief's field) as an example of such a structure. *Zunde raMambo* is meant for support to vulnerable groups in the community. Households under that chieftaincy contribute labor for the production of grain which will be distributed to deserving households upon recommendations from the village heads. *Zunde raMambo* is governed by a committee of village heads. All FGD respondents reported that this structure has many problems associated with cooperatives. In an FGD in ward 15, respondents concurred with a male respondent, who remarked:

“Zve cooperative zvinonetsa. Kuno hatina nherera kana chembere dzatinoziva dziri kubatsirwa asi tichibatsira kuzunde kwacho” (Pooling resources is a problem. In this area, we do know that we have orphans or elderly people that are not being assisted under the scheme yet we are offering our support to the scheme) (male respondent)

Both men and women were skeptical about communal grain storage facilities, citing management challenges that come with cooperatives.

9. Improved Post Harvest Technology Delivery and Promotion

9.1. Introduction

This section deals with the EGSP's approach to Engendering Improved Technology Delivery, Gender and Improved Technology Development and Access – Insights from Artisans

9.2 Gender and Improved Technology Delivery – EGSP’s Approach

In all the studied wards, the only improved grain storage technology that farmers made reference to was the metal silo. In all the wards, farmers had not seen the super bags, but some had heard about them. The metal silo was introduced by CIMMYT in Shamva in 2013. Details of the number of metal silos distributed to women, men and institutions in both Shamva and Makoni districts are shown below (Figure 1).

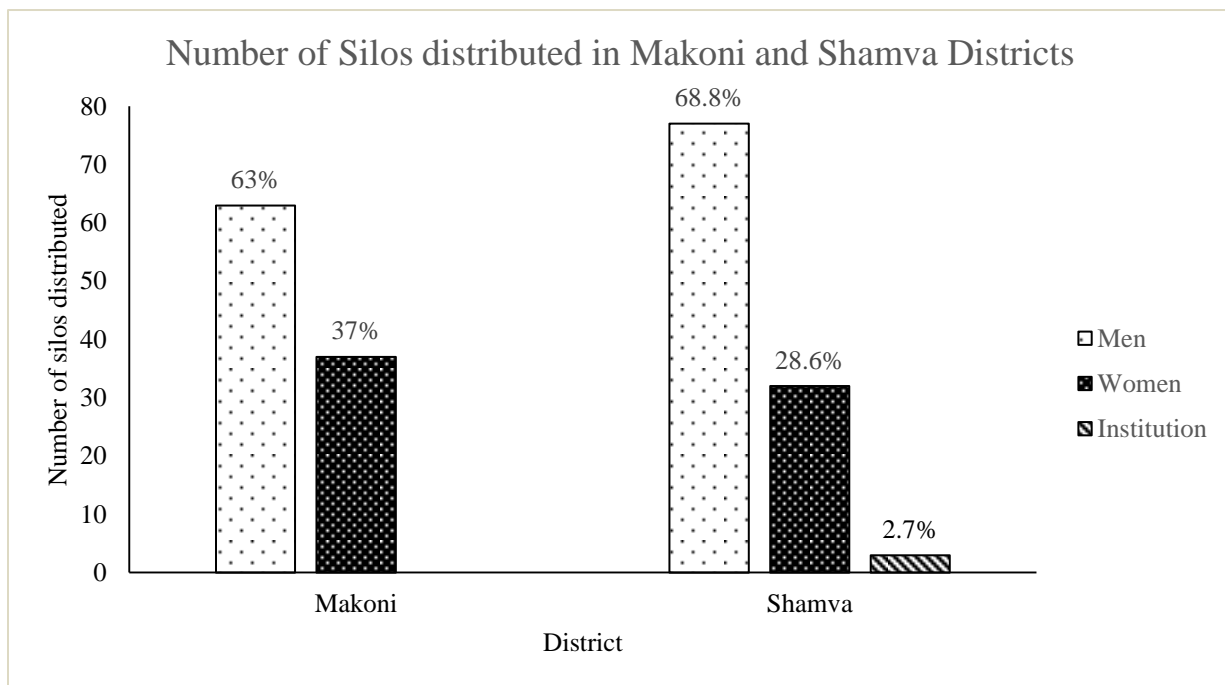


Figure 1: Number of Metal Silos distributed in Makoni and Shamva districts

Three metal silos were distributed to institutions for demonstration purposes. The total number of metal silos distributed in Shamva district is 112 and 100 in Makoni district. In Shamva district, 68.8 percent metal silos were distributed to men while 37 percent were distributed to women in Makoni district. Only 2.7 percent were distributed to institutions and in Shamva district only. However, by the time of this report, a total of 236 metal silos were distributed to farmers (male-157, female-73) and 6 to institutions in both Shamva and Makoni districts. While overall male farmers were more targeted than female farmers, a comparison of both districts shows that more male farmers were targeted in Shamva district and more women were targeted in Makoni district.

A gender analysis of how the metal silo has met the needs of farmers revealed that both men and women preferred the metal silo to other grain storage technologies for a number of reasons. They all mentioned that the metal silo is durable and that it keeps maize clean and in its natural state for a long time. Because no chemicals are applied, both men and women saw a great saving on money previously used to buy chemicals. Women and men stated that:

“Chibage hachisakare chinongoramba chiri chitsva” (The maize remains new) (male and female respondents)

A current challenge was that the metal silos that were distributed only store one tonne of maize. The metal silo was preferred because it does not allow moisture, pests, termites, weevils and rodents inside and as a result, there is no grain loss owing to these. One male respondent summarized the advantages of the metal silo as:

“Dura iri rinoshamisa nekuti rinopedza nhamo dzose dzatinosangana nadzo pakushandisa dura redu repasi chigare. Dura iri rine advantages anoti; haripinde dust, makonzo, zvipfukuto; hapana mushonga unoiswa; ukaisa 1 tonne harimbodzikira uye chibage hachishanduke-zvawachiisa chakaita ndizvo zvachinoramba chakaita; Chibage chikapinda chiri one tone inongobuda iri 1 tonne hachidzikire sezvinoita matura edu ekare” (This silo is amazing because it addresses all the challenges we had with the granary. The silo has the following advantages: dust, rats, and pests cannot enter; when you store one tonne of maize you also retrieve the same amount unlike with our traditional grain storage facilities where the amount retrieved is less than that stored) (male respondent)

Women saw the metal silo as a means of promoting health and hygiene. This is because no chemicals are applied plus no people enter into it to retrieve grain. A woman in ward 15 remarked:

“Matura edu aye taingodaidza mwana achitamba, netsvina yake aingosvikopinda muchibage imomo asina kugeza. Asi iri dura harina utsvina. hapana kurwara-rwara nechipfuva kana midumbu zvinokonzereswa nechirindamatura” (We used to call children from playing then straight away in their dirt they would enter the granary to retrieve maize, not so with the metal silo. This metal silo promotes health and hygiene; chest and stomach problems emanating from use of grain treatment dusts such as Chirindamatura dust are done away with) (female respondent)

In addition women reported that owing to the fact that no chemicals are applied, there is no labor of winnowing the grain upon retrieval from the silo as they used to do with maize from the granary. Metal silos were also applauded for doing away with labor associated with mid-storage retrieval of grain for re-treatment. Furthermore because grain can be easily retrieved from outside, grain losses at retrieval are not witnessed. A female respondent in ward 15 remarked:

“Ndingangoti matambduziko ese ekurasikirwa nechibage anowanikwa padura remakarekare ese azogadziriswa nedura iri resimbi” (I can say all the problems of grain loss associated with the granary have been addressed by the metal silo) (female respondent)

However both male and female respondents reported some design flaws of the current metal silo (Table 4)

Table 4: Attributes and design aspects of the metal silo by women and men

Attribute/design aspect	Sex of Respondents who largely highlighted this aspect	
	Women	Men
Locks	x	x
Compartments for other grain storage beyond maize	x	
Larger Size	x	x
Price is too high	x	x
Options for paying in kind using for instance maize	x	x

Men and women suggested that metal silos should have a lock for the improved security of the grain. Amongst those with metal silos, some had improvised and locked the silos while others just locked the room where the metal silo was placed. As with the granary, keys to the metal silo are kept by the male head of the household among the Korekore and by women among the Zezuru. In polygamous unions, the keys are kept by the head of household. Owing to the fact that metal silos require to be placed in a house, a man in a polygamous union reported that he placed it in the house belonging to the junior wife

because his other wives did not have space for the silo. Some people that received metal silos including one in a polygamous union reported that they built an extra house to accommodate the metal silo.

Women reported that the challenge with the metal silo is that they are not compartmentalized. As a result men have monopolised use of the silo for maize, while women's crops such as groundnuts are stored in the traditional granary. Under the circumstances, keys to the traditional granary have been surrendered to women. Both men and women reported that the metal silo is small to accommodate their grain reserves. On average most households, both male and female headed reported that they store an average of between one and two tonnes (except in ward 21 where they said they store an average of 5 tonnes) hence a silo which accommodates only a tonne cannot benefit them much as they would still need to go back to the traditional granary to store surplus maize.

Respondents were captivated by the fact that CIMMYT trained local people as artisans, which would ensure that the silos would be available locally. Both men and women recommended that the metal silo be sold at an affordable price so that everyone can acquire it. Furthermore, there should be optional payment terms including use of crops for payment. Information on post-harvest technology is provided by Agricultural Extension Officers as well as neighbours. Both male and female respondents in all wards preferred workshops as well as field days as platforms for sharing information and as a way of marketing new post-harvest storage technology. They indicated that these platforms provide for dialogue and direct interface with the technology and people can be allowed to seek clarity on areas they do not understand unlike other strategies. The workshops should be accompanied by demonstrations and testimonies from beneficiaries to share their experiences with this new technology with those that have not interfaced with it. Their testimonies can help market the technology. Overall, the evidence suggests that for projects of this nature, it is crucial to employ multiple strategies for information dissemination in order to maximize the chances of reaching men and women.

Both men and women reported that information on postharvest technology can also be shared through pamphlets written in vernacular for people to read for themselves about the new technology, their benefits as well as where to find them. Radios and televisions were also considered as ways of disseminating information on postharvest technologies which can help those with these gadgets. Whereas all the other groups did not mention use of mobile phones, the youth preferred this platform.

A gender audit of the implementing partners was conducted to establish the centrality of gender issues at institutional and programming levels. The results are first discussed at broad EGSP level and at partner level following six dimensions as follows: planning, decision making, partnerships, programming, budgeting, and Monitoring and Evaluation.

Table 5: Gender Audit of the EGSP in Zimbabwe

Dimension	Findings
1. Planning	Baseline data lacks gender analysis
2. Programming	<p>The EGSP does not have a gender mainstreaming strategy hence gender equality programming has been limited by weaknesses in areas including budgeting, and monitoring and evaluation.</p> <p>Although selection of metal silo beneficiaries was based on the capacity of the farmer to produce enough crops that could be stored for a prolonged period of time, women were deliberately included as metal silo beneficiaries.</p> <p>For one to qualify for training as an artisan, they were supposed to be practising. Owing to this selection criterion, all the artisans are male and mostly from the Johane Masowe sect that is traditionally into tinsmithing.</p>
3. Partnerships	The EGSP has not involved key players in the area of gender and women empowerment such as the Ministry of Women Affairs, Gender and Community Development, which has structures at ward level and could help in the mainstreaming of gender. However, the project has women as beneficiaries. The EGSP has not involved the women's and gender NGOs and networks.
4. Decision making	The little evidence to the fact that gender issues are regularly discussed at EGSP meetings. Key tools such as attendance registers do not show participants' sex.
5. Budgeting	There are no budgets for gender mainstreaming.
6. Monitoring	There is little evidence of consideration of gender issues in Monitoring and

and evaluation	evaluation of the EGSP.
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The overall assessment is therefore that the extent of gender mainstreaming in the EGSP is generally weak.

In Zimbabwe, the EGSP has partnered with the Department of Mechanisation in the Ministry of Agriculture, Mechanisation and Irrigation Development as well as the University of Zimbabwe. The contract of the later in the EGSP expired in December 2013. Two people, both males (a lecturer and a student), were involved in the EGSP from the University of Zimbabwe. Their role was to conduct on-station and on-farm tests of metal silos and super bags. However, at the time the contract expired, only on-station tests were conducted, hence interviews with the contact person on gender issues in on-farm tests were futile. The University of Zimbabwe has a gender policy so the Faculty of Agriculture uses the same policy document. The Faculty of Agriculture and the University at large do not have budgets for gender mainstreaming.

The Department of Mechanisation’s role in the EGSP is to train artisans in the production of metal silos in partnership with the Department of Agriculture Extension. The partnership with the Department of Agriculture Extension is for the main reason that it has structures at ward level, which the Department of Mechanisation does not have as it ends at district level. A gender audit of the Department of Mechanisation was done on the following six dimensions: staffing, policy, partnerships, planning and decision making, budgeting and monitoring and evaluation and the results are shown below.

Table 5: Gender Audit of the Department of Mechanisation

Dimension	Findings
1. Staffing	There is one female staff member out of the 14 members involved in the EGSP. The staff members involved in EGSP are distributed as follows: 2 members in senior management (both male); 8 programme staff members (7 male and 1 female); 4 support staff members (all male).

2. Policy	There is a gender policy at Ministerial level, but the Department does not have its own policy.
3. Partnerships	The Department does not work with key players in the area of gender and women empowerment such as the Ministry of Women Affairs, Gender and Community Development, which has structures at ward level and could help in the mainstreaming of gender.
4. Planning and decision making	There is little evidence to the fact that gender issues are regularly discussed.
5. Budgeting	There is no budget for gender mainstreaming. Of the USD1 million received, slightly above 60 percent of the amount was devoted to information dissemination.
6. Monitoring and evaluation	There is little evidence on consideration of gender issues in Monitoring and evaluation. However, on reporting, sex disaggregation of data is encouraged.

9.3 Gender and Improved Technology Development and Access – Insights from Artisans

About 23 artisans in Shamva district were trained in development of metal silos late 2013. In April 2014, a further 24 artisans from Shamva district were trained in metal silo production and business skills development. It is important to point out that all the trained artisans are male.

The objectives of the training they underwent were for the artisans to:

- Understand basic grain postharvest management and why the metal silo is being introduced and promoted,
- Have practical skills in the manufacture of metal silos,
- Manufacture different capacities of metal silos,

- Develop own businesses for manufacturing metal silos,

The artisans received training on business skills development and are expected to market the technology and consider the fabrication of metal silos as a business. They however did not receive any gender training hence they understandably had limited appreciation of the different needs of men and women farmers or potential metal silo clients. A further challenge identified by one key informant was that because one of the recruitment criteria for artisans was that someone had to be practising, this attracted people from the Johane Marange Apostolic sect owing to the fact that their sect encourages tinsmiths. This sect holds strong religious beliefs supporting the subordination of women.

A content analysis of the Manual for Manufacturing Metal Silos for Grain Storage shows that the tool is not gender sensitive. The general assumption throughout the manual is that the artisan is a man. The illustrations therefore reinforce traditional gender roles. The same roles are portrayed by the pamphlets. The following gender roles are portrayed in the manual:

Table 6: Gender roles portrayed in the Manual for Manufacturing Metal Silos

Roles	Female roles	Male Roles
Training	Trainees	As trainers and trainees
Demonstrating	On-lookers	Leaders
Checking grain moisture content	Grain retrieval	Demonstrating
Silo location/placement	Periodical inspection of grain	Leading the process
Silo care and maintenance		Leading the process
Checking for leaks		Leading the process
Pouring grain into the metal silo		
Metal silo transportation		Male on bicycle
Quality Seal		Male 'Hernandez Jose Ernesto' as recipient of quality seal pp 146 of Manual

The artisans interviewed had not developed any metal silos for sale to community members after the training. One artisan reported that he made 15 silos requested by CIMMYT for demonstrations. The carrying capacities of the 15 silos were 30 and 100kg. The other artisan made a 30 kg metal silo for demonstration purposes which he took to a residential town called Chitungwiza.

They both reported that the fact that they did not make any metal silos for community members does not mean that people do not want metal silos, but that the technology is new to people so they still need to know more about it. Furthermore, the technology was introduced after people had harvested their crops,

so uptake and adoption of the technology can only be assessed after harvesting. They mentioned that they receive inquiries from both men and women on metal silos. One artisan remarked:

“Pane vakauya kwandiri, pane madzimai nevarume. Umwe mudzimai aida diki rekuchengetera nyemba. Murume aida maviri, rinotakura matonne maviri nerinotakura matatu” (Of those that approached me, a woman was asking about a small silo for cowpeas while a man asked about a two and a three tonne capacity)(Artisan)

They indicated that from the inquiries they received to date, it seems the one tonne and two tonne silos are common. However, both men and women raised the following concerns:

- Both prefer metal silos with a locking system,
- Both prefer paying in installments,
- Both want an option of paying using their crops instead of cash,
- Both are asking if the government could subsidize the price.

With regards to the last concern, it was established that the gazetted prices for metal silos are as shown in the following table:

Table 7: Price of metal silos by carrying capacity

Carrying capacity of metal silo	Price
½ tonne	USD 125
1 tonne	USD 174
1½ tonne	USD 222
2 tonne	USD 266
2½ tonne	USD 408
3 tonne	USD 422

The artisans had no marketing strategy to target men and women in the area and beyond. One reported that he was asked by the Ministry of Agriculture and Mechanisation to accompany them to all field days and give a 15 minutes talk on metal silos.

10. Discussion of Major Findings

To understand technology adoption, it is important to consider which crops are grown, who chooses the crops to grow and who makes the management decisions. This study established that, under certain circumstances, allocation of roles and crops does not follow traditional strict male/female classifications. In this study, female heads of households had the same priorities as the male heads of household on the types of crops to grow owing to the breadwinner roles that they perform. As a result, the general and rigid classification of certain crops as belonging to men falls away as these become 'breadwinner' crops. Furthermore, this study brings an additional dimension to the classification of crops as male and female, the dimension of a 'household' crop, maize. This crop is equally important to males and females of all ages for the role it plays in ensuring food security. Decision making on grain storage and retrievals were done by the household head in consultation with other members of the household.

This study established that both men and women engage in post-harvest activities, albeit with different degrees of engagement as well as tasks. Although men and women are now performing certain tasks that were not traditionally theirs, other gender roles have remained unchanged, such as winnowing, transporting grain by head, transporting grain using scotch carts and grain retrieval. It was further established that the division of labor is not always exploitative but is sometimes considerate of the health and welfare of women; for example, applying chemicals to grain.

With regards to assets, this study revealed that there are clear definitions of assets as belonging to men and women both among the Zezuru and Korekore. These emanate from the use of the asset as well as who in the household mostly uses the asset. Of particular importance are the granary and the kitchen. These houses at Zezuru homesteads belong to women, while among the Korekore, only the kitchen belongs to women. Despite the fact that these houses belong to women and that women are involved in decision making, overall, men's decisions are final.

Owing to the scenario described above, technology adoption is dependent on power dynamics at household level, linked to ownership of resources such as crops, assets and decision making power. These resources do not lie at one power point, but shift from one power point to the next depending on the type of crop, asset and decision to be made. Sometimes the resources are even collectively owned particularly in male headed households, both monogamous and polygamous. In this regard, even when technology is targeting women, the involvement of men is key. For example, male involvement is

critical for the adoption of technologies that require re-arrangements of existing structures/houses or construction of new ones such as metal silos. Doss (2001) observed that women may not be able to avail themselves for new technologies that require cash from men if the men do not realise a direct benefit. Issues of power relations are therefore important when discussing technology adoption. Technology adoption by women or men is not dependent solely on the design of the technology but on gender and power relations as well as asset ownership. This explains why men and women adopt agricultural technologies at different rates. Men are quick to adopt new technologies because they are the decision makers. Yet for women in marriage, decision making involves consulting their husbands first.

Adoption of the metal silo in Shamva district depends on the crop ownership system, ownership of the granary, ownership of houses on the homestead, as well as the quantity of grain harvested. The danger with most interventions is to maintain already existing inequalities. It emerged that power relations surrounding grain management retrievals in the traditional granary were transferred to management of grain in the metal silo. However, metal silos have proved to be culturally appropriate; labour saving (they create time for women to be involved in other tasks); promoting women's health and savings on buying pesticides. Silos can last 15-20 years and are associated with easy loading and retrieving of grain into and from silo. Metal silo has improved the status and self esteem of women farmers in Kenya because they are responsible for managing the silo (CIMMYT Completion report, 2011)

Postharvest management in Shamva district is characterised by salient and open negotiations of gender roles by both men and women to the benefit of each of the groups. Both men and women are exercising agents. Some gender roles are becoming blurred as households pursue a common goal of ensuring food security. However, due to cultural and societal expectations, some practices pertaining to ownership of resources still persist.

11. Suggestions for the Gender Strategy for Post-Harvest Management

The following recommendations are made from the study:

- 1) The development and promotion of the metal silos requires a gender sensitivity approach on the part of the artisans. It is therefore important that gender training be mainstreamed in the artisans training programme. The success of this depends on the level of awareness of gender

mainstreaming among the trainers in the Ministry of Agriculture and Mechanisation. It may call for gender training of the trainers themselves first,

- 2) There is need for continued technology promotion and awareness creation through use of field days which bring together many people, both men and women to sensitise the community on the effectiveness of the metal silo. Demonstrations can also be intensified and should also be carried out by women to show other women how user friendly the metal silo is to women. Testimonies from men and women who have benefitted from the silos will help to speed up the adoption rate. This strategy could be accompanied by distribution of pamphlets and digital video devices that are in vernacular which women and men can read and listen to at times convenient to them,
- 3) Given the design preferences highlighted by both men and women, it is conceivable that the improved post harvest management technologies such as metal silos may not be adopted at a rapid pace. Rather, improvements of the technologies need to take into account unique preferences highlighted by both men and women in order to maximize chances of adoption,
- 4) Owing to the fact that the project needed to take off, selection of artisans as well as metal silo beneficiaries was not gender sensitive. Going forward, it is proposed that a deliberate attempt be made to target and train female artisans as well as target female headed households as metal silo beneficiaries. Important lessons for the project will be learnt through this,
- 5) Because metal silos provide a solution to storage related grain losses, it is important that other post-harvest losses be addressed through raising awareness by extension workers. Such awareness campaigns should be in the form of workshops and field days which are accessible to both men and women of all ages,
- 6) The project should help raise the awareness of farmers on storage for future sale rather than just for consumption. This awareness raising will enhance the involvement of men in grain storage and will make grain storage a household and shared responsibility, rather than a responsibility for women. It will further contribute to improved income streams to farmers, as they will have an option to sell their grain at a time the market is not flooded. Because farmers considered metal silo prices to be prohibitive, it is recommended that super bags be introduced as well so as to broaden options for hermetic storage technology adoption. Furthermore, the project can capitalise on its relationship with the Ministry of Agriculture and Mechanisation to seek partnerships with agriculture financiers for farmers to secure the silos at a subsidised price. The project needs a gender focal person to guide the project on gender mainstreaming.

12. Study Limitations and Areas of Future Research

Owing to the fact that the study was conducted in one district, similar studies could be conducted in other districts such as Makoni, which has people from a different ethnic group from Shamva. Due to the fact that this study was done at a time artisans had just received training, and the metal silo beneficiaries had not used the technology and therefore not in a position to evaluate the effectiveness of the technology, it is proposed that further research work be done with artisans as well as metal silo beneficiaries. This means that a gender analysis of the artisans' work is called for as well as household profiling showing the benefits of the metal silo to men and women.

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