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Gender Analysis of Maize Post-Harvest Management in Malawi: A Case Study of Lilongwe and Mchinji districts

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Executive Summary

This study addresses the issue of gender in post-harvest management of grain crops, through a case-study approach that documents in-depth insights from Lilongwe and Mchinji districts of central Malawi. Specifically, the study aims to understand factors around gender relations and roles in post-harvest management (PHM) of grains at household and at community levels. In addition, this study investigates the accessibility, adoption, utilization and impacts for men, women and youth of improved post-harvest management technologies such as metal silos.

Malawi represents an appropriate case-study country to examine gender issues in post harvest management of grains mainly because maize is the main dietary staple food, grown and consumed by the majority of the population. Most maize in Malawi is produced in one season each calendar year making post harvest management a critical aspect of household food security and livelihood strategy. At the centre of the maize economy in Malawi are women who provide 70 percent of the workforce and produce 80 percent of food for home consumption. Improvements to reduce post harvest loss of grains, especially among women can represent a strategic gender objective.

Metal silos are relatively new among small-scale farmers in Malawi. They were first introduced by the Food and Agriculture Organization (FAO) of the United Nations in 2007. In June 2008, CIMMYT started a pilot post harvest management project called Effective Grain Storage Project (EGSP-I) in Dowa and Mchinji districts of central Malawi. The objective was to experiment with a metal silo approach for improved grains storage in Africa with the aim of providing conclusive insights on the viability, impact potential and actual scale-out pathway for a longer-term program in the Eastern and Southern Africa (ESA) region. Other EGSP-I pilot sites were in Embu and Homa Bay districts (now Counties) in Kenya. Motivated by the impacts, lessons and limitations of the first phase (EGSP-I), the project entered a second phase (2012-2015) and was renamed the Effective Grain Storage for Sustainable Livelihoods of African Farmers Phase-II (EGSP-II). In Malawi, the project was implemented in Mchinji and Lilongwe districts. The EGSP-II project expanded in scope to cover two additional countries in Southern Africa, Zambia and Zimbabwe.

In 2009, through the Ministry of Agriculture, the government of the late President Bingu Mutharika took over and scaled up the metal silo programme across Malawi when the FAO

project phased out. However, when President Joyce Banda succeeded President Bingu Mutharika from April 2012 to May 2014 the metal silo project was deemphasized. By April 2014, it was apparent that the Ministry of Agriculture was continuing with the metal silo initiative but amid struggle due to funding challenges. The government's effort in metal silos was scaled down and re-focused to the EGSP-II project sites in Mchinji and Lilongwe districts.

This cross country study covering Kenya, Malawi, Zambia and Zimbabwe administered four sets of uniform data collection tools. A Community Focus Group Discussion (FGD) Tool was administered to farmers in focus groups consisting of men only and women only groups or both men and women groups. The tool contained non-exhaustive themes and questions around farming systems, post harvest management practices, improved PHM technologies and related gender roles and impacts. A Key Informant Interviews (KIIs) Tool was administered to EGSP implementers (Department of Crop Protection and Department of Agricultural Research at Chitedze Research Station in the Ministry of Agriculture, Mchinji World Vision International and Somebody Cares Ministry in Lilongwe) and field extension workers.

Like the FGD tool, the KII tool also contained non-exhaustive themes and questions that ultimately sought to document the approaches used to build awareness on improved PHM technologies – and their potential for reaching and positively impacting men, women, and youth. An Artisan Tool was administered to metal silo artisans to understand various aspects around their personal and business profile and dissemination, promotion and marketing of metal silos. A Case Study Household Profiling Tool, was administered to households that had 'adopted' the metal silos to collect information on their experiences around farming systems, post-harvest management, metal silos and related gender roles and responsibilities within the household. These multiple tools made it possible for the study to triangulate findings and gain insights from various actors within the improved PHM technologies domain.

Recent studies (e.g. Tefera *et al*., 2011; Gitonga*et al*., 2013) demonstrated that metal silos are an effective grain storage technology for reducing post-harvest insect and pathogen losses in maize while improving smallholder farmers' food security in developing countries. Metal silos prevent desperate sale of maize by enabling farmers to store their maize longer and to sell at better prices. Additionally, silos provide a potential business opportunity for those

involved in the fabrication and marketing. This gender analysis study exposes the difficulty of designing and managing an improved storage technology for maize in rural Malawi that is both poor friendly and gender responsive. The study offers insights for examining future strategies for gender in PHM, for example:

(a) In Malawi, a metal silo in the local language is known as *nkhokwe za chitsulo*. The term *nkhokwe* refers to traditional granaries made from bamboo. Other versions of nkhokwe are granaries made of tree poles or grass are historically associated with storage of husked local maize for food purposes, from the time of harvest around April until the maize is depleted or until the next harvest. Traditionally, the nkhokwe is located outside the house but close enough to keep guard especially at night. The management of food maize in nkhokwes and its subsequent food use related activities is traditionally a woman's responsibility and is primarily in her control. Recent developments such as, a decline in men's participation in tobacco production transformed the roles leading to increased men's responsibility and control over maize. Maize in Lilongwe and Mchinji is historically a household food security crop in which both men and women jointly participate to produce although its PHM is chiefly a woman's responsibility. For cash, men historically depended on tobacco while women depended on groundnuts to meet small household cash needs. Two important changes transformed these traditional roles of men and women. First, tobacco profitability has declined in recent years culminating in men exploring alternative cash crops. Second, the government, international organizations such as the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), national farmers' organizations such as the National Smallholder Farmers' Association of Malawi (NASFAM), and Non-Governmental Organisations (NGOs) have in recent years supported the groundnut economy resulting in a vibrant groundnut value chain. The outcome of this is a male take-over bid on the women's groundnut economy.

Although historically nkhokwes are used for storing husked local maize mostly grown by women for household food, technological advancements and increased commercialization spurred an increase in production of hybrid maize by men for market. Contrary to the tradition, husked hybrid maize is now managed by women in

the nkhokwes for up to three months. Thereafter, it is retrieved, de-husked, shelled, and treated with chemicals such as actellic dust and bagged for storage in the house, ready for sale. Thus, in this new long pathway, women now manage the husked maize for the first1to3 months in the nkhokwes after which men manage the bagged maize in houses and control its use including proceeds from the sale. Owing to security breakdown in the communities and a decline in the local maize production, maize is no longer stored outside in nkhokwes for extended periods.

(b) Lilongwe and Mchinji districts where the EGSP is operating are traditionally Chewa culture. Historically, the Chewa family system is strictly *chikamwini* which places considerable emphasis on the woman's right and husband's subordination to the wife's kin, and importance of female children as future reproducers of the lineage and inheritance of property. The intrusion of patrilineal peoples like the Ngoni in Mchinji increased the incidence of patrilineal descent leading to proliferation of *chitengwa* system. Other changes of the Chewa system are linked to certain religious teachings and changing modern lifestyles. The implication for technology adoption is that, while women can be expected to adopt, own and control improved technologies such as metal silos, these cultural changes are skewed in favour of men through the rights and privileges that are bestowed by patriarchy.

(c) A metal silo occupies a precious space in a household asset economy in the chitengwa study communities of Mchinji and Lilongwe districts. Men own and control big household assets of which metal silos qualify to be one. Introduction of metal silos at a time men are switching to maize production for cash partly strengthens men's ownership and control of metal silos in the home.

(d) Design features of metal silos are based on technical specifications or standards. At the time of the fieldwork in April 2014, metal silos were available in a long cylinder shape with a grain capacity of 500 kilograms (kg), 900 kg, 1,500 kg and 3,000 kg. For security reasons, most metal silos are installed inside a house. Installing a metal silo is considered a great challenge and inconvenience as men and women farmers needed to break walls to create space in order to allow entry of metal silos. Most structures that are referred to as houses in rural Malawi are temporary in nature and can barely accommodate a standard double bed (most people sleep on mats). However, some

farmers felt that the capacity of metal silos currently available in the country were too small for their maize harvest. Design features that farmers, particularly women, preferred include (a) a flexible size and capacity to suit farmer demand, (b) a stand/legs or raised outlet for easy retrieval of the grain, (c) a provision for locks for security and (d) a transparent section for monitoring maize quantities in the silo.

(e) At the time of the fieldwork, a metal silo was priced at Malawian Kwacha (MK) 45, 000- MK200, 000 (USD 100-300) depending on capacity. This is beyond the affordability of most farmers especially women. Rural poverty in Malawi is estimated at 56.6 percent, urban poverty at 17.3 percent and the rural poor corresponds to over 95 percent of all the poor people in Malawi (Reference). Poverty among rural women is estimated at 63 percent compared to 55 percent among rural men (Reference). A population is deemed poor, if its total consumption is below MK37, 002 (USD 92.5) per annum. Most individual buyers of the metal silos in Malawi are relatively rich urban dwellers who are part time farmers. In the study communities organizations such as the government and World Vision distributed metal silos free of charge to farmers. This study reveals further insights on who is really suitable to adopt and use the metal silo technologies.

(f) Artisans that fabricate metal silos are located in local trading centres with access to electricity but are as far away as 30 kilometers from where the metal silos are actually used by farmers. For women, the distance is a constraint due to their limited mobility owing to the well documented triple roles. In addition, transportation is a delicate process that can result in substantial damage of the metal silo. In the study communities, organizations such as the government and World Vision delivered the metal silos at farmers' door steps at no cost for demonstration purposes. Local agro-dealers may be willing to stock the metal silos in the communities but issues of their profitability and space require careful consideration or analysis.

(g) The government of Malawi has a gender policy framework within which the agriculture sector programming is nested. Unfortunately, the approach used to implement the EGSP II project did not take advantage of this enabling policy framework in order to institutionalize gender equality goals. Largely, the programme staff working in EGSP was unable to interpret and apply the various national and

agriculture sector gender policies and instruments in the programming and management of EGSP activities. The outcome is that gender in EGSP has not transcended beyond looking at gender from a perspective of numbers of men and women. For example, focus was on the number of men and women who received the free metal silos or who were trained as artisans. Little was done to understand the implications of each and every step in the policies, procedures and practices and their impacts. For example, what does the introduction of a metal silo mean to a woman's role and responsibility over household food security? Or what are the implications for men and women if a committee managing a community metal silo facility lacks women's voice?

Suggestions for a Gender Strategy for Maize Post Harvest Management

This study is qualitative and covered a relatively limited geographical scale. The findings and conclusions should be taken as 'subjective' and some aspects may require further analysis. They, nevertheless, represent the 'best judgements' of the research team given the interpretive methodology applied. The findings and conclusions provide insights on improved post harvest management technologies around maize in Malawi, useful in informing a future EGSP strategy.

A future strategy for gender in PHM should go beyond looking at gender from a perspective of numbers of men and women adopters of the metal silo and other improved technologies to start to understand the implications of every step in the policies, procedures and practices and their impacts. Special emphasis should be placed on monitoring processes and their gender outcomes and impacts. For this to happen, there is need to develop and repackage clear and functioning gender policy guidelines and implementation plans and gender monitoring system in order to track down progress that is being made and address challenges that are being encountered. Specifically for technology development and promotion, sspecial emphasis should be placed on understanding socio-economic and cultural environments in which different farmers operate and their needs as well as their specific-gender preferences. The presence and/ or importance of gender knowledge, skills and experiences among staff and farmer leadership structures actively engaged in EGSP activities is more useful than relying on a separate gender unit to drive the gender agenda in EGSP.

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List of abbreviations

ADD	-	Agricultural Development Division
ADMARC	-	Agricultural Development and Marketing Corporation
AEDC	-	Agricultural Extension Development Coordinator
AEDO	-	Agricultural Extension Development Officer
ASWAP	-	Agriculture Sector Wide Approach
CADECOM	-	Catholic Development Commission of Malawi
CIMMYT	-	International Maize and Wheat Improvement Center
COMESA	-	Common Market for Eastern and Southern Africa
COOP	-	Cooperative
DADO	-	District Agriculture Development Officer
EGSP-I	-	Effective Grain Storage Programme Phase 1
EGSP-II	-	Effective Grain Storage Programme Phase 2
EPAs	-	Extension Planning Areas
ESA	-	Eastern and Southern Africa region
FAO	-	Food and Agriculture Organization of the United Nations
FBOs	-	Faith Based Organizations
FEWSNET	-	Famine Early Warning System Network
FGDs	-	Focus Group Discussions
FHHs	-	Female Headed Households
GDP	-	Gross Domestic Product
Govt.	-	Government
GVH	-	Group Village Head
IHS2/ IHS3	-	Integrated Household Survey 2 or 3
JFFLS	-	Junior Farmer Field and Life School
KIIs	-	Key Informant Interviews
Kg		Kilogram
MVAC	-	Malawi Vulnerability Assessment Committee
NASFAM	-	National Smallholder Farmers' Association of Malawi

NGOs	-	Non-governmental organizations
OPVs	-	Open Pollinated Varieties
PHL	-	Post harvest loss
PHM	-	Post Harvest Management
RDP	-	Rural Development Programme
SACAU	-	Southern African Confederation of Agricultural Unions
SDC	-	Swiss Agency for Development and Cooperation
STAs	-	Sub Traditional Areas
TAs	-	Traditional Areas
TEVETA	-	Technical and Vocational Training Authority
USD	-	United States Dollar
WHHs	-	Women heads of households
WMHHs	-	Women in male headed households
WPHs	-	Women in polygamous households
WVI	-	World Vision International

List of local names and terms

Chikamwini	-	Matrilineal-matrilocal system of marriage
Chiongo	-	'Thank you cash' given to a woman's family in order for the woman to settle in the man's village in *chitengwa* arrangement
Chitengwa	-	Matrilineal-patrilocal system of marriage
Kukhanyula Miyendo	-	A woman over-stretching her legs in public and has some obscene connotation. Over-stretching of legs is associated with women climbing into *nkhokwes*. This explains why traditionally males are not allowed to be closer to where women are to climb into *nkhokwes*.
Kukolola	-	Harvesting
Kusenga Chimanga	-	Cutting maize stalks
Kusoka	-	Sewing
Lichero	-	Winnower or winnowing basket
Lobola	-	Dowry
Makoswe	-	Mice
Mphale	-	Pounded maize
Nkhokwe	-	Traditional granary
Nkhokwe yoluka	-	Traditional granary made from grass
Nkhokwe za chitsulo	-	Metal silos
Nsungwi	-	Bamboo
Sefa	-	Sieve
Zisononkho	-	Shelled maize cob

1. Background

This research study addresses the issue of gender in post harvest management of grain crops, through a case-study approach that derives useful information from Lilongwe and Mchinji districts of central Malawi. Specifically, the research is concerned with issues around the accessibility, adoption, utilization and impacts for men, women and youth of improved post harvest technologies. The focus is particularly on improved technologies that the International Maize and Wheat Improvement Center (CIMMYT) has introduced, disseminated and promoted in Lilongwe and Mchinji districts in central Malawi in the last five years to reduce post-harvest losses, increase incomes, and enhance food security. It is recognised here that there are other past and current technologies on a wider scale across the country disseminated and provided by the Food and Agriculture Organization (FAO) of the United Nations, the government of Malawi and non-governmental organizations (NGOs). The improved technologies have included metal silos, concrete silos and super bags.

This gender analysis study is particularly informed by the experiences, opportunities and challenges of metal silos that CIMMYT has promoted in Malawi in the last five years. In June 2008, CIMMYT with funding from the Swiss Agency for Development and Cooperation (SDC) and working in collaboration with World Vision International started a pilot post harvest management project called Effective Grain Storage Project (EGSP I) in Dowa and Mchinji districts of central Malawi. The other pilot sites in the African region were Embu and Homa Bay districts in Kenya. The pilot project was motivated strongly by successful experiences from the POSTCOSECHA program in Central and South America and the Caribbean. The objective was to experiment with a metal silo approach for improved grains storage in Africa with the aim of providing SDC and other potential investors with conclusive insights on the viability, impact potential and actual scale-out pathway for a longer-term program in the eastern and southern Africa (ESA) region.

During the first phase from 2008 to 2010 (EGSP I), trainers from El Salvador, trained 41 master trainers and artisans from Malawi on how to fabricate and manage the metal silos. A total of 45 metal silos of various capacities were produced and distributed to small farmers in the rural Dowa and Lilongwe. The metal silos helped the beneficiary farmers to buy cheaper grains at peak harvest time, and to use the grains throughout the year. These experiences have since stimulated interest in some schools and urban communities in Malawi and in several

countries and organizations in Africa to use metal silos or to engage in their production and promotion (CIMMYT and SDC, 2011).

Motivated by the impacts, lessons and gaps of the first phase (EGSP-I), the project entered into a second phase 2012-2015 and is now renamed the Effective Grain Storage for Sustainable Livelihoods of African Farmers Phase-II (EGSP-II). In Malawi, the project is being implemented in Mchinji and Lilongwe districts in collaboration with the Department of Crop Protection and the Department of Agricultural Research in the Ministry of Agriculture and Food Security. Two NGOs - World Vision International in Mchinji and Somebody Cares Ministry in Lilongwe – are also collaborating institutions. The other countries where the project and this gender analysis study are being implemented are Kenya, Zambia and Zimbabwe. It is emphasised here that the EGSP focus in Malawi is on metal silos; super bags are yet to be introduced and promoted. The other countries may have different project emphases (CIMMYT/SDC, 2011; Kandiwa and Mugure, 2013).

The need for gender equality and women's empowerment in the EGSP Project arises from the realization that the project aims to benefit both men and women farmers. To facilitate this outcome, the need to conduct a gender analysis of post-harvest management with particular reference on maize was realised. Outcomes of the gender analysis study will inform the design and implementation of a precise gender strategy and action plan for the project (Kandiwa and Mugure, 2013).

2. Literature review

This study's main focus is on a gendered analysis of post harvest management of grains. Gender analysis can be approached differently by different people and in different situations. For the purpose of this study, gender analysis refers to critical assessment or evaluation of the 'position' and 'condition' of men and women relative to each other, and the factors that determine such positions or conditions. By comparing women and men rather than looking at women and men as isolated groups, gender analysis illuminates key aspects of a given situation, making it easier to identify obstacles and potentially workable solutions to achieving gender equality and women's empowerment.

Gender analysis of the development practice leads to two possibilities which Kabeer (1994) characterises as gender blind development and gender aware development. Gender blindness

implies the inability to take into consideration specific needs of men and women by assuming that men and women can participate and benefit from development in the same way.

Assumptions and misconceptions abound in the agricultural sector that agricultural technologies and practices being promoted are gender neutral. Access, adoption and benefit for and by men and women are assumed to be equal and with same effects or impacts. This kind of gender blindness in the agricultural sector may lead to unequal distribution of benefits, burdens or risks, perpetuation of exclusion of some groups, or missed opportunities for business development. The effect of such gender blindness is well known in the agriculture sector.

Women compared to men in agriculture face many constraints in access to, ownership of and control of productive resources and benefits, for example, (a) they have limited access to, control of and ownership of land in terms of quality and quantity; (b) they have limited access to agricultural labor in terms of both supply and demand in the context of quality and quantity; (c) they lack access to technologies that relieve time consuming agricultural tasks and that can increase their productivity; (d) they have limited access to appropriate, timely and quality agricultural extension services to enable them to improve their productivity; (e) they are undercapitalized due to limited access to both formal and informal financial services – because women are less mobile than men, women are less educated than men, and women lack adequate collateral; and (f) there is generally low productivity gains among women farmers owing to women's lower use of production inputs and support services (Saito 1994).

Gender awareness in development, on the other hand, recognises that men and women have different needs and actively and explicitly seek to understand how different factors shape individual experiences and preferences within and beyond the household. Gender awareness also involves analysing and anticipating potential negative impacts of different interventions on men and women. This may allow development of strategies that mitigate any such negative impacts and also increase the probability of equalizing opportunities, and bridging gaps among men, women, and youth farmers (Moser, 1993; Kabeer, 1994).

Gender analysis becomes particularly important in post harvest management given the historical and pivotal roles played by women in agricultural activities (Meinzen-Dicket al., 2011), and the history of failures of previous post harvest attempts and initiatives which so far

have emphasised economic and technical aspects of the post harvest improvements with little attention paid to social/cultural dimensions. For example, recent studies have demonstrated that metal silos are an effective grain storage technology for reducing post-harvest insect and pathogen losses in maize while improving smallholder farmers' food security in developing countries. Additionally, metal silos are effective against storage pests, leading to reduced grain losses and therefore improved household welfare and food security. Metal silos prevent desperate maize sales by enabling users/farmers to store their maize for longer periods and to sell at better prices. Economic or financial savings associated with grain loss reduction capabilities of metal silos at household level, in the range of USD 102–130, are significant enough in countries such as Malawi where per capita gross domestic product (GDP) is USD 226.50, according to most recent estimates by the World Bank (Tefera, *et al*., 2011; Gitonga *et al*., 2013).

Interest in gender research on post harvest management appears to have emerged in the last 10 years. Earlier research on post-harvest management in the 1970-1980s (Adams and Harman, 1977; Lancaster and Coursey, 1984) placed emphasis on establishing the scope and depth of post-harvest losses by developing satisfactory methodologies to evaluate the extent of the losses; establishing reasonably reliable cost-benefit relationships for improved storage techniques and recommending longer term focus and scaling-up plans for improved storage technologies. Subsequent research (e.g. Proctor, 1994; Komen *et al*., 2006; Tefera, 2012) has strengthened the technical and economic understanding of the extent and levels of post-harvest losses, the processes in which post harvest losses occur, farmer perceptions and the causes and economic impacts. Broadly, the major causes of PHL can be categorised as biological (e.g. insects, moulds and mycotoxins) and socio-economic (e.g. poor transport systems, poor marketing and poor post harvest handling). On their own or in combination, these causes have effects on market prices, food security and ecosystem health. It is within the breadth of these studies that recommendations have emerged around development, introduction and promotion of improved post harvest technologies such as super bags, hermetic bags and metal silos.

Most recent research on post harvest management (Tefera *et al*., 2013) placed emphasis on technical and economic/cost aspects of improved post harvest management technologies. In Kenya, for example, impact evaluations show high losses in untreated polypropylene bags but

negligible losses in metal silos. In terms of cost effectiveness of metal silos, there are more potential benefits from larger metal silos than smaller metal silos suggesting that use of larger metal silos is more profitable where post harvest losses are high and also where maize prices are sufficiently high (Nduku *et al*., 2013). Similar outcomes of improved storage technologies were observed in countries such Nigeria (Sekumade and Akinleye, 2009). In Malawi, additional benefits accrue from environmental friendliness as the metal silo technology reduces the need to use natural resources such as trees, bamboos and grasses that most farmers use in constructing traditional storage facilities (Maonga and Haraman, 2011).

Gender aspects of post harvest management in sub- Saharan Africa also received fair analysis dating as far back as 1990s. For example, Gunther and Zimprich (1998) examined gender-orientations in the post harvest management only by way of suggesting pointers for identifying gender-specific aspects. A farm level cross-sectional study of adoption of small metallic grain silos in Malawi by Maonga *et al*. (2013) recognizes the dominance role of women in the post harvest management of smallholder food grain and their potential to adopt metal silo technology. These studies, however, provide little insight on the ways in and extent to which men and women play their roles and with what challenges and impacts.

Some seminal research contribution on post harvest management in the sub Saharan region emerges from Manda and Mvumi (2010). The authors examined gender relations in household grain storage management and marketing in Zimbabwe and demonstrated that men and women are involved in all post harvest activities except for winnowing which is done by women. Another insightful research contribution comes from Rugumamu (2009) who assessed gender relations in grain storage technologies in Tanzania. The study revealed gender dynamics, motivations, and welfare outcomes for spouses and children in simple monogamous, complex monogamous and polygamous households. In the case of Malawi, Maonga *et al*. (2011) draws attention to some key challenges affecting adoption and use of metal silos by different groups of farmers. The Malawi study unmasks gender concerns from farmers and extension workers regarding technical design (size and height) of the metal silos. Women farmers find the metal silos too high for comfortable loading of grains and/or too heavy to be carried/ lifted. Instead, women users of the metal silo technology prefer relatively lighter and shorter designs of metal silos than what is currently promoted by government and CIMMYT in most parts of Malawi.

These studies shed little light on how cultural norms and power relations shape the distribution, roles, benefits and control around metal silo technology at household and community level. The earlier discussion shows that cultural norms, agency and relations in most societies in Africa lead to inequitable outcomes for men, women, and youth. For instance, gender gaps in technology access account for the huge productivity gaps between men and women managed plots (Udry, 1996; Doss and Morris, 2000; Doss, 2001). Unequal access to technologies reduces the pace at which households and nations can attain household food and income security, nutrition, and overall well-being (Meinzen-Dick, et al. 2011). The understanding of gender aspects of post harvest management technologies may help to develop gender sensitive metal silo technology by particularly designing for women (Doss, 2001).

3. Rationale for this gender analysis study

Malawi represents an appropriate case-study country to examine gender issues in post harvest management of grains. This is mainly because it is well-known as one of the countries in Africa with an unusually high nutritional dependence on the single grain crop of maize, as the dietary staple food for the population. Most maize is produced in one season each calendar year making post harvest management a critical aspect of household food security. Maize has historically played a pivotal role in social and economic life in Malawi, and continues to play the same important role today.. Being the staple food for the population, it is fundamental to food security in Malawi. Its cultivation occupies roughly 60 percent of the cultivated area in the small farm sector (Government of Malawi, 2008).. It is variously estimated that maize contributes between 55 percent (Jayne *et al*., 2008) and 72.8 percent (FEWSNET 2007) of all calories consumed by the population of Malawi. Some 97 percent of small farmers are believed to grow maize (Government of Malawi, 2005). Since attaining political independence from Britain in 1964, successive governments in Malawi have exhibited a policy preference for promoting maize production and consumption (Maliro, 2011). In the recent years, since 2005/2006, this policy stance on maize was supported through a very costly but government preferred farm input subsidy programme (Dorward and Chirwa, 2011; Ellis and Maliro, 2013).

There are many other reasons why Malawi is a best case study for conducting gender analysis of post harvest management of grains. At the centre of the maize economy in Malawi are

women who are known to provide 70 percent of the workforce and produce 80 percent of food for home consumption (Government of Malawi and FAO, 2012). The important role of women in the maize economy of Malawi and many parts of sub-Saharan Africa calls for urgent attention to gender-specific opportunities and challenges in post harvest management. Improvements to reduce post harvest losses of grains especially among women can represent a strategic objective towards the achievement of gender equality and women's empowerment in matters of food security in the country.

For a long time, efforts in the agricultural sector in countries such as Malawi emphasize on improving agricultural production and productivity especially grains and maize in particular. It is increasingly recognized that the problem of poor post harvest management coupled with the existing low production, though this is not considered a new concern, it is however considered to be unacceptable and complicates the food insecurity problem. Most recent estimates suggest that post harvest losses in Malawi account for some 21 percent of the grains, mostly the staple maize crop (Kaminski and Christiaensen, 2014). If we take the average national maize production of 1.50 million metric tonnes per year for Malawi (Maliro, 2011) (table 1.3), this loss translates to some 315 thousand metric tonnes. This is more than enough to feed a population at risk of missing food entitlements in a worst famine scenario. For example, during the 2004/2005 famine which to-date is considered to be the worst in Malawi so far, some 4.2 million people representing 35 percent of the Malawi population was at risk of missing food entitlements. They required free food distributions in maize equivalents amounting to 269,400 metric tonnes or 17.9 percent of total national maize production (Maliro, 2011) (table 5.16). A reduction in post harvest loss of grains can represent an important objective towards improving food security in Malawi given the importance of grains in the region in terms of both production and consumption.

The agriculture sector in Malawi was subjected to a fair gender analysis. Much is known regarding the role and contributions and challenges of women in the Malawi agriculture sector. Most studies dating as far back as 1990s (e.g. Spring, 1995) have advocated for gender responsiveness in the farming systems by making the woman farmers more visible. Some suggested gender strategies have included the creation of gender-aware policies and procedures that ensure and enforce equitable sharing of agricultural resources and benefits between male and female farmers. Despite these efforts, gender inequalities in the Malawi

agriculture sector still persist. For example, a recent gender study of a nationwide cropping systems in Malawi reveals that while women constitute 69 percent of the full-time farmer population in Malawi, it is male farmers who have significantly greater experience as heads of households, use more fertiliser, and devote a greater land area to cash crops (Gilbert *et al*., 2002).

The literature on post harvest management technologies provides little understanding on gender. Maonga *et al*., (2013) makes some seminal empirical research contribution on post harvest management by examining the adoption of small metallic grain silos in Malawi. This study analyzed gender issues in adoption of metal silos from two perspectives. The first perspective is that women and men in the farming sector of Malawi play different economic roles with men generally concerned with management of cash enterprises while women take care of household food security. One expects gender to have a positive effect on the adoption of small metallic silo technology because women dominate in the smallholder food grain production in Malawi. The second perspective relates to marital status of the household head. This study conceded lack of knowledge on how being married or otherwise influences farmer decision to adopt a new technology. The study hypothesized that farmers who were married could easily make a unified decision with minimal risk aversion to adopt improved technology if it is deemed to improve household socioeconomic status. Applying a probit analysis, this study sheds little insights regarding the gender effects of adoption of metal silos.

In many agricultural policies and investment plans in Africa (e.g. Government of Malawi and FAO, 2012; COMESA, 2013), the gender focus so far is mainly on female headed farming households who are mostly widowed, separated/divorced or who have not been married before. Little attention is paid to women farmers in male headed households (WMHHs) or women farmers in polygamous households (WPHs) and women heads of households (WHHs). It is also possible in districts like Mchinji to find a married woman being categorised as a female headed household if the man who is supposed to be head of the household is incapacitated or deliberately ignores/abandons this role and responsibility as head of household (e.g. is an alcoholic or is in polygamy). These different types of households confront different opportunities and challenges in issues of technology adoption. For example, women in male headed households may benefit from male cash to acquire the technology but suffer the problem of male control over the technology and the benefits derived from the

technology. On the contrary, women heads of farming households may exercise independence and freedom on use of the technology but may be constrained in such aspects as cash to purchase the metal silo. It is therefore not enough to compare only female and male headed households but also it is crucial that we focus on women in male headed households. It is an established fact that poverty in Malawi is not only rural in character but also feminized in nature (Government of Malawi, 2012).

The gender knowledge gaps above stimulate interest for further research on gender relations and roles in post harvest grain management, that goes beyond application of conventional econometric analysis to examine actual gender and social processes, relations, bargaining, etc, that revolve around different aspects of post harvest management in and outside the homes. These considerations lead to a set of research objectives and questions about gender relations and roles in post harvest management of grains which this study seeks to tackle as provided in the next sections of this report.

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) 1. (i) What roles do men, women, and youth play in grain post harvest management?

(2) (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?

(3) (iii) In what ways do social and cultural norms determine individual's roles, rights, responsibilities and claims over other members of the household?

(4) (iv)What strategies do men, women, and youth use within households for grain and store management?

(5) (v) What bargaining goes on between men and women in the area of stored grain management, marketing and control over resources?

(6) (vi)What socio-cultural constraints do women and men in different household circumstances encounter in post harvest management?

(7) (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?

(8) (viii) In what ways do improved storage technologies such as metal silos meet men's, women's and youth's design needs and preferences?

(9) 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?

(10) 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.

The fieldwork underlying this study deployed a variety of methods in order to address the above objective and research questions, and these methods are set out in full in the next section of this report. The methods include focus group discussions, key informant interviews, interviews with partner organizations and case study profiling of metal silo adopter households. Substantial reliance was also placed on secondary data sources and different analytical gender frameworks in order to construct the analysis of the study. The reason for placing a high reliance on secondary data sources in this study is that several of the research questions posed above can best be approached by interrogating existing data/information in a different way from the uses to which it is normally put, or by extending the analysis in new directions. For example, Malawi has had a comprehensive evaluation of a Government/FAO Metal Silo Project (Maonga and Haraman, 2011) which provides detailed and useful information on coverage, functioning and impacts of metal silos in Malawi.

6. Methodology

6.1 Conceptual Issues in Gender Analysis

The rationale for gender analysis in post harvest management was provided in the foregoing discussion. The gender development literature provides a number of gender analytical frameworks that can help to analyze and interpret different situations as they affect and are affected by men and women and the factors responsible. Examples of such frameworks include the Harvard Analytical Framework (Overholt, *et al*., 1985), Moser Gender Analysis Framework (Moser, 1993), Longwe's Gender Equality and Empowerment Framework (Longwe, 1991), the FAO Socio-economic and Gender Analysis F (SEAGA) Framework (FAO, 2001) or Kabeer's Social Relations Framework (Kabeer, 1994). Detailed discussions of these frameworks are beyond the scope of this study. Of course these gender analysis frameworks can contribute to ensuring that development practice promotes gender equality in post harvest management although their use is only one element in the process and cannot alone ensure that gender considerations are integrated into the post harvest management in practice (March *et al*., 1999; Warren, 2007).

In this study extensive application of the Harvard Analytical Framework was used to examine roles and responsibility of men and women and division of labor, as well as access and control of improved post harvest management technologies such as metal silos. Another framework that is used extensively in this study is the Social Relations Framework. It is preferred in this study because it provides an opportunity to interrogate social dynamics and power bargaining between men and women at levels of household and farmer groups (e.g. farmer cooperatives) on matters of pooled grain management.

A number of different fieldwork methods can be appropriate for examining gender issues in post harvest management of grains and, specifically, for collecting field data related to gender roles and responsibility, division of labor, access to and control of improved post harvest management technologies and their benefits. Some of these fieldwork methods are qualitative in character and others are quantitative. Still, some methods emphasize primary data sources while others advocate the use of secondary data sources. In general, combined qualitative and quantitative methods are recommended for this type of research (Booth *et al*., 1998; Kanbur, 2003). However, the emphasis in this study was on qualitative methods. The reason for this is that the issues under investigation in this research require in-depth narrative discussions with respondents drawing on their personal experiences. The main goal of qualitative research is to provide a rich and contextualized understanding of the human experience. Of course, at the risk of over-generalization, qualitative methods have been identified with phenomenological interpretative research derived from the humanities with an emphasis on holistic and qualitative information. On the other hand, quantitative methods are associated with positivist theoretical approaches predominantly utilized by economists and modelled on the natural sciences with emphasis on empirically quantifiable observations that lend themselves to analysis by mathematical tools. To enhance the credibility and persuasiveness of a qualitative research account, triangulation therefore becomes a useful device (Glaser and Strauss, 1967; Denzin, 1970). The earlier discussion mentioned that the triangulation methods used in this research included focus group discussions, key informant interviews, interviews with partner organizations and case study profiling of metal silo adopter households, details of which are provided in the next sections of this report.

6.2 The Study Context

6.2.1 Organization of agricultural services in Malawi

Malawi is well-known as one of the poorest countries in Africa with a high dependence on agriculture. The government vision for the economy since attaining political independence in 1964 has prioritised estate-led agriculture on titled private (leasehold) land for the export market dominated by tobacco and smallholder agriculture on customary land for national food self-sufficiency dominated by maize. Smallholder farmers are nevertheless allowed to grow some tradable crops such as fire-cured tobacco, cotton and groundnuts. The government's position on the smallholder agriculture economy has involved public provision of a continuum of services: agricultural technologies, credit, extension, and, input, output and food marketing (Kydd and Christiansen, 1982; Harrigan, 2001). In the earlier years, these services were organized through an integrated agricultural credit-input-extension policy that aimed to promote improved agricultural technologies (e.g. hybrid maize and fertilizer). An agricultural extension worker at community level served as facilitator and mediator of links between farmers and various service providers. This subsidised distribution service arrangement could be regarded as quite successful in ensuring a high level of adoption of improved agricultural technologies and practices (Dorward *et al*., 2005; Poulton *et al*., 2006). The role of government in the provision of support services has evolved greatly over the years in the wake of market liberalization but the thinking within government and among smallholder farmers might not have changed. Currently, the role of government in the smallholder agriculture sector often represents tensions between provision of public service support to achieve desired objectives and full market liberalization to facilitate private sector growth and development. This public-private relationship in Malawi is important for interpreting and understanding roles and expectations of government, farmers, private sector (e.g. artisans, agro-dealers) and stakeholders (e.g. NGOs) in the development, promotion and use of the metal silo technology.

For the purposes of agricultural service delivery, the country is divided into eight agricultural zones known as Agricultural Development Divisions (ADDs). An ADD is managed by a programme manager, who covers two to seven zones called Rural Development Projects (RDPs) of which there are 31 in total. In the past, some RDPs cut across two districts but now all fall within a district following the introduction of the national decentralization policy. An RDP is now typically called the District Agriculture Office, and is managed by a District Agriculture Development Officer (DADO). RDPs comprise 2-19 Extension Planning Areas (EPAs) under the management of an Agricultural Extension Development Coordinator

(AEDC) and there are about 150 of these across the country. An EPA is further divided into 2-15 zones called Sections managed by Agricultural Extension Development Officers (AEDOs). A Section covers a village or group of villages. The lowest unit in this system is a Block, from which a group of farm families is organized into farmer clubs as a unit of contact for the AEDOs (extension workers) (Government of Malawi 2008). Again, this background information is important in understanding pathways in which the famers access the metal silos in EGSP.

6.2.2 Cultural context

Many challenges that women farmers in Malawi confront and which this study seeks to uncover are feminized in character and closely linked to culture or, specifically, systems of marriage. It is an established fact that marriage systems define gender beyond the household to include women's rights and responsibilities in the wider economy. For example, marriage can provide some secure access to agricultural resources but only as long as one remains in the marriage (Yngstrom, 2002). In general, however, reinforced by marriage systems, many societies in Africa have powerful gender stratification that tends to place men in more advantaged positions with women relegated to disadvantaged, subordinate positions (Safilios-Rothschild, 1990).

Studies show that the extent to which a woman in Malawi exercises power across a spectrum of her life or the extent of negative cultural perceptions around women's empowerment depends to a larger extent on the marriage system. Women in the matrilineal-matrilocal marriage are known to be relatively more powerful compared to counterparts in *lobola* and *chitengwa* systems (Reniers, 2003). Negative perceptions around women as leaders in favour of men are also most prevalent in the patrilineal-patrilocal communities (lobola) and matrilineal-patrilocal communities and far less in matrilineal-matrilocal communities (Ndeti, 2003). Women in matrilineal-matrilocal marriages (chikamwini) in Malawi are characterized by highest cases of divorces and remarriages hence the high prevalence of female headship of households compared to women in patrilineal-patrilocal (lobola) systems and matrilineal-patrilocal (chitengwa) systems (Reniers, 2003). Understanding implications of marriage

systems/culture in the EGSP project sites can be helpful in interpreting gender participation and impacts in post harvest management technologies and practices.[1]

The EGSP project is being implemented in Lilongwe and Mchinji districts in Central Malawi. The central region is predominantly a matrilineal-patrilocal marriage system (chitengwa) in which a man gives *chiongo* ('thank you cash' – this is not same as dowry) to a woman's family and the woman settles in the man's village and is treated as part of the man's family. Upon his death, the woman has a choice either to remain with the man's family or return to her village of origin. Upon her death while still married, the woman can be buried at the man's village or at her village of origin depending on agreements reached by the two families. Turning more specifically to the *Chewa* culture which is dominant in the two study districts of Lilongwe and Mchinji, the Chewa family system is supposed to be strictly chikamwini which places considerable emphasis on the woman's right and husband's subordination to wife's kin, and importance of female children as future reproducers of the lineage. A number of important changes in the *Chewa* system have occurred over the years which have affected the marriage contract, family residential patterns, exercise of domestic authority, and control or custody of children. In particular, the intrusion of patrilineal peoples like the Ngoni in Mchinji has increased the incidence of patrilineal descent leading to proliferation of chitengwa system. Other changes of the *Chewa* system are linked to certain Christian missionary teachings that are in conflict with matrilineal principles of family organisation, labour migrancy and cash-cropping. In recent years, increasing privatization of production and consumption has also led to individualistic tendencies in rural Malawi thereby weakening both patrilineal and matrilineal family systems. These factors that often impinge on relations between husband and wife have contributed to changes in the Chewa culture although they have not brought about a complete transformation of the Chewa system (Phiri, 1983; Mtika and Doctor, 2002).

[1] Three main systems of marriage can be found in Malawi. A patrilineal-patrilocal (lobola) system prevails in the north and among the Sena/Mang'anja in Chikhwawa and Nsanje districts and the Chewa of north Kasungu (bordering the Ngoni/Tumbuka Mzimba district) and the Tonga of Nkhota Kota north (bordering the Tonga of Nkhata Bay). In this system, a man pays a dowry or *lobola* to a woman's family. The woman settles in the man's village where she becomes part of the man's family. Upon his death, the woman is inherited by the husband's brothers or kins although the practice is now dying due to the threat of HIV/AIDS. The common marriage system in the central region is *chitengwa or* matrilineal-patrilocal. A man gives *chiongo* (thank you cash) to a woman's family in order for the woman to settle in the man's village. Upon his death, the woman has a choice either to remain with the man's family or return to her village of origin or to remarry elsewhere. In chitengwa, a man can settle in a woman's village if there are conflicts in the man's village affecting her marriage or if there is no land in the man's village. A matrilineal-matrilocal (*chikamwini*) system prevails in the southern region among the Yao/Lomwe. A man marries and settles in the woman's village. The man returns to his village of origin upon death of the wife.

The implication for technology adoption is that while women can be expected to adopt, own and control improved technologies such as metal silos, the factors that have transformed the *Chewa* culture over the years may play a role in favour of men.

6.2.3 History of metal silos in Malawi

The EGSP is not the first and only initiative to promote metal silos in Malawi. Other metal silo initiatives have included those of the government on its own or in collaboration with the Food and Agriculture Organization of the United Nations (FAO) and NGOs/Faith Based Organizations (FBOs). The metal silo initiatives by FAO and the government require a special mention in this report because of the scale of their coverage in the country. The FAO and government's silos account for 61.5 percent of recipients of the technology in 10 of the 28 districts of Malawi (Maonga and Haraman 2011).

From 2007 to 2009, FAO supported the government through the Ministry of Agriculture and Food Security to introduce metal silos through a national project called Artisanal Manufacturing of Small Metallic Silos Project. The project trained 200 artisans and distributed free metal silos across the country. During the Mutharika government Malawi registered unprecedented maize surpluses every year since 2006/2007 season. This might have stimulated interest in the government to explore proper ways of managing the maize in the country owing to the significant rise of population at risk of missing food entitlements despite the maize surpluses (Maliro, 2011). By November 2011, the government had distributed over 1,000 free metallic silos to farmers across the country since the past three years (Maonga and Haraman, 2011).

Table 1 summarises output progress around adopters and artisans as of June 2014.

Table 1: Summary of selected output progress of EGSP-II as of June 2014

Description	Year 1			Year 2			Total Trained in 2 years
	Male	Female	Total	Male	Female	Total	
Artisans trained in metal Silo Fabrication and Management	26 (93%)	2 (7%)	28 (6%)	33 (75%)	11 (25%)	44 (20%)	72 (11%)
Extension staff trained on Grain Handling Prior to Storage; Silo and Super Grain Bag Management	23 (77%)	7 (23%)	30 (7%)	26 (74%)	9 (26%)	35 (16%)	65 (10%)
Farmers trained on Grain Handling Prior to Storage; Silo and Super Grain Bag Management	130 (60%)	87 (40%)	217 (47%)	63 (65%)	34 (35%)	97 (43%)	314 (46%)
Media Personnel trained on Grain Handling Prior to Storage and Silo Management	6 (60%)	4 (40%)	10 (2%)	3 (60%)	2 (40%)	5 (2%)	15 (2%)
Agro-dealers Trained on Grain Handling Prior to Storage, Silo and Super Grain Bag Management	-	-	-	7 (78%)	2 (22%)	9 (4%)	9 (1%)
Silos Fabricated and Disseminated	116 (67%)	56 (33%)	172 (38%)	19 (58%)	14 (42%)	33 (15%)	205 (30%)

Source: Haraman (2014)

During the two years, 46 percent of the totals targeted were trained on grain handling prior to storage, silo and super grain bag management Agro-dealers were not trained in the first year and only formed one percent of the total trained in the two years. While metal silos fabrication and dissemination formed 30 percent of the total trained. In both years, the trained people were more male than female in all categories i.e. artisans, extension staff, farmers, media personnel and agro-dealers

6.2.4 Definition of a community

This study has a community focus which requires a definition of its purpose and its implications for adoption or distribution of the metal silos. When people talk about a 'community' especially in rural Malawi, they imply different catchment hierarchies or levels of the traditional leadership structure. Malawi has a strong and influential leadership structure that comprises an informal but officially recognised administrative structure of chieftaincy system. The traditional leadership hierarchy comprises of Traditional Authorities (TAs) and sub-Traditional Authorities (STAs), typically known by the title of chief. They have responsibility over a catchment known as a Traditional Area. The smallest unit of the traditional authority system is a village headed by a village headman/woman. A number of villages are headed by a group village head (GVH). In practice, however, a TA, a GVH or a village head can be referred to as a 'chief'. A Chiefs Act was passed before Malawi attained political independence in 1964 provides the legislative framework for traditional authority.

Although government holds the power to confirm, promote or reject a chief, traditional leadership is inherited. A chief is answerable to the president through a District Commissioner and draws a monthly honorarium. The traditional leadership system applies predominantly in rural areas. Urban areas in Malawi have 'chiefs' but government does not recognize this arrangement, preferring to call them 'block leaders'. Traditional leaders in Malawi are influential and act as the focal point for social, cultural, political, and economic aspects of rural life as well as the de facto system for local participation. The traditional leaders serve multiple roles and command respect as custodians of legal, governance, security, administrative and development issues at the community level. This structure existed from colonial times and was strengthened during the government of Kamuzu Banda from 1964-1994. Successive governments in Malawi strengthened this structure (Maliro, 2011).

Participation of youth in agriculture is an emerging development issue in Africa. In the EGSP, there is strong interest and effort to engage the youth in improved post harvest management. A definition of a youth is a requisite here because the definition in Malawi varies with context and often poses confusions. A 'cultural definition' in rural areas is one that suggests that one ceases to be a youth when he or she gets married or once he or she has a child of his or her own – in rural Malawi 'a person without a child is a child'. Broadly, policy in Malawi describes persons aged below 18 years as children and persons aged 15 to 25 years as youth.

In principle, children and most youth are expected to be in school or training but in reality some children head households due to different circumstances. An earlier national youth policy in Malawi described youth as persons aged 15 to 25 years but a most recent Malawi National Youth Policy of 2010 defines a youth as a person between 10 and 29 years of age while providing for some flexibility on other parameters that could be used in categorizing the youth. In a Junior Farmers Field and Life Skill (JFFLS) Project to inspire youth interest and participation in agriculture, FAO described a youth as one who falls within the age bracket of 18 to 35 years. Most agriculture programmes in Malawi now adopt the FAO definition (Maliro, 2013). A youth in this study is one who is aged between 18 and 35 years.

6.2.5 The gender policy environment in Malawi

Finally, it is important to also provide a broader gender policy environment for Malawi and for the agricultural sector. Significant progress was made towards the promotion of gender in Malawi since 1993 when the government established an institutional structure for promoting women's empowerment. Subsequent to this was the establishment of conducive policy environment for advancing the gender agenda. Examples of the gender policies are the National Platform for Action (1997), the National Gender Policy (2000), the National Gender Programme, the National Response to Combat Gender Based Violence, National Programme on Increasing Women Representation in Parliament and Local Government and the Malawi Growth and Development Strategy.

For the agricultural sector, Malawi has an Agriculture Sector Gender, HIV& AIDS Strategy covering the period 2011-2015. In all these national and agriculture gender policies and strategies, government set out very good gender agendas and specific areas of interventions including addressing low and unequal participation of women in the agricultural sector. One challenge to gender mainstreaming in the COMESA region including Malawi seems to lie in the inability of programme staff to interpret and apply gender policies and strategies into their specific programming contexts. Programme staff often refers and rely on 'gender' staff in a separate unit in the same ministry or in gender ministry to lead the gender mainstreaming effort. This is often too late into the programming process and when technical gender advice is provided, the programme staff rarely consider it as a priority in the programming process since it is viewed as added-on burden likely to over-balloon the budget (Maliro, 2015). This has implications on how gender is managed in the EGSP across the four project countries.

6.3 Data collection tools and selection of the study sites and respondents

This cross country study covering Kenya, Malawi, Zambia and Zimbabwe administered four sets of uniform data collection tools as follows:

(a) Community Focus Group Discussion (FGD) Tool

This tool contained non-exhaustive themes and questions around farming systems, post harvest management practices, improved PHM technologies and related gender roles and impacts. The earlier discussion has defined a community as generally understood in Malawi. An explanation has also been provided regarding the Ministry of Agriculture service delivery structure. The dominant government metal distribution and management structure in Malawi comprises the Department of Crop Protection in the Ministry of Agriculture at national level, crops section of the district agriculture office at district level and EPA and Section at the community level. Mchinji has 6 EPAs but much effort in the metal silo work appears to focus on five EPAs (Mlonyeni, Mkanda, Mikundi, Chiosya and Msitu). Lilongwe has 18 EPAs in two District Agriculture Offices but the metal silo activity appears to concentrate in three EPAs (Chitekwele, Chigonthi and Malingunde).[2]

The community FGDs were conducted in Mlonyeni, Mkanda and Msitu EPAs in Mchinji and Chitekwele, Chigonthi and Malingunde EPAs in Lilongwe. These represented a good concentration of the metal silo activities and potential for rich data. One FGD was conducted in each EPA at Section level or Group Village level. In total, 7 FGDs were conducted (Table 2).

Table 2: Distribution of the focus group discussions

EPA/District	Key FGD focus
Mlonyeni/Mchinji	1 male FGD & 1 female FGD
Mkanda/Mchinji	1 mixed FGD
Msitu/Mchinji	1 female FGD

[2] Mchinji District Agriculture Office has 6 EPAs namely Mkanda EPA covering TA Mkanda, Kalulu EPA covering TA Dambe & TA Kapondo, Mikundi EPA covering TA Mduwa & TA Nyoka, Chioshya EPA covering TA Simphasi & TA Zulu, Mlonyeni EPA covering TA Mlonyeni and Msitu EPA covering TA Mavwere. Lilongwe South-East Agriculture Office in Lilongwe has 6 EPAs namely Chigonthi, Mkwinda, Chitsime, Chiwamba, Mpenu, Nyanja and Chitekwele. Lilongwe North-West Agriculture Office in Lilongwe has 12 EPAs namely Mitundu, Mlomba, Thawale, Malingunde, Ming'ongo, Chileka, Mpingu, Ngwangwa, Ukwe, Chilanza, Demera and Nthundu.

Chitekwele/Lilongwe	1 mixed FGD
Chigonthi/Lilongwe	1 female FGD
Malingunde/Lilongwe	1 Female FGD

Source: As explained in the text

(b) Key Informant Interviews Tool

Like the FGD tool, the Guide for Key Informant Interview contained non-exhaustive themes and questions around farming systems, post harvest management practices, improved PHM technologies and related gender roles and impacts. It was administered to EGSP implementers (Department of Crop Protection and Department of Agricultural Research at Chitedze Research Station in the Ministry of Agriculture, World Vision in Mchinji and Somebody Cares Ministry in Lilongwe) and field extension workers in the study communities described above. It aimed to collect data relating to organizational profile; gender integration in EGSP activities; institutional policies, programs, and tools; and staff knowledge, experience, and attitude on gender responsive programming.

(c) Artisan Tool – key themes

This tool was administered to metal silo artisans to understand various aspects around education and technical background of the Artisan, history of metal fabrication business, marketing strategies, promotion, market segmentation approaches and profiles of households, individuals or institutions that adopted improved post harvest (PH) technologies some of whom can be highlighted as case studies and perceptions on constraints faced by potential buyers of metal silos.

A number of factors were considered to select the respondents. CIMMYT data listed 11 artisans trained under EGSP. Ministry of Agriculture produced metal silo promotional posters that approve and recommend 15 artisans to fabricate metal silos in Malawi. Following consultations with EGSP Coordinator in Ministry of Agriculture, World Vision in Mchinji manager and project coordinator in Somebody Cares Ministry, we selected two artisans for Lilongwe and three artisans for Mchinji. We also made a deliberate effort to talk to a female artisan in Balaka district in southern Malawi who was trained under EGSP in Mchinji. The objective was to gain gender perspectives and experiences from women's points of view.

Earlier discussions with the EGSP partners and male artisans suggested that the women artisans trained under EGSP were not as active as their male counterparts due to the 'masculinity nature' of the fabrication work.

(d) Case study household profiling tool

This tool was administered to households that 'adopted' the metal silos to collect information around general themes on post-harvest management such as traditional storage practices, gender roles associated with those, and desirable characteristics; improved storage technologies, gender roles associated with those, how things may have changed or remained the same over time in terms of access to and control over stored grain; individuals' technology preferences. It was administered to heads of household and 1-2 other adult members of the households separately to collect information around intra-household gender relations and bargaining that occurs around post harvest management of grains.

Different ways of selecting the 'adopter' households were considered. Useful information sources for identifying the 'adopters' included the artisans, the partners (Ministry of Agriculture maintains copies of artisans sales receipts), key informants or the FGDs. A list of metal silo adopters in Malawi as of 2011 that was made available by the CIMMYT study team leader was used mainly because it was clear on a number of important selection criteria such as length of adoption (years owned the metal silo), gender and age of the household head, ownership of the metal silo and geographical location. The study recognises that group ownership of metal silos could be a rich source of information on how social relations and bargaining are managed but these aspects were captured through FGDs and KIIs. These considerations led to the selection of 4 adopter households (last column of Table 3).

Table 3: Summary of Malawi Metal silo adopters 2011 and the selected respondents

Key selection attributes	Lilongwe	Mchinji	Selected for Profiling
No. of Adopter Households	50	50	
No of MHH adopters	5	1	
No of FHH adopters	5	1	1 FHH – Lilongwe
No of FHHs (Spouse) adopters	0	1	1 FHH – Mchinji
No of Youth (18-35 years) adopters	12	16	1 Male youth – Mchinji
HHs individually owning the silo	33	11	

HHs individually owned but used by many	3	1	
HHs family owning the silo	3	1	1 MHH – Lilongwe
HHs group owning the silo	9	28	
HHs owning silo in partnership with friend	2	9	
HHs still using silo in 2011	42	43	

Source: As explained in the text

6.4 Organization and implementation of the fieldwork

As stated earlier, this study is part of a cross country study covering Kenya, Malawi, Zambia and Zimbabwe. The study was led by Dr Vongai Kandiwa of CIMMYT Kenya who collaborated with gender experts from the four respective countries in the design and implementation of the study. In Malawi the team leader participated in fieldwork in Mchinji. The Malawi research team comprised of three members – Dyton Maliro with overall responsibility of the research including reporting – supported by two research assistants, Rachel Mkandawire and Chance Mbale. The research assistants administered focus group discussions and adopter household case-profiling tools, transcribed field notes, and assisted in data analysis and summary report writing

The research team worked closely with the EGSP project coordinator in the Ministry of Agriculture and World Vision in Mchinji Manager to select the EPAs. At community level, the research team worked closely with Agricultural Extension Development Officers (AEDOs) to help select and mobilize a 'community'. The AEDOs also helped in mobilizing the FGD participants. Participants for focus group discussions were met at a central place where they normally assembled for agricultural and other community meetings. Adopter households were interviewed at their own homesteads while metal silo artisans were interviewed at their workshops. The partners were interviewed at their offices while the key informants were mostly field agriculture staff and interviewed at their offices or where the FGDs were held.

Preliminary findings of this study were presented at the EGSP Annual Meetings in Lusaka in June 16-18, 2014 where participants provided useful insights that \were taken into account when finalising this report.

6.5 Data Analysis and Interpretation and Research Limitations

Field notes were taken during the discussions. Immediately after the fieldwork, the research team developed content narrative but analytical summaries around research questions that this study set out to explore. The earlier sections of this report discussed epistemological issues in qualitative research. It however, it was not possible to comprehensively examine all aspects of adoption and gender outcomes of post harvest management technologies in Malawi. The findings and conclusions of this study should be taken as 'subjective' and interpretive. They, nevertheless, represent 'best judgements' after examining the evidence gathered from the fieldwork. It is hoped that the findings, conclusions and recommendations provide a correct 'gender picture' of post harvest management of maize in Malawi, useful in informing a future gender strategy in EGSP.

7. Cultural Context, Agricultural Farming Systems and Gender Roles

7.1 Introduction

This section discusses culture and farming systems in the communities visited in order to situate aspects of post harvest management of crops in a proper context. It describes the culture and farming systems implications on adoption and management of improved post harvest management technologies. The discussion reveals that traditionally, management and control of maize stored in nkhokwes is largely a woman's responsibility and for household food security. The switch by men from tobacco to maize for the market that has emerged in recent years has transformed the traditional gender roles. Men are now beginning to own, manage and control maize storage facilities. This has implications on adoption, use and control of metal silos by men and women.

7.2 Cultural and Gender Practices in the Community

A cultural context of Malawi was introduced in a preliminary way in the earlier sections of this report in order to situate culture and gender in the two study districts of Lilongwe and Mchinji. As mentioned earlier, the two study districts are located in the central region of Malawi where the Chewa is a dominant ethnic group but whose culture has evolved over the years due to many factors discussed earlier on but one important factor worth recalling here is the intrusion of the patrilineal-patrilocal Ngoni culture especially in Mchinji district (e.g. Mlonyeni community is mostly Ngoni while Mkanda community is predominantly Chewa).

It was apparent during the fieldwork discussions in both districts that both systems prevail among the Chewa. However, in communities where chikamwini is predominant, incidence of female headship of household was reportedly high compared to communities where chitengwa is predominant. For example, the discussions with an AEDO for Mkanda South Section of Mkanda EPA suggested that out of 2,550 farm households in the section, about 600 households or 24 percent were female-headed households.

One interest in this study is to document cultural and gender practices in relation to gender roles and responsibilities, division of labour and access to and control of resources and benefits. The tone of the focus group discussions in Lilongwe and Mchinji confirmed women's preoccupation with the reproductive economy. There was shared appreciation that although men and women live as 'one' within the perimeter of marriage, achieving equality in these aspects of research interest was not an end in itself. In terms of gender roles and responsibilities, consensus across the focus group discussions suggested that it is culturally expected for men, as heads of households, to decide and assign roles and responsibilities to women and children at both household and at community levels. Men are also culturally expected to be responsible for or take a lead role in financial decisions e.g. paying school fees. On the other hand, women and children are culturally expected to be the usual takers of roles or responsibilities assigned to them by the men. Women are also expected to lead in aspects that are designed as feminine roles such as care of children.

In terms of division of labour, work assumed to be physically challenging is done by men while kitchen jobs are for women because they are assumed not to be physically challenging. However, most farming activities are done jointly. In terms of access to and control of resources, the FGDs confirmed what is already known that men have more access and control of resources and benefits than women, even in circumstances where the resources and benefits are owned by women. In particular, men in Mchinji and Lilongwe have more control on cash crops especially tobacco while women exercise some control over food crops especially maize and groundnuts. The next section of this report discusses these gender dynamics in greater detail.

7.3 Agricultural and Farming Systems and Post-harvest Losses

Lilongwe and Mchinji districts fall within the Kasungu-Lilongwe Livelihood zone which can be considered to exhibit higher potential for crop production (especially maize, tobacco and

groundnuts) compared to other agricultural zones in Malawi. For the purpose of monitoring vulnerability to hunger, the government, through the Malawi Vulnerability Assessment Committee (MVAC), has divided the country into 18 livelihood zones which group locations of similarities in terms of livelihood activities, shocks and coping strategies.

Both Lilongwe and Mchinji districts are located within the Kasungu-Lilongwe Livelihood Zone, which can be considered to be Malawi's best zone agriculturally. Major smallholder crops grown are maize, groundnuts, cassava, sweet potatoes and beans (Government of Malawi, 2002). Mchinji district, in particular, exhibits a high maize production potential. Maize yields in Mchinji district have increased steadily over the years while the area planted to maize has generally remained almost the same. This contrasts with the national picture that suggests some steady increase in the area planted to maize but uneven progress on yields (Maliro, 2011). But the two study districts are also potentially vulnerable to hunger due to limited food diversity (Government of Malawi, 2005; Government of Malawi, 2008). By exhibiting both the highest potential for maize production and the potential risk of vulnerability to seasonal hunger, the two study districts provide a strong case for promoting improved post harvest management technologies.

This study sought to establish the cropping systems and gender preferences in the study areas and draw implications for adoption of improved post harvest technologies such as the metal silos. Table 4 presents summary of major crops in the communities visited and gender preferences. The discussion that follows Table 4 elaborates issues of priorities and preferences based on what was discussed with the FGDs and KIIs.

Table 4: Gender crop preference in the communities assessed

1 Community	2 Major crops grown	3 Crops preferred by men	4 Crops preferred by women
5 Chitekwere 6 (Lilongwe)	7 Maize, Groundnuts, Soya, Tobacco and Beans.	8 Maize and Tobacco	9 Beans and Soya
10 Malingunde 11 (Lilongwe)	12 Maize, Tobacco, Groundnuts, Soya, Sweet potatoes, Common beans, Bambara nuts	13 Tobacco	14 Maize and Groundnuts
15 Msitu 16 (Mchinji)	17 Maize, Groundnuts, Soya, Tobacco, Cassava, Sweet potatoes, Common beans and Irish potatoes	18 Tobacco	19 Maize and Groundnuts
20 Mkanda 21 (Mchinji)	22 Tobacco, Maize, Groundnuts, Soya, Common beans, Sweet potatoes, Irish potatoes, Cassava, Onions and Tomatoes	23 Tobacco, Maize, Irish potatoes and Soya	24 Maize and Groundnuts

Source: Field data from community FGDs & KIIs, 2014

The first column of Table 4 lists the communities from which the results presented are based. The second column lists crops that were discussed with FGDs and KIIs as major crops in the area in terms of being widely grown and lived on by majority of people in terms of food and

cash. The third and fourth columns list crops preferred by men and women respectively and the crops are not listed in priority. Across the communities visited, like in most parts of Malawi, maize is the staple food crop. Every farming household attempts to grow maize regardless of circumstances. Tobacco, soya, cassava and sweet potatoes are grown mainly for cash. Groundnuts and beans serve dual purposes but to a larger extent have a market orientation. Women have historically exercised control over post harvest management of maize because of its role in household food security. For cash, men have traditionally relied on tobacco while women have relied on selling part of the groundnuts to meet essential household needs such as salt or milling costs.

Two key factors have transformed this history and tradition in most recent years. First, increased efforts to promote groundnut value chains by the government and organisations such as the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), and the National Smallholder Farmers Association of Malawi (NASFAM) have transformed groundnuts from being a subsistence crop to a lucrative cash crop. Second, tobacco prices at the auction floors (the only authorised tobacco selling market for farmers in Malawi) declined over the years resulting in unaccommodating losses on the part of small farmers. The outcome of this is 'male take-over bid' of the crops, especially maize and groundnuts, in which women have traditionally exercised control. The gender implications of this 'economic squeeze' around lucrative value chains is since documented in the literature (e.g. Farnworth 2011) and can be important for examining a future gender strategy for EGSP.

The men's crop preferences as shown in Table 4 have a 'bigger' cash income earning connotation as discussed above. Beyond household food security reasons discussed above, women particularly prefer the groundnut value chain because it is not as input intensive as other crop value chains. In other words, the input outlay requirements for crops such as tobacco has prevented women from engaging in the 'bigger' cash earning crops. Women also prefer groundnuts because they are considered to be easier to sell than the other crops which may require complicated market transactions and long distance markets. Despite the fact that maize is considered to be a family or household crop, women's particular interest in the crop increases because as food, maize brings 'social respect' and peace at the household. For example a female discussant in the FGDs stated that:

"When there is no maize in the home, there is no 'peace' in the home. Children go about eating from neighbours and this makes one lose social respect" (Female discussant)

The takeover bid by men of the women's crops has implications on how men and women access and control post harvest management of crops for which the metal silo technology is being advocated under the EGSP. The gender preference of the crops has implications on the promotion of metal silo technology under the EGSP. Recent gender studies around groundnut value chains in Malawi (e.g. Maliro, 2014) show that innovative marketing arrangements through warehousing are fast emerging among groundnut growers in Mchinji where the crop is pooled and stored in a common warehouse to benefit from good prices at a later date (Maliro, 2014). It is discussed in the next sections of this report that there are similar group marketing arrangements among beneficiaries of the EGSP project (e.g. Mando Cooperative in Mlonyeni EPA) where the metal silos are used for storing pooled maize and groundnuts have not benefited from the metal silo technology. The recent gender studies on groundnut value chain in Malawi also reveal that in the emerging warehousing marketing arrangements women have not participated and benefited as much as their male counterparts. Major factors for this are low production volumes, urgent need for cash, long distances to the warehouse facility and strict grade requirement.

Policy and practice on post harvest management among small farmers in rural Malawi focus on maize for reasons already stated. Scientists at Chitedze Research stations who have monitored post harvest management issues in Malawi estimate national level post harvest loss to be 17.9 percent of total maize harvest. The major cause of the loss is storage pests especially the larger grain borer. Perceptions of farmers and KIIs around post harvest management issues varied greatly as shown in Table 3 below. Estimates on maize loss while in storage ranged from 20 to 50 percent but, if the community estimates are anything to go by, on average, loss could be as high as 30 percent. Similarly, estimates on the length of period maize is stored varied greatly from a minimum of 5 months to a maximum 12 months but the emerging picture from information in Table 5 suggests 8 months on average. Again, main causes and their corrective measures varied by community but broadly large grain borers (*nankafumbwe mkulukulu*) and weevils were common causes, especially on hybrid maize. Application of chemicals mostly actellic is the common control measure used by farmers. The

discussions during the fieldwork suggested that the problem affected women more than men because women were ‘too slow to buy and apply the chemicals’ indicating challenges in accessing improved post harvest management measures. The later sections of this report make a comment on feminization of poverty in rural Malawi and the gender implications for adoption of metal silos.

Table 5: Summary of post harvest management maize losses and their gender impacts

Community	Summary of post harvest management maize losses and their gender impacts	Source of information
Mkanda (Mchinji)	• Maize stored 10 months (April-January); Weevils and grain borers are main storage problem accounting for 25 % loss of maize in storage • PHL affects female headed households more because they are deemed to be too slow to buy and apply actellic	KIIs
	• Maize stored 5-7 months; Post harvest Loss 20-50 % • Major causes and their respective control measures (hereby in brackets) are: Weevils (shelling and applying pesticides), rodents especially mice known as *makoswe* in the local Chichewa language (keep cats), termites (chemicals such as solignum is costly), theft (shelling/bagging to keep inside the house), rains (rain proofing roof with plastic sheets which is costly) • For men, the losses mean poverty in the home resulting in selling assets to buy maize, trekking to Zambia for piecework. Over staying in Zambia brings mistrust between married couples as this may lead to recklessness e.g. the women sleeping with other men for food; and petty theft to get food for the home. • For women, inadequate maize in the home means lack of peace among children; resorting to piecework when they should be tending to their fields, leading to higher risk of hunger the following year (vicious circle); risky behaviour such as sleeping with men in exchange for cash or food	Mixed FGD
Msitu (Mchinji)	• Maize stored 8 months and as high as 50 % loss of maize in storage • Major causes are weevils, larger grain borer (*nankafumbwe wamkulu*) and lack of improved storage technologies. • Extent loss depends on maize varieties but most varieties are susceptible • Control measures are pesticides and processing maize into *mphale* (pounded maize) • Affects female headed households more because too slow to buy and apply actellic	Women FGD
Chitekwele (Lilongwe)	• Maize is stored for about 12 months; Loss in storage is 40-50% depending on the control measures as well as how early the problem is detected • Main causes are termites, weevils and rodents. • Weevils mainly controlled by application of insecticide (actellic)	Mixed FGD of metal silo adopters and Non adopters

	• Control for termites and rodents is costly • For men, loss means loss of cash to purchase insecticides and, subsequently, to buy food for the household; engaging in piece works to access food. • For women, the loss means lack of peace at home due to food shortage; women suffer most through piece work to bring food at home	
Malingunde (Lilongwe)	• Maize is stored 7-8 months; Storage loss as high as 40% • Main causes are weevils, rodents, termites and rotting • Weevils controlled by actellic but no known control for rats and termites • For women and children, loss means suffering, e.g. stopping children from going to school to help with piecework • For men, it means inability to provide family with other necessities as all the money is spent on food, children fail to go to or drop out of school.	Mixed FGD of metal silo adopters and Non adopters

Source: Field data from community FGDs & KIIs 2014

7.4 Traditional Post-Harvest Storage Technologies and Practices

Traditional bamboo (*nsungwi*) granaries and mudded granaries have a long history among farmers in Malawi and are still commonly used today. The granaries are constructed and located outside a farmer's house but close enough for the farmer to keep watch at night. Construction of traditional granaries uses local materials that most farmers can easily access and are thus less costly. Construction of traditional granaries takes place around harvest time after a farmer has assessed how much maize harvest to expect. This provides an opportunity for a farmer to construct a granary adequate for the expected maize harvest. This flexibility may not be possible if maize were to be stored in bags in the house. The practice around traditional granaries has evolved over the years. In the past, the granary was used as a stand-alone storage technology for local maize until the maize was depleted. The introduction of modern maize varieties or hybrid maize, as it is commonly understood in Malawi, and security breakdown means the role of granaries in the maize economy of Malawi is diminishing. The practice for the majority farmers in the communities visited is that the granary is now used as 'transit storage facility' where maize is stored in their husks for 1-3 months before all maize is removed at once, de-husked, shelled, bagged and treated with chemical and moved into a house for secure storage.

The most common improved storage technology is the polythene bag. Fieldwork discussions suggested that polypropylene bags are easy to use and provide security since they are kept inside the house. The major challenge is that the polythene bag technology requires heavy use of chemicals. This means that farmers have to buy the bags and in most cases almost every year. Apart from cost, the chemicals are not readily available on the market at the time farmers need them. Some farmers access the chemicals through unorthodox methods and from unauthorised sources. Many farmers, especially women, have problems following the recommended chemical application rates due to literacy challenges. These factors individually or in combination affect the efficacy of the chemicals (e.g. KIIs claimed that efficacy of the Actellic super dust is affected by light) and the health and safety of the farmers.

Discussions held with KIIs also confirmed and/or it was observed during the community FGDs that, in all the communities visited in Lilongwe and Mchinji districts, *nkhokwe* (traditional granaries) and hessian sacks/bags were the common storage facilities for maize. Three distinct types of nkhokwes stood out – (1) nkhokwe made from grass, (2) nkhokwe made from small poles (trees) and (3) nkhokwe made from bamboo. Construction of nkhokwe is typically a man's job. Husbands or male members of the household or hired male labour constructed nkhokwes especially those made of bamboo and poles. Nkhokwe made of grass were the most common storage facility for female headed households because the FHHs could afford to pay men to construct only grass nkhokwes or the FHHs could manage to construct the grass nkhokwe on their own.

Hybrid maize is the most commonly grown in the communities visited but production of local maize is also on a significant scale. The tone of discussion among men in most communities visited implied that nkhokwes were old-fashioned storage facilities. In some communities such as Chitekwele in Lilongwe, FGDs implied that nkhokwes were still useful in their maize economy. Nkhokwes were praised for being easy and cheap to construct and capable of protecting damage from weevils because nkhokwes stored maize in its husks. The major reason against use of nkhokwe is threat of loss through theft, weevils (in case of hybrid maize), termites and rodents.

In summary, nkhokwes as storage facilities appear to have stood the test of time. They can be used as a storage facility either on their own throughout the season or as temporary storage to facilitate further drying before bagging for sale or further storage in houses. Nkhokwes are ideal for local maize while both local and hybrid maize can be stored in bags. However, the common post-harvest storage practice is that from the fields, the maize is stored in shelved or not shelved in nkhokwes outside houses first for some time (1-3 months) before all is taken out, shelled, treated with chemicals and stored in bags inside the house. The practice in the communities visited is to store local maize and hybrid maize in separate bags. Local maize is mainly for the farmers' consumption while hybrid maize is for both consumption and sale. It is emphasized here that the practice in the communities visited is to store seed maize separately from food maize. Seed maize is commonly stored in its cob form in the kitchen by hanging on a roof directly above the fire place. The soot/smoke is considered to be a

'traditional pesticide'. Another way is to keep the seed maize in their husked or de-husked form on roofs or on trees where it is sun heat- hardened. This acts as a control measure in place of pesticides. For the majority of farmers that grow hybrid maize, seed is purchased every year.

Turning to specific gender aspects, the tone of the FGDs suggested that men prefer bags because it is easier to monitor the depletion of maize. It was also easy to control unnecessary retrieval of the maize by spouses. Effective male monitoring of the maize is not present in *nkhokwe* which, traditionally, is a woman's domain. It was apparent through the FGDs that women preferred *nkhokwes* because apart from exercising control over the maize for household food security reasons, women were able to 'steal' the maize and sell it to meet essential household needs in cases where their husbands were unwilling to provide because they prioritized personal interests such as beer or 'other women'.

7.5 Gender roles in post harvest management of maize

Post harvest management of maize in the communities visited varied across households and contexts but four distinct pathways can be identified. These have implications on labour use for men and women as well as adoption of improved post harvest management technologies. The first and shortest pathway involves dehusking the cobs from standing stalks right in the garden and the de-husked cobs are transported home. Once at home, the maize is dried in cobs before shelling or in shelled form. This pathway involves farmers with little harvest not lasting longer than 1-3 months. The harvest is for immediate consumption and is typically stored in tins or bags in the house. The second pathway involves farmers who harvest mostly local maize for home consumption not lasting more than 4-6 months. This pathway involves cutting the maize stalks and stooking them. The cobs are removed from the stalks in their husks and transported home where it is dried further before it is loaded into traditional granaries whilst in their husks. When needed for food or small sales, the maize is retrieved in its husked form, de-husked, shelled and used as appropriate (milling or selling). The latter and former pathways are mainly for typical subsistence farmers, the majority of whom are women.

The third pathway involves cutting the maize stalks and stooking the stalks. The cobs are removed/de-husked whilst still in the garden before transporting home where it is dried, shelled, treated and bagged. In some cases, cobs are de-husked from standing and not cut

stalks. The fourth and probably the longest pathway involves cutting the maize stalks and stooking them. The cobs are removed from the stalks in their husked form and transported home where they are heaped outside for further drying before being loaded into nkhokwes for temporary storage for 1-3 months. The maize is then retrieved from the nkhokwes, de-husked, shelled, bagged and treated before storage in houses. The fourth and third pathways are typically for farmers who harvest enough maize to last the year and most of the maize is for sale. The majority of actors in these two pathways are men. The table 6 presents summary of major tasks involved in post harvest management of maize based on what was discussed during the community consultations. The tasks are applied variably in the four pathways discussed above. The summary of tasks is followed by narrative explanation, as discussed with FGDs to bring out gender issues which may be salient or silent if the summary findings in the Table were to be interpreted and understood on their own..

Table 6: Gender roles in post harvest management of maize in selected communities

25 Major tasks in post harvest management of maize	**26 Chitekwele Mixed FGD** **27 (Lilongwe)**	**28 Malingunde Mixed FGD** **29 (Lilongwe)**	**30 Malingunde AEDO** **31 (Lilongwe)**	**32 Msitu Women FGD** **33 (Mchinji)**	**34 Mkanda FGD** **35 (Mchinji)**	**36 MANDO COOP** **37 (Mchinji)**
38 Constructing nkhokwes/ Procuring sacks	Men	Men	Men	Men	Men	Men
39 Cutting Stalks (*Kusenga chimanga*)	Jointly men &women	Both men and women	Men and women	men but women can	men, but single women can	Family (men, women & children)
40 Stooking	Jointly men women and children	Both men and women	Women, sometimes men can take part		Women	both men and women
41 Removing maize from stalks (*kukolola*)	Jointly men women and children	Whole household	Whole household	men, women and youth	Family including children	Family (men, women & children)
42 Transportation including paying for hire for ox-cart	Men and also single women	Men and also single women		Men	Men	Men
43 Loading/off loading ox-cart	Women		Women		Women	Women
44 Loading into *nkhokwe*		Both men and women	Women			Women

45 Dehusking					Women	
46 Shelling	Men if cash labour or women if to get *zisononkho* (the shelled cobs for firewood)	Women –for zisononkho	Women –for zisononkho	Women for zisononkho, The women in groups work in turn to help in each	Women	Women
47 Winnowing	Women		Women	Women	Women	Women
48 Buying pesticides	Men	Men	Men	Men	Men	
49 Applying pesticides	Shared men & women	Men	Men	Both men and women	Men	Men
50 Packaging & sewing of bags (*Kusoka*)		Men		Men and male youth	Men and male youth	

Source: As explained in the text.

The first step in the post harvest management is to acquire adequate storage facilities based on farmers' subject assessment of expected maize harvest. Traditional or common storage facilities in the communities visited are discussed in the previous sections of this report. For bags and to some extent nkhokwes, the responsibility for acquiring the facility rests with a man because of the cash requirement. For constructing bamboo and pole nkhokwes, males in the household (husbands, male members of the household or hired male labour) are fully responsible because of 'technical skills' required in construction. Female headed households with cash engage male labour to construct bamboo and pole nkhokwes

while cash constrained FHHs construct grass nkhokwes on their own. Once storage facilities are ready or their sources known, actual harvesting can begin.

Harvesting in the gardens begins with cutting maize stalks and stooking them in heaps at one or some strategic points in the garden easily accessible by ox-carts. As men and male members of the household cut the stalks, women and female members of the household carry the stalks for stooking. A few days later, actual harvesting is done by women and female members of household. Female hired labour can be engaged to help with the actual harvesting. Because of theft, the harvested maize is transported home the same day. However, if the maize is transported on a different day, men usually keep guard especially at night. Women are responsible for loading the maize into ox-carts while men drive the ox-carts home for off-loading. Where a household cannot afford an ox-cart, women carry the maize on their heads in big baskets while male children also carry on their heads but in big sacks. Regardless of the transportation method, the maize is off-loaded at a secure place at which point women are responsible for loading into nkhokwes for temporary storage. Once the maize is the nkhokwe located outside the house, a woman has responsibility and/or control if it is not retrieved immediately for shelling and bagging for immediate sale or for further storage in the house.

After 1-3 months the maize is retrieved from the nkhokwes and heaped on a secure place from where it is de-husked and shelled. Women are responsible for the retrieval and de-husking and shelling. Shelling is done by hired labour which is mostly men if cash payment is involved or mostly women if communal work is involved where 'payment' by the *zisononkho* (the left-over cob after the maize is shelled) which the women use as 'firewood'. Common instances where men take part in shelling involve fund-raising by choir groups. Shelling by fund-raising groups such as church choirs were also common instances discussed in the FGDs. Depending on composition of the group, male involvement can be significant. One concern that emerged from men FGDs is their inability to access the maize (e.g. to sell) and monitor its depletion because of women's traditional role of managing and controlling maize in nkhokwes. Men FGDs alleged that women were able to 'steal' the maize. Women FGDs justified the 'stealing' to sell and meet small but immediate household needs.

Once all the maize is shelled, women clean it through winnowing using *lichero* (a winnower or winnowing basket) and this traditionally a woman's responsibility. If men are to clean the

maize, they use locally constructed or improvised sieve on raised platforms of timber. Two men stand facing each other as they sieve the maize. Men that were consulted during the FGDs claimed that because the sieving process involves standing for a long time, women could not manage to use the sieves. Before the maize is bagged, it is treated with chemicals (e.g. actellic dust). Men are responsible for buying and applying the chemicals. Women are not involved in handling chemicals because most cannot afford to buy and/or cannot follow recommendations because of illiteracy and for safety reasons i.e. women handling food and care for small children.

In some women FGDs, beliefs emerged that actellic can damage a woman's womb. The bagged maize is then stored in houses. Loading maize into the bags and sewing (securing the bags) is done by men and male youth in the household. Carrying the bags is a joint household responsibility but men take lead. Once the maize is in bags in the house, a man has overall responsibility and control. One concern that emerged from women FGDs is their inability to manage the maize for household food security as the men's priority was to sell the maize and use the cash mainly for non-priority needs. Men FGDs accepted that maize in bags was easier to monitor and prevent misuse of maize or 'stealing' by women. In polygamous marriages, men and women keep separate grains largely because of this emerging absolute male control over the stored maize

Both men and women can do the above tasks. Based on what was discussed with FGDS as gender roles and division of labour, men are responsible for cutting stocks, constructing nkhokwes and or buying bags, applying actellic dust, bagging and sourcing and paying hired labour. Women are traditionally responsible for loading cobs into ox-carts, loading cobs into nkhokwes, dehusking and cooking for communal and hired labour. Sons and male members of the household help the men while daughters and female members of the household help the women. Some roles are changing with time and circumstances for example, cutting stocks used to be man's traditional role but increasingly women are now doing it due to female household headship and inability to engage hired male labour.

7.6 Summary

This summary has implications on adoption of metal silos. It is the responsibility of men and male youth to buy the sacks or construct traditional granaries (nkhokwes). Traditionally, men in the two study districts used to hold absolute control and access over tobacco and its storage

facilities (barns, bales) but the decline of the industry has seen more men switching to maize, groundnuts and soya. Traditionally, management and control of maize stored in nkhokwes is largely a woman's responsibility. The switch from tobacco to maize means men are now beginning to own, manage and control maize storage facilities (mostly bags).

Key merits of the traditional granaries are that by using locally available materials, farmers most of who are poor can own a granary. Increasing insecurity (theft) is diminishing the traditional role of nkhokwes. Sacks/bags are placed in a house for safe custody but this is a limitation for farmers with large harvests but cannot afford to buy many bags and large storage space in a house. While affordability is a key element in the use of bags, other considerations that emerged during the fieldwork are: (a) sometimes pesticides that accompany use of the bags are not readily available in the form that famers can easily manage; (b) most famers, especially women, do not know or adhere to safe use and storage of the chemicals; (c) poor handling of the pesticides affect efficacy of the active ingredients (e.g. efficacy of the Actellic super dust is affected by light).

The specific or preferred storage technology to use also depends on the variety of maize grown. Farmers usually store hybrid maize in bags treated with chemicals because most hybrids are prone to weevil and other insect attacks. Local maize and composite (open pollinated varieties (OPVs) of maize) are normally stored in nkhokwes because they are relatively more resistant to pest attacks than hybrids are but the use of bags is also common especially where such bags are readily available. Again, use of the maize determines type of storage facility to use. Food maize is normally stored in nkhokwes while maize for sale is normally stored in bags for easy transportation to the market place. The practice in most communities is to use maize stored in bags for both food and sale. Seed maize if managed by farmers, and not purchased, is hung on the roof above a fireplace in the kitchen or stored in clay pots and applied with ash from tobacco stalks (traditional pesticide).

8. Gender and Improved Storage Technologies

8.1 Introduction

Nkhokwes constructed from locally available materials represent traditional storage technology in Malawi that has been used from time immemorial and is still in use by many

farmers today. Sacks/bags which emerged and have been promoted in the last 20 years and metal silos which have entered Malawi in the last 5 years are new introductions that can be said to represent improved storage technologies. When people talked about improved grain storage technologies during the fieldwork, they were essentially talking about metal silos. Other types of improved storage technologies in Malawi include concrete silos made from cement. KIIs claimed that many farmers liked the concrete silos but they could not afford the cost. The tone of the discussion suggested that it would be too absurd to expect farmers, especially women, to adopt concrete silos.

It is also important at the onset to mention that three distinct pathways for acquiring and managing the metal silos can be identified from the communities visited. One pathway involves group management by closely related households in a village. The second pathway involves community wide management through a legally constituted farmer cooperative. The third pathway involves individual household management of the metal silo. In all these pathways, the metal silo is largely a free gift or donation from government (mostly individual metal silos) or NGOs (mostly group and community pathway). The fourth pathway is where individual farmers buy their own silos. In the rural communities that were visited, cases of individual famers acquiring the metal silos on their own through purchases were few and far between. In Mchinji district, artisans that were consulted mentioned 2-3 individuals from nearby Chipata in Zambia and 1-2 individual farmers from the communities visited having ordered and purchased metal silos from the artisans. We managed to visit and discuss with a young farming household in Mlonyeni EPA in Mchinji district who owned five metal silos with grain capacity (in 50-kg bags) of 25, 18, 19, 12 and 10 bags. According to artisans who were consulted in Lilongwe district, individuals who ordered and purchased the metal silos were mostly urban working class who could be considered to be above average income level.

This background information is useful for examining not only gender issues but also adoption issues around the metal silo technology. It was apparent in the communities visited that even farmers who received the free metal silos were being referred to as adopter households. What was discussed and observed during the community visits for this study may not in strict sense qualify to be 'adoption' of metal silos. In the agricultural adoption literature (e.g. Feder *et al*., 1985), adoption refers to full acceptability of the technology by farmers. Major measures of adoption are the time lapse between when the farmer is made aware of the technology and

when the farmer fully accepts the technology once found useful, and the extent to which the farmer abandons traditional technologies in favour of the new technology once it is perceived to yield best-expected net benefits compared to traditional agricultural technologies. Adoption of metal silos in this study should be interpreted in the context that most farmers in the communities visited have (1) been provided with free metal silos, (2) 'owned' the metal silos for about one growing season, (3) largely used their traditional storage facilities while 'testing' the metal silos.

8.2 Improved Post- Harvest Technologies Awareness, Access and Preferences

From the foregoing discussion, the metal silo represents an improved storage technology as discussed and observed during the community visits. The history and evolution of metal silos in Malawi is discussed in the earlier sections of this report. This section focuses on issues of awareness, access and preferences around metal silos as summarized in Table 7.

It was apparent during the community visits that many farmers were aware of metal silos. The FGDs enumerated and discussed the radio, government (Ministry of Agriculture), CIMMYT, World Vision International and world Food Program (WFP) as major information sources. When asked what they considered to be appropriate information dissemination channels for the metal silos, in general, the FGDs mentioned farmer trainings, field demonstration, field days – especially where adopter farmers showcase their experiences, Farmer clubs and religious gatherings e.g. church meetings and agricultural extension workers. Gender preferences emerged in few communities. For men, appropriate channels would be to distribute silos to more farmers to act as role models and to train and support more artisans. On the other hand, women farmers suggested that distributing silos to more females to act as role models would represent appropriate information channels for women.

The silos are provided free of charge to the farmers by the organization making the donation. Across all the communities visited, it was apparent that many farmers preferred metal silos to other storage technologies but there were many limitations to individual ownership with cost being a key concern. At the time of the fieldwork, metal silos that were available were of grain capacity 500 kg, 900 kg, 1,500 kg and 3,000 kg. They were being sold directly from artisans on average at MK45, 000; MK75, 000; MK120, 000 and MK200, 000 respectively. Definitely, this is beyond the reach of the many farmers, the majority of whom are poor. An

Integrated Household Survey (IHS2) conducted in 2004-2005 yielded a rural poverty estimate of 56.3 per cent while urban poverty was 25.4 percent (Government of Malawi, 2005). The rural poor corresponded to 94.5 per cent of all poor people in Malawi (Maliro, 2011). A similar survey conducted in 2010-2011 (IHS3) showed little progress as rural poverty was estimated at 55.9 per cent against 25.4 per cent urban poverty. In this survey, a population that has total consumption below MK37, 002 (USD 92.5) per annum is deemed poor and a population with total consumption less than MK22, 956 (USD57.39) per annum is considered ultra-poor (Government of Malawi, 2012).

The cost of the metal silo becomes a gender issue in that the poverty is not only rural in character but also feminized in nature. About 63 percent of rural people in female-headed households are poor compared to 55 percent of rural people in male-headed households, according to IHS3. Some FGDs suggested some innovative ways of tackling the cost issue. Instead of paying at once, farmers could be allowed to pay by seasonal installments (paying after crop harvests) as long as effective mechanisms were in place to facilitate this arrangement. Subsidy could also reduce the cost and make the silos affordable. This raises a question as to which socio-economic group the metal silo would suit.

Table 7: Farmer knowledge and views on improved storage technologies

Information source	Improved storage technologies aware of	Sources of information	Which ones adopted?	Desired storage facility attributes & arrangements	Suggested improvements to existing metal silos	Appropriate information dissemination channels	Appropriate marketing channels
Women FGD (Msitu EPA - Mchinji)	Metal silos	World Vision	None	Bigger capacity silos than currently available	Increase capacity	Farmer trainings Demonstration sites	More radio programmes
Mixed FGD (Mkanda EPA – Mchinji)	Metal Silos & Super bags	Radio Ministry of Agriculture	Some farmers are using metal silos	Larger capacity silos (36 - 50 kg bags of maize) Affordable cost Every grain crop/variety has own silo	Locks for the outlets Needs inbuilt stands (*miyendo* or legs in English) Cemented platform	Field days Demonstrations Agricultural extension workers	Newspapers, Radios & community meetings to advertise and promote
Mixed FGD (Chitekwele EPA – Lilongwe)	Metal silos	Through a Ministry of Agriculture survey to assess and register recipients of the silos	Some farmers have adopted metal silos	1,500- 2,500 Kg (30-50 50-kg bags) capacity metal silos Household ownership of metal silo to store food maize and community owned metal silo for seed	Locks Raise metal silo outlet in relation to platform it is installed – currently hard to retrieve maize	<u>Men</u> Distribute silos to more farmers to act as models More artisans trained and supported with	Training of more artisans in the communities

				maize		capital <u>Women</u> Distribute silos to more females to act as models	
Mando Cooperative in Mlonyeni	Metal Silos & Fumigations	WFP & Agricultural Commodity Exchange	Metal Silos			Farmer clubs Religious gatherings e.g. church meetings	
AEDO – Mkanda South Section	Metal silo & Concrete silo	CIMMYT trainings	Some have adopted metal silos		Silo design to account for place to be installed Reduce height & increase diameter	Field days – adopter farmer showcases	Identify local traders to stock metal silos
AEDO/AEDC Navikali Section Mlonyeni	Metal silo & Concrete silo	Ministry of Agriculture sessions	Some adopted metal silos		Metal silo too high for height of most houses and for women Designate special room for installing silos Design to allow entry into house- currently break part of wall to allow entry		Identify local dealers Reasonably priced Promote payment by seasonal instalments

In terms of market accessibility, from the earlier discussion, the silos are delivered directly to the farmers by the organization making the donation at no cost to the farmers. Two reasons justify this according to what was discussed during the fieldwork. First, there are so far no retail outlets for the metal silos. The metal silos are being fabricated on demand. All the artisans are located at trading centres that are as far as 30 kilometers from communities where the silos are needed. Second, transporting a silo was a delicate process. In Mchinji district, agriculture staff recalled many cases of damage and waste during transportation to distribution centres in the communities.

Access options were discussed during the fieldwork. One option is where artisans could fabricate the silos at the farmers' premises but this too poses its own challenges in terms of transporting equipment and materials and access to electricity for welding. Another option is to identify and enter into business arrangement with agro-dealers based in the communities. Issues of business profitability and transportation of the metal silos are key considerations here. Notwistanding these accessibility concerns, the fieldwork discussions suggested what they considered to be market promotional channels appropriate for their communities. These included radio and newspaper advertisements, community meetings, training of more community based artisans and identifying and supporting local traders to stock metal silos

In the communities visited, the metal silos were known as *nkhokwe za chitsulo* (metal granaries). Given the cost and social prestige associated with ownership of the metal silo at household level, the metal silo is one most prestigious and valuable asset a farmer guards intimately. It is recalled that the *nkhokwe* (traditional granary) is located outside on a raised platform of tree poles but close enough to the house for a farmer to keep watch. Increased security has evolved the way maize is managed in nkhokwes. Nkhokwes are now temporary storage facility before the maize is transferred into bags and stored in houses.

At a household level, the practice is for farmers to install the metal silos in houses to safeguard the asset and the maize. It is recalled that the metal silos were available in grain capacity 500 kg, 900 kg, 1,500 kg and 3,000 kg. Installing the metal silos in houses has not been a rosy experience for the majority farmers. Walls have had to be broken to create space for the metal silo to be put in the house. For most farmers, especially women, their houses may not be classified as houses in strict sense but a 'hut' which is temporary structure, too small and/or too short to accommodate even the smallest metal silo capacity currently

available in the communities visited. A visit to a young commercial maize famer who had five metal silos initially installed outside the house on raised platform of tree poles but had been attacked by termites and collapsed. At the time of the visit, the metal silos had been moved to his father's house and not in use. Discussions suggested that farmers are provided with the metal silos without training on how they should really manage them given their individual socio-economic contexts. The focus of the training provided to metal silo owners emphasized technical issues such as removing air from the metal silos before loading well dried grain if the metal silo is to be effective in reducing grain loss.

Apparently, the farmers consulted did not find the current technical designs of the metal silo technology to be appropriate for their circumstances. First, for some farmers, a bumper maize harvest requires bigger capacity silos or more than one metal silo which in turn leads to a problem of space in the house. For most farmers, the silos are too high to load the grain when the silo is installed in the house. When installed in the house, it is hard to retrieve maize because of small space clearance between the ground and the metal silo maize outlet. Famers visited would like the following changes introduced to the current design:(a) flexible size and capacity to suit farmer demand, (b) stand/legs or raised outlet for easy retrieval of the grain, (c) provision for locks for security and (d) a transparent section for monitoring maize quantities in the silo. Most of these design suggestions emerged from women and are therefore more likely to benefit women more than men.

8.3 Improved Post- Harvest Technology Management at Household Level

This section draws on experiences of individual farming households that owned metal silos mostly from own purchases. For all practical purposes, such households are loosely considered to be metal silo adopter households – the conceptual definition of adoption is discussed in the earlier section of this report. The purpose of profiling the adopter household was to collect information around general themes on post-harvest management and to capture intra-household gender relations and bargaining that occurs around post harvest management of grains. As mentioned in the methodology section, four adopter households are profiled but experiences of a married youth who owned the metal silos from own purchases is presented here as a case study. The remaining three received free silos and it turned out that the individual household received the metal silo on behalf of a group. It is not implied that metal donations are a bad way of promoting the metal silos.

Patrick is aged 25 and a secondary school graduate (Form 4) while the wife Jane is 21 and they have a 6 month old child. Both are Chewa and are in a *chitengwa* marriage. They live in a small brick walled, grass thatched, mud floored house next to Patrick's father's big brick walled, corrugated iron- roofed and cemented floor house. He has two married brothers who live in their own houses within the premises and a school going brother who lives with the parents.

The household has 20 acres of arable land, 3 acres of wetland for winter farming and 2 hectares of grazing land. In the 2013/2014 growing season, they rented additional 5 acres at the cost of MK25, 000. For income, the household depends on tobacco, groundnuts and soya which in the 2011/12 growing provided MK800, 000, MK50, 000 and MK100, 000 respectively. In the 2012/13 season, the household grew only maize, soya, groundnuts and sun flower and not tobacco. Patrick has overall responsibility and control over key agricultural decisions especially on maize and soya while Jane exercises control over groundnut and sunflower.

Table 8 presents information on cropping for the 2012/13 season. It can be seen that acreage for the crops grown by the woman was far smaller compared to crops grown by the man.

Table 8: Adopter household's cropping in 2012/2013

Crop grown	Area planted (Acres)	Qty harvested (50-kg bags)	Key decision maker
Maize	15	200	Patrick
Soya	1	8	Patrick
Groundnuts	1.5	5	Jane
Sunflower	1.5	9	Jane

Source: compiled from separate interviews of the man and women

This household owned five metal silos with grain capacity (in 50-kg bags) of 25, 18, 19, 12 and 10 bags respectively. The metal silos were not in use during the field work because of the collapsed wooden platform earlier discussed and that the metal silos were in the parents' house because of lack of space in their house. When we probed Patrick and Jane separately about distribution of ownership of large assets in the households in order to situate the ownership of the metal silos (see Table 9). The findings in Table 7 suggest that although the metal silos were considered to be jointly owned, the tone of the discussions suggested that they were actually owned by Patrick. Jane in essence, owned a hoe and an axe.

Table 9: Post-harvest management of maize in Patrick's household

Post harvest Management task	Who plays major role	Why play this role	HH responsibility	Cultural responsibility
Cutting down stalks	Man, Woman, labourers	To speed up process to avoid theft	Man	Both
Stooking	Man, Woman, labourers	To speed up process to avoid theft	Man	Man
Dehusking	Man, Woman, labourers	To speed up process to avoid theft	Man	Woman
Transportation	Man & labourers	Too involving for woman	Man	Man
Drying in husks at home	Woman	Not much work is involved	Woman	Woman
Shelling by hand	Hired labour	To speed up process	Man	Both man & woman
Cleaning (removing debris and rotten kernels)	Man using *sefa* (improvised sieve)	Involves standing for too long and requires physique	Man	Woman
	Woman using lichero (winnower)	Traditional role for woman	Woman	
Sorting and Grading	Jointly done	Not much work is involved		
Purchasing pesticides	Either Man or Woman			Man
Applying pesticides	Man	Safety reasons because Woman handles child and food	Man	Man
Packaging and storage	Jointly involved in loading into bags		Jointly	Man and woman
	Man involved in carrying bags into house	Too hard for Woman to lift/carry bags	Man	Man

Source: compiled from separate interviews of the man and women

In terms of maize storage, the household traditionally used *nkhokwe yoluka* (grass granary) and sacks/bags to store maize. The use of nkhokwe yoluka was stopped in 2011/2012 while bags/sacks are still in use. On average, the household spends MK31,500 to buy about 210 (50-kg) sacks every season at MK150 per sack. Maize in bags/bags is stored for 6-12 months

depending on market availability. The household experienced cases of maize rotting in bags due to moist conditions in the house and damage by weevils despite application of actellic dust. Notwithstanding these problems, the man finds storing maize in bags convenient as a lot of maize can be stored in a small space in the house and that the bags are handy to transport to markets. In the past, the household used to store in nkhokwe for 3-4 months. The man claimed to know how to construct nkhokwes but used to hire local experts at MK40,000 because of large volume of the maize harvest.

As stated earlier, the household's five metal silos are jointly owned by the man and woman. Discussions with the woman suggested that this was a big departure from past arrangement when either of them could just sell the maize without consulting the other. Although ownership has improved for both of them, the husband has more access and control over use. In separate discussions, both claimed that the man was more knowledgeable about operations of metal silos because he attended a training session while the woman failed to attend because she was expectant.

The silos were acquired in 2011/2012 season after hearing about them from radios and later seeking advice from agricultural staff on how and where to get the metal silos. The household used the metal silos for only one growing season and stopped after the wooden platform where the silos were installed collapsed and the silos moved to the parents' house for safe keeping. This experience stimulated the man's need for additional training on good installation of the silos which the earlier trainings did not cover. In that one season, managing maize in the metal silos was a joint responsibility but the man had control and overall decision making power over the maize. Both were responsible for checking moisture content and cleaning the silos because these were not considered to be difficult tasks. The woman claimed to be responsible for cleaning task because the man did not care about it. Desirable attributes of metal silos that the household was able to enumerate are: (a) opportunity to install in a house to prevent theft (b) protection from weevils and mice and, (c)metal silos were also ideal where a house leaks resulting in maize rotting.

8.4 Group management of an individual's metal silo

During the fieldwork in Mchinji, the research team interviewed a 39 year old Chewa woman named Stella married to 56 year old Ngoni man, in a chitengwa marriage. Stella belongs to an

irrigation scheme club of 21 members of which 15 were from same village and related by blood. The club is led by a committee of 10 of which Stella is a member. In 2010, World Vision distributed 4 metal silos, each with 1,000 kg grain capacity, to four members of the club. Stella was one of the recipients. Although the group used the metal silo, discussions with famers and KIIs referred to the metal silo as Stella's and it was installed within her premises. This contrasts with the case of Mando Cooperative in the same area, discussed in the next section, where the group silos are installed at a community warehouse.

In this arrangement, the metal silos are used in rotation. Two household members of the club use the silo every season and Stella was the first user. Each household is allowed to load maize equivalent to 500 kgs. This is a local arrangement to provide opportunity for all 21 members to use the 4 silos by the end of 3-4 years. Chair of the club has overall responsibility over use of Stella's metal silo while management including security and cleaning is her responsibility. The tone of the focus group discussion suggested that this is not a favoured arrangement and revealed complications and difficulties around management of pooled grain. These complications include quality control, security, and access issues.

8.5 Community management of a metal silo in a 'commercial' setting

Traditionally, ownership and management of post harvest in Malawi is a responsibility of an individual household. Community ownership and management are new approaches that emerged in the mid 1990s promoted mostly by NGOs in response to repeated crop failures due mainly to droughts. Examples are community grain banks/seed banks by Concern Universal in Dedza district in central Malawi from March 1996 to December 2001 or community grain seed banks implemented by the Catholic Development Commission of Malawi (CADECOM) in Dedza district in central Malawi and Mangochi and Chikwawa districts of Southern Malawi. Theoretically community and individual households contribute to the grain bank and access the grain later in times of need at subsidized rates or favorable terms and conditions, repaying in grains. Non-members would access the grain at 'market price'. Also, the theory envisaged local committees managing the storage and transaction activities. Evaluations showed that the community grain banks were a useful innovation that benefited many people in times of food shortage. However, one key challenge in all these schemes related to inability to adhere to quality control and to their sustainability. Members

would access good quality grains but repay with poor quality grains (Tripp and Kambewa, 2001; Maliro and Sibale, 2006).

The development literature on Africa is silent on scalability of community grain banks but this concept/approach seems to enter the development practice from a different non-subsistence perspective. In this section, we discuss community post harvest management of maize from a commercial perspective, represented by a case of Mando Cooperative in Mchinji. The cooperative started in 2008 as a farmer club of 25 members to produce maize for sale, and to enhance marketing capabilities and bargaining power over good prices. In 2010, World Vision provided 4 free metal silos with 750-1,000 kg grain capacity. The government followed with a free donation of a 500 kg grain capacity silo. In 2013, World Vision made a further donation of 15 metallic silos. At the time of the field work in April 2014, the cooperative had 25 metal silos and 52 members, of which women were accounted for about 25 percent. Membership begins at farmer clubs level. In other words, one cannot be member of a cooperative if he/she does not belong to a farmer club in his/her area. One pays a subscription fee to become a member.

The cooperative trades in grains namely maize, groundnuts, common beans, and sunflower but the silos are mostly used for maize. Individual members initially pool their grains at club level which in turn pool at cooperative level. The functioning and sustainability of the cooperative depends on volume of grains handled. This is achieved through additional grains that the cooperative as a group obtains from rented gardens and purchase from other non member farmers as well as surplus from members. An elected executive committee of 9 people provides overall leadership and works successively through a loans recovery sub-committee, a development sub-committee, a finance sub-committee, a marketing sub-committee and a disciplinary sub-committee. To be elected, one had to own shares in the cooperative. It was apparent from the FGDs that by the time shares entitling individuals to become members of the cooperative were being sold, the majority who bought them were men. This should not be surprising as men are more likely than women to access timely information and to have the financial capacity to afford the shares.

Table 11 shows gender distribution of positions in the committees. The information in Table 11 shows low representation of women in the committees. What is observed in Table 11 regarding gender distribution of the positions is, nevertheless, not unique for the Mando

Cooperative. It supports what is already known that even where women's numbers as members of a farmer group may be larger than men's, the most powerful post of chairperson is held by a man except in all women's groups. To the extent that when women do get into leadership positions, the highest they go tends to be as treasurer or secretary. The majority of women have to be content with just being simple members of the group, with elevation to ordinary member of a committee (SACAU 2013).

Table 10: Gender distribution of leadership positions in Mando Coop

Position	Gender of position holder
Main committee	
Chairperson	Male
Vice Chairperson	Male
Secretary	Male
Vice Secretary	Male
Treasurer	Male
Committee members	2 Male and 2 Female
Loan Recovery sub-Committee	
Chairperson	Male
Secretary	Female
Development sub-Committee	
Chairperson	Male
Secretary	Female
Member	Male
Disciplinary sub-Committee	
Chairperson	Female
Vice chairperson	Female
Secretary	Male
Marketing sub-Committee	
Chairperson	Male
Treasurer	Male
Secretary	female
Finance sub-Committee	
Chairperson	Male
Secretary	Female
Committee member	Male

Source: compiled from information discussed with Mando Coop

In terms of management, the grain pooling process begins with famers pooling the grain at club level which in turn pool at cooperative level. A development sub-committee oversees the process to ensure good quality grain is pooled and subsequently manages the stored grain. While the grain is in store, a marketing sub-committee is responsible for identifying markets and bargaining for high prices. Once a market is identified, representatives from various committees meet to approve the identified market and to allow the marketing committee to sell the grains at the agreed terms. The cooperative can decide to sell the grains cheaply to members and surrounding communities when there is critical maize shortage during lean periods of December to March when maize prices in most markets are at the highest. Sales proceeds are shared according to the number of shares a member holds.

Apart from women losing out on shares and influential leadership positions, they also lose out in terms of balance between household food security and commercial objectives in this pooled grain arrangement. In this context, women's chief objective is around maize is to ensure food security while men's objective is cash. Discussions during the fieldwork pointed to circumstances when desperate members, especially women, have had to demand to retrieve maize for food. Given the dominance of male voice in the leadership structures, women suffer silently or otherwise fail to address their unique needs and circumstances. This means is that programming processes need to go beyond looking at gender from a perspective of numbers of men and women in the leadership positions to start to understand the implications for men and women of pooled grain arrangements and women's capacity and voice to influence decisions in their favour.

9. Improved Post Harvest Technology Delivery and Promotion

9.1 Introduction

The discussion in this chapter focuses on delivery and promotion of metal silos and their gender implications. At the time of this study, metal silos could be accessed only from the artisans located at trading centres. The dominant route in which men and women farmers accessed the metal silos was through institutions that engaged and paid the artisans to fabricate the metal silos. The same institutions transported the metal silos to the door steps of the farmers for free distribution. Transporting the metal silos is a delicate process that can result in substantial damage to the metal silos. The artisans priced the metal silos at

MK45,000–MK200,000 depending on grain capacity. This is beyond the affordability of most famers. At household level, managing the metal silo has not been easy. Walls have had to be broken to allow entry of the metal silo into the house for its safe-keeping and that of the maize. Managing maize stored in metal silos that are installed in the house has not been easy in terms of loading because of the height of the metal silos relative to the house. Neither has it been easy to retrieve the maize due to lack of space clearance from the floor to the maize outlet on the metal silo. Lack of transparent section on the metal silo means difficulties to monitor rate of depletion of the stored maize grain. Again, lack of locks on the metal silos means problem to ensure that the maize is not stolen or retrieved anyhow by members of the household. Study respondents stated that these challenges affect women more than they affect men.

9.2 Gender and Improved Technology Delivery – EGSP's Approach

There are currently no known retail outlets for metal silos in the study communities and their surrounding area. The metal silos are fabricated by order or demand by artisans based in trading centres that are located as far as 30 kilometers from where the metal silos are actually needed and used by farmers. It is also discussed that transporting the metal silos is a delicate exercise which can result into unrecoverable damages. It is also discussed that free distributions to individual households and farmer groups by government and NGOs (World Vision) is the main pathway in which the farmers access the technology. Two delivery and distribution routes are followed here. One route is where the institution enters into contract with an artisan to fabricate the needed numbers of metal silos and the institution collects the metal silos from the artisans' workshops for delivery to farmers in the communities. Another route is where the institution distributing the metal silo enters into agreement with an artisan to fabricate the metal silos within the farmers' premises. The first route is mostly followed where the metal silos are to be distributed to individual farmers or farmer clubs. The second route is mostly followed where the metal silos are to be given to cooperatives since most cooperatives conduct their businesses in community trading centres that have access to grid power or electricity.

Progress reports from the Ministry of Agriculture show that by June 2014, through ESGP, 72 artisans had been on metal Silo Fabrication and Management (28 in EGSP I and 44 in EGSP II). Of the 72 artisans trained, 11 were women representing 15.3 per cent (Haraman, 2014). It

was apparent from discussions with EGSP partners and artisans during the fieldwork that the female artisans were not active because of the 'masculine' nature of the fabrication work. In this study, we interviewed 5 artisans at their workshops to understand various aspects around metal silo fabrication business.

Description of what was involved in the metal silo fabrication work varied from artisan to artisan. Major stages include mobilizing materials (metal sheets), cutting three pieces of metal sheets (e.g. 110 cm each), joining the three pieces into one long sheet ('mat'), measuring the top and bottom sides of the joined metal sheet to ensure equal diameter, folding round the metal sheet and to join the two ends by soldering, setting an inlet for top metal sheet and also an outlet before welding. Once the metal silo is fabricated, 2-3 burning candles are placed inside the metal silo to check presence of oxygen. If the candles blow out then the metal silo is well fabricated. Key considerations when fabricating the metal silos, and hence the price charged, are the availability of materials, cost of materials and size of the silos. On average an artisan has fabricated no more than 5 silos in a year for sale on his own. Most silos have been fabricated as a group of artisans under contract mostly to CIMMYT, World Vision and the government. As indicated in the previous discussions most silos are of grain capacity 500 kgs, 900 kgs, 1,500 kgs and 3000 kgs selling at MK45,000, MK75,000, MK120,000 and MK200,000 respectively but some artisans claimed to have fabricated silos of 5000 kgs capacity. According to the male artisans interviewed, only men are involved in these activities due to 'technical' nature of the work that is suitable for males. They held the view that the only time women were involved was when loading of maize into the silo and when cleaning the silos at household level.

During the study, one female artisan who had been trained in Mchinji but normally resided in Balaka district in southern Malawi was visited. It was apparent from discussions with the female artisans that other factors and not the masculine nature of the work contributed to non-activeness in the metal silo business despite the training. In her case, she is a qualified carpenter and manages a carpentry business in Balaka. She attended the metal silo fabrication because she was identified by one of the lead artisans not because of her personal interest or prior expertise in metal fabrication but because they were family friends. She admitted that beyond or after the training, she had never practiced metal silo fabrication and management. We nevertheless asked about her experiences during the training that was held in Mchinji. The

only challenge she could recall as a woman's issue is the inability of women to climb a raised platform in order to weld the top part of the metal silo. Women had to over-stretch their legs (*kukhanyula miyendo*) in the presence of men which is not acceptable in the Malawi culture. This has implications for men and women in terms of how to organize suitable training and workshop environments. We now turn to the 5 male artisans that were interviewed for this study – 3 in Mchinji and 2 in Lilongwe. Table 12 presents summary of the history and profile of their fabrication business.

Many training institutions in Malawi offer technical training to artisans under the regulatory oversight of the Technical, Vocational Entrepreneurial Training Authority (TEVETA). The metal silo artisans in EGSP were trained at government run technical colleges in Mzuzu, Lilongwe and Salima and awarded certificates. Of course, some artisans expressed need for refresher courses and advanced courses in metal silo fabrications. Others prefer training in maize mill fabrication and business management. Most artisans had heard about gender but none had undergone any gender training. One artisan claimed to have attended master technical trainers course together with females and in turn trained male and female youth on metal fabrication under the sponsorship of the Ministry of Agriculture. He interpreted this to be gender mainstreaming.

As summarised in Table 12, the artisans had 5-30 years of experience in welding and fabrication. Their education levels ranged from 6 years of primary to 4 years of secondary education. Their experience in metal silo fabrication ranged from 3-7 years. Most were trained in during the FAO project period (2007-2009) and continued to be trained during subsequent projects (e.g. World Vision, EGSP). These institutions were also major buyers and acted as big motivators for artisans to embrace metal silos into their fabrication businesses. Only one artisan did not find fabrication more lucrative preferring farming business.

In addition to reducing post harvest grain losses, the metal silos can be a good business for the artisans (CIMMYT/SDC 2011). This may be the case where a vibrant market for the metal silos exists. To the extent that institutions are not able or willing to promote metal silos by giving deliberate big contracts to the trained metal silo fabricators, metal silo fabrication may not a worthy undertaking. For the artisans, quick money and easy to sell products are key reasons to remain in the fabrication business. Their normal business focus, variably, is general

welding services, door and window frames, ox carts, stoves, tins which easily sell. Others are also engaged in fabricating maize mills, gates and child care facilities (e.g. swings). In Malawi, it is a legal requirement to register a business with the Registrar of Businesses based in Blantyre in southern Malawi. Many small scale businesses find problems registering and often lose out in large contracts where legal status of the business is a strict requirement.

Table 11: Summarized profiles of the metal silo artisans interviewed

Profile Aspect	Mchinji Artisan 1	Mchinji Artisan 2	Mchinji Artisan 3	Lilongwe Artisan 1	Lilongwe Artisan 2
Age	46	33	52	41	45
Highest education	6 yrs primary	2 Yrs secondary	4 Yrs secondary	4 Yrs secondary	2 Yrs secondary
Yrs in Metal Fabrication	30	11	16	11	5
Yrs in Metal Silo	7	7	7	7	3
Who motivated you into silos?	FAO	Ministry Agric	Brother – trained engineer	Ministry of Agric	EGSP
Workshop ownership	Owned	Owned	Rented	Owned	Rented
Legal status of business	Not registered	Registered – District Council	Registered – District Council	Registered – Registrar of Businesses (Blantyre)	Not registered
Employed staff	3	1 – brother	2	3	Works alone
Other businesses	Bar, Drilling wells, Borehole installation	Rent out 3 rooms but fabrication more money	Used to own car/taxi but stopped	Minibus but fabrication higher income	Farming - more money
Products fabricated other than metal silos	General welding	Door/window frames	Welding services, Products - Ox carts, Maize mills, window frames	Door and window frames, Stoves, tins, gates, child care facilities	Tins, pots
Major customers	Individuals from Zambia, Mozambique and locals Men- cars, ox carts, maize mills Women- borehole repairs, child care facilities	Individuals for door/window frames Institutions for metal silos	¾ are Farmers from nearby villages Civil servants NGOs e.g. World Vision, Mostly men but women for window frames	Mostly men Equal demand by rural and urban customers	Individuals
Major markets outlets	Workshop & elsewhere on demand	Window/door frames mainly on demand Silos by coops/institutions	Workshop	Workshop	Surrounding villages
Metal silos fabricated	100+ (in a group of artisans) of which 19 were for World Vision; 2 to individuals	36	50 (in a group of artisans) to World Vision; 5 to individuals	10 to individuals; 266 (in a group of artisans) for World Vision	103 (in a group of artisans)

We now turn to factors that are critical in dissemination, promotion and marketing of metal silos as discussed with the artisans and summarized in Table 13. The reason for artisans to engage in metal fabrication is to make quick money through products that easily sell. For the metal silo, the market is not yet developed despite emerging interest among farmers. Many farmers want to buy on credit which the artisans not willing to do because they would be out of business. The metal silo fabrication business also requires heavy capital outlay which many artisans cannot afford. The availability of relatively cheap storage facilities e.g. sacks means few farmers can buy the relatively more expensive metal silos. These act as key limitations to the success of the metal silo side of the fabrication business. To succeed, the artisans suggested more and relevant training in welding and building strong partnership with institutions that promote improved post harvest management.

On which gender category of farmers were likely to adopt the metal silos, consensus from the artisans suggests that women are more likely than men and the youth to adopt metal silos. More women than men seem interested in metal silos because the metal silos are mostly used to store maize that women have a more passionate stake in than men. Most men have little interest or concern about the storage of food maize. These views on adoption contrast with what was actually observed and discussed with the famers as FGDs and case study adopter households as earlier discussed. Men were mostly likely to adopt because of the emerging interest in maize as source of income, the role and place of metal silo in household assets given its value, and more awareness of the technology and its management compared to women due to exposure to information and training. Of course, the artisans identified a cost as major limitation to adoption by both men and women but it is of a particular concern to women. Traditionally, women depend on men to finance such costs. Some artisans held the view that the youth were unlikely to adopt because storage of food maize was not their priority. Earlier, we presented a case of a youth aged 25 years who owned 5 metal silos store maize for the market. For the future of metal silos in Malawi, the artisans suggested the following: NGOs to support promotion and distribution and the government to establish loan schemes for artisans, to remove tax on raw materials, to act as a strong bridge between artisans and farmers, to subsidize the cost of the metal silos and to promote marketing e.g. through the Agricultural Development and Marketing Corporation (ADMARC).

Table 12: Summary of factors for success of metal silo business – an artisan perspective

Metal silo aspect /Name of Artisan	Mchinji Artisan 1	Mchinji Artisan 2	Mchinji Artisan 3	Lilongwe Artisan 1
Major challenge of metal silo business	Market not yet developed despite emerging interest in silos Artisans not willing to sell on credit	Heavy capital requirements	Availability of relatively cheap storage facilities e.g. sacks	Materials for fabrication expensive
Key factor for success as metal silo artisan		Training in welding		Partnership with institutions
Ranking men, women and youth in adopting silos	More women than men seem interested in metal silos	Women early adopters, men follow and youth never		More women than men
Major constraint to men adopting metal silos	Cost	Most men little concern about food storage		Cost
Major constraint to women adopting metal silos	Cost especially where depend on men to finance	Cost Lack of awareness		Cost
Major constraint to youth adopting metal silos		Never think much about food storage		Cost
Ideas to make metal silo technology better		NGOs to support promotion and distribution	Govt loan schemes for artisans Govt to be strong bridge between artisans and farmers	Govt to remove tax on materials Govt to subsidize poor farmers Govt to help with promotion e.g. through ADMARC

9.3 Institutional and staff gender capacity and implications for EGSP activities

In the EGSP project, institutional efforts around gender have not gone beyond numbers of men and women to start understanding the implications for men and women of each and every step and process in the project. For example, the project trained 11 female artisans but none is known to have ever practised after the training. Unlike the male artisans, female artisans had no prior experience in metal fabrication. Measures of tracking female artisans to understand their circumstances and to draw lessons for future training might be achieved if gender mainstreaming is seriously considered. In particular, these female artisans needed special strategic support to get established and to remain in the metal fabrication business with a focus on metal silos. This section is devoted to issues around institutional gender capacity, staff capacity and knowledge of gender issues in PHM and gender budgeting, based on what was discussed and observed during the field consultations.

In Malawi key partners in the project are Ministry of Agriculture, Mchinji World Vision and Somebody Cares Ministry in Lilongwe. The Crops Protection Unit in the Ministry of Agriculture coordinates EGSP activities while a Post Harvest Management Unit at Chitedze research station is responsible for on-farm demonstrations and evaluation. Few staff in the Ministry are actively involved in the project, one each in the Crops Protection Unit and the Post Harvest Management Unit while at district level, the Crops Section in the District Agriculture Office leads the process working successively through AEDC at EPA level and AEDOs at Section level. The coverage of EGSP II is Mkanda, Chioshya and Mikundi Extension Planning Areas (EPAs) in Mchinji district and Chitekwele, Chigonthi and Malingunde EPAs in Lilongwe district.

The Ministry of Agriculture in Malawi has a fully fledged department responsible for gender mainstreaming in the agriculture sector. The Ministry developed an Agriculture Sector Gender, HIV and AIDS Strategy 2012 – 2017 to systematically guide the gender mainstreaming effort (Government of Malawi/FAO, 2012). In particular, the Ministry has an Agriculture Sector Wide Approach (ASWAP) which represents the national agriculture investment plan with specific budget allocation to gender activities. Activities under the gender mainstreaming budgets include promoting the transfer and adoption of improved technologies (Government of Malawi 2010). These policy frameworks provide an opportunity for post harvest management activities to integrate and budget for gender. Based on what was

discussed with staff in the Ministry of Agriculture who closely followed activities of EGSP, this opportunity has been lost. The main challenge was the inability of the programme staff involved in EGSP activities to interpret, adapt and apply the gender policy provisions to their contexts in EGSP.

World Vision International (WVI) is a Christian relief, development and advocacy organization dedicated to working with children, families and communities to overcome poverty and injustice through improved access to health and nutrition, improved food security, improved access to education, and improved prevention and mitigation of the impact of HIV and AIDS. In Malawi, World Vision International with a head office in Lilongwe operates in a number of districts across the country but for the purpose of the EGSP, the Mchinji district office is the most relevant. Mchinji WVI cluster manager and two male field development facilitators are actively involved in metal silo activities. Mchinji WVI has pursued a group approach to dissemination and promotion of metal silos. In EGSP (I & II), WVI worked with a farmer cooperative called Mando Producers and Traders Cooperative in Mlonyeni EPA. In Msitu EPA, Mchinji on its own promotes metal silos through Bua and Tete Traders. Like in the case of Ministry of Agriculture, World Vision in Malawi has very good gender policy framework and a pool of gender expertise which is yet to be explored in issues of promotion and management of post harvest management.

In Lilongwe district, EGSP II has partnered with a faith based organization called Somebody Cares Ministry. This is a new organization established in the country in 2003 with particular focus on HIV/AIDS to address social injustice and upholds the dignity and rights of individuals living or affected by HIV/AIDS. The organization works with 28 communities in 5 traditional areas of Kabudula, Kalomo, Njewa, Chitukula and Mtema but the focus in the EGSP II is in three communities of Mandala, Chitimba and Ngwangwa where it runs a Nkhokwe (Silo) Project, covering about 80 farmers in groups of 10, most members being women (about 75 per cent). In food security and HIV/AIDS, a default structure for delivery of EGSP activities, Somebody Cares Ministry works with village committees in which 50:50 gender representations is emphasized. Based on fieldwork discussions, however, in reality most committees are dominated by women due to the nature of the activities (food security and HIV/AIDS). At the time of fieldwork for this study, EGSP activities had just started in form of awareness and promotion of the metal silos. Somebody Cares Ministry did not have a

gender policy but reported having provided gender training to staff. According to Somebody Cares Ministry, early signals suggested that adult men and women in the project sites preferred traditional post harvest technologies while youth preferred metal silos. For this reason, Somebody Cares Ministry emphasized the training of the youth to become metal silo artisans.

9. Summary of major findings and conclusions

Efforts in improved maize storage technologies in Malawi in the last ten years focussed on metal silo technology that was initially introduced by FAO and later popularised by government and NGOs with the support of CIMMYT's EGSP. The metal silo technology in Malawi and elsewhere demonstrated actual and potential benefits in terms of not only reduction in post-harvest losses and enhanced food security on the part of the adopting farmers but also job creation and income enhancement on the part of the business operators especially artisans.

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

This study revealed the difficulty of designing and managing an improved storage technology for maize that is poor friendly and gender responsive, and offers insights as to which category of farmers the metal silo technology is most relevant. The metal silo in local language is

known as *nkhokwe za chitsulo*. The term *nkhokwe* in Malawi refers to traditional granaries made from bamboo. Other versions of *nkhokwe* are made from tree poles or grass. By nature of the materials used, nkhokwes are less costly to construct or acquire and are of seasonal use. Historically, nkhokwe is located outside the house but close enough for keeping guard especially at night. Nkhokwes are historically associated with storage of husked local maize for food purposes, from the time of harvest around April until the maize is depleted or the next harvest. The management of food maize in nkhokwes and its subsequent food use related activities are traditionally a woman's responsibility and control.

Maize in Lilongwe and Mchinji districts is historically a household food security crop in which both men and women jointly participate to produce. For cash, men historically depended on tobacco while women depended on groundnuts to meet small household cash needs. Declining tobacco profitability in recent years resulted in men exploring alternative cash crops. This is occurring at a time when government, ICRISAT, NASFAM and other NGOs are supporting the groundnut economy culminating in a vibrant groundnut value chain. The outcome of this is a male take-over bid on the women's groundnut economy. The maize sector has seen increased production of hybrid maize by men for sale. This development has also been accompanied by increased men's responsibility and control over maize. Contrary to the tradition, husked maize is now managed by women in nkhokwes for 1-3 months. Then it is retrieved, de-husked, shelled, applied with chemicals such as actellic dust and bagged for storage in the house, ready for sale. Security breakdown in the communities and decline in local maize means that maize is no longer stored outside in nkhokwes for extended period. In the longest pathway, women now manage the maize for 1-3 months in the nkhokwes while men manage the bagged maize and control its use and proceeds from the sale.

Lilongwe and Mchinji districts where the EGSP is operating are traditionally *Chewa* culture. Historically, the Chewa family system is supposed to be strictly chikamwini which places considerable emphasis on the woman's right and the husband's subordination to the wife's kin, and the importance of female children as future reproducers of the lineage and inheritress of property. The intrusion of patrilineal peoples like the Ngoni in Mchinji has increased the incidence of patrilineal descent leading to proliferation of chitengwa system. Other changes of the Chewa system are linked to certain religious teachings and changing modern lifestyles. The implication for technology adoption is that while women can be expected to adopt, own

and control improved technologies such as metal silos, these factors act in favour of men. While women in the communities visited continued to exercise interest and control of post harvest management of maize in traditional storage systems (nkhokwe) for household food purposes, men exercise and control storage of maize in bags for marketing purposes.

By virtue of its cost and economic value, a metal silo occupies a precious space in a household asset economy in the chitengwa communities visited in Mchinji and Lilongwe districts. Given that men also own and control big household assets of which metal silos qualify to be one such household asset, the introduction of the metal silos that has occurred at the time men are increasingly switching to maize production for cash in a way means gradual loss of women's traditional responsibility over management of stored maize.

Turning specifically to the design features, women prefer shorter but large metal silos but then this poses a new challenge if other social cultural issues are brought into consideration. For security reasons, most metal silos are installed inside a house. Most structures that are called houses in rural Malawi are temporary in nature and can barely accommodate a double bed (most sleep on mats). Installing a metal silo has been a great challenge and inconvenience as walls are broken to allow entry of the metal silo. Some farmers felt that the capacity of metal silos currently available in the country were too small for their maize harvest. Design features that farmers, particularly women, would like the designs to consider include (a) flexible size and capacity to suit farmer demand, (b) stand/legs or raised outlet for easy retrieval of the grain, (c) provision for locks for security and (d) a transparent section for monitoring maize quantities in the silo.

So far, farming communities visited in Lilongwe and Mchinji districts accessed the metal silos at no cost from organisations that also deliver the metal silos at their door-steps. At minimum, a metal silo costs MK45, 000 which is beyond financial capacity of most farmers especially women. A most recent full household income and expenditure survey in Malawi conducted in 2010-11, rural poverty is estimated at 56.6 per and urban poverty at 17.3 percent, and the rural poor corresponds to over 95 per cent of all poor people in Malawi. The survey reveals that 55 percent of people in male-headed households in the rural areas are poor as compared to 63 percent of rural people who reside in female-headed households. In this survey, a population is deemed poor if its total consumption is below MK37, 002 (USD 92.5) per annum. Thus, most individual buyers of the metal silos in Malawi are relatively rich urban

dwellers who are part time farmers or for their farmer-relatives in the rural areas. This raises a question as to who really is suitable to adopt and use the metal silo technology. What is emerging from this study is that a metal silo design that is gender responsive and poor friendly may not be inconceivable but practically unusual. Nevertheless, innovative ways of lowering the cost would represent a useful strategy engaging the rural poor to acquire the metal silos on their own without the need to wait for free donations, which in the communities visited are largely group-oriented.

Artisans that fabricate the metal silos are located in local trading centres with access to electricity but as far as 30 kilometers from where the metal silos are actually used by farmers. To women, the distance is a constraint. In addition, transporting a metal silo is a delicate process that can result in substantial damage. Local agro-dealers may be willing to stock the metal silos in the communities but issues of their profitability and space require careful consideration.

The agriculture sector in Malawi has very good gender policies and strategies and a pool of gender expertise. This includes a fully fledged department responsible for gender mainstreaming in the agriculture sector, an Agriculture Sector Gender, HIV and AIDS Strategy 2012 – 2017 and a gender responsive Agriculture Sector Wide Approach (ASWAP) with specific budget allocation framework for gender activities. This opportunity seems to have been lost in EGSP due to the inability of the programme staff to interpret and apply these various gender instruments in the programming and management of EGSP activities. Future gender strategy in post harvest management there is need to place more emphasis on training for agricultural and gender policy analysis, advocacy and lobbying within the EGSP implementing organizations.

10. Suggestions for a future strategy for Post-Harvest Management

Based on findings and conclusions of this study, a future gender programme strategy in EGSP should go beyond looking at gender from a perspective of numbers of men and women who have adopted the metal silo and other improved technologies to start to understand the implications of each and every step in the policies, procedures and practices and their impacts. For example, what does it mean if a shorter but larger metal silo is provided to a married woman to help sustain her traditional role in management of food maize? Or what are the

implications for men and women if a committee managing a community metal silo storage facility comprises men or women only?

The presence and functioning of clear policy guidelines and their implementation plans would also be useful to systematically track down the gender outcomes. The potential challenge in EGSP is that it is difficult to ensure achievements of desired gender outcomes in the absence of clear gender policy and guidelines. Similarly, an effective gender strategy requires the presence of a proper and functioning gender monitoring system to track progress that is being made and address challenges that are being encountered. It is discussed in the earlier section of this report that a number of women were trained as artisans but none are practicing. A strong gender monitoring system could have identified and helped to address specific challenges that the women artisans were experiencing.

(a) Technology Development – Artisans

Foregoing sections of this report revealed that a metal silo design that is gender responsive and poor friendly may not be inconceivable but practically unusual because the technical requirements of such a technology may not be easily balanced against socio-economic requirements of the users. What is required in the technology development is to exercise a degree of flexibility where possible to focus on demand-driven technology and not supply led technology. Artisans must be trained to understand and interpret demands and requirements of potential users and consider them into technical design of the technology. For example, many users want a metal silo with legs/stands which fabricators should be able to take into account while simultaneously taking into account the cost structures of different requirements.

(b) Technology promotion, delivery and marketing issues

The promotion of the technologies through government structures of agricultural extension and through radios has been effective in creating awareness of the metal silo technology among men and women in Malawi and could form a major focus in EGSP. However, the limited awareness and inaccessibility of the metal silo distribution channels remains a challenge. The most popular distribution channels in Malawi are community distribution through NGOs or government agriculture structures. Individuals acquire the technology directly from the artisans but it is possible many would acquire the metal silos if the were distribution channels in the communities. For example, Malawi has a network of agro-dealers

(e.g. Famers World, ADMARC, Agora, etc) that market farm inputs and implements where farmers are. Engaging such agro-dealer networks to promote and market improved storage technologies would represent an effective mechanism for reaching individual farmers who can afford to buy metal silos. However, issues of business viability and space require careful consideration to stimulate sustained interest and capacity in the agro-dealers.

(c) Government policy

Malawi has good gender policies and strategies in the agriculture sector although they fail to find rightful application in programmes such as the EGSP due to the inability of staff to interpret, understand and apply in their specific programming context. Future EGSP can place greater emphasis on training for agricultural and gender policy analysis and gender programming within the EGSP implementing organizations.

Turning to specific policy issues, issues of improved post management technologies were implemented as matters of presidential directives and not institutionalised agricultural policy. In the process, issues of improved post management technologies do not have proper policy space and budgets within the national agriculture framework. There are cases when metal silo programmes enjoyed government support and resources and there have been times the when government has taken a back seat waiting for development partners and research institutions to lead and fund programmes in improved post harvest management technologies. Placing significant emphasis on policy advocacy in the future EGSP strategy would help improved post harvest management technologies to find rightful space in the agricultural policy and budgeting framework in Malawi

(d) Research

Data from this study supports that metal silo technology is effective in food security reducing loss of grain during storage, and improving distribution and marketing of the grains to take advantage of high prices during food deficit chains. Further, evidence from this study suggests that metal silos can potentially improve income generation for artisans. But, this study also reveals the need for designers and promoters of improved post harvest storage technologies to understand not only technical aspects of the technologies but also the wider socio-economic environment, including gender, in which different storage technologies including metal silos operate. Future strategy in EGSP can therefore focus on gender and

socio-economic research around adoption, cost and impact of the improved technologies. Special emphasis should be placed on understanding environment in which different women (e.g. female heads, women in male headed households or women in polygamous households) operate and their needs.

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