

**A GENDER ANALYSIS OF CROP VALUE CHAINS IN CHAMWINO AND
KILOSA DISTRICTS, TANZANIA**

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**A THESIS SUBMITTED IN FULFILMENT OF THE REQUIREMENTS FOR
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EXTENDED ABSTRACT

Gender issues fundamentally shape the totality of production, distribution, and consumption within an economy but have often been overlooked in value chain development. The current study adopted a cross-sectional study design and was carried out in Chamwino and Kilosa districts. The study's overall objective was to undertake a gendered analysis in investigating smallholder farmers' participation in the crop value chains, in Chamwino and Kilosa Districts in Tanzania. Specifically, it aimed at analyzing the influence of gender roles in upgrading strategies on multiple-commodity food value chains, assessing the gendered impact on food securing upgrading strategies using different gender tools, analysing gender in asset ownership and participation in market oriented crop value chains and determining pathways of addressing gender based constrains for equitable and sustainable participation in profitable crop value chains. The selection of the study sites was based on their agro-ecological characteristics, a balance of matrilineal and patrilineal societies, levels of food crop commercialization, availability of infrastructure, and accessibility to regional thus enabling a good comparison all together. Data were collected using a structured questionnaire from 600 randomly selected households and complemented with focus group discussions and key informants interviews. The sampling involved purposive sampling techniques. In the analysis the influence of gender roles in upgrading strategies on multiple-commodity food value chains were computed. The findings show that crops commonly grown in the two study districts are maize (*Zea mays*) and sesame (*Sesamum indicum*) are widely grown in Kilosa, while bulrush millet and groundnut are grown in Chamwino, 50% of these crops produced are sold. The results show that in Kilosa there was no difference between men and women in relation to upgrading strategies related to natural resources, in contrast to Chamwino District where a statistical difference between male and female farmers was

observed. The results further show that female farmers in Chamwino are more concerned about processing and storage, with more than 50% of female farmers indicating processing and storage to be a problem compared to 26% of male farmers, implying that women in Chamwino are highly involved with processing and storage tasks or are more affected by processing and storage constraints than men. A closer look at the three value chain nodes (production, processing and marketing) shows that the main constraints relate to natural resources and production. Between 76% and 95% of the respondents indicated these as leading concern, followed by processing between 20% and 53% and lastly, the marketing node between 28% and 37%. The study concludes that gender difference in the choices of crops is associated with the impact and role of the particular crop on the respective gender, for example cash crop or food crop. The study further concludes that women and youth in both regions are the ones heavily involved in the lower end of value chain components such as production, processing and storage. The study further concludes that there is a strong association between MHH and FHH asset ownership and food crop commercialization and that although asset ownership is crucial, but not all assets serve the same purpose or same importance. On removing GBC the study concludes that the intention to remove GBC in value chain is iterative since most GBC involves multiple factors, therefore it is important to identify context specific strategies to ensure that the GBC are addressed. Lastly it can be concluded that both male and female headed households are forced into food crop commercialization due to wealth situation. At the household level, men are recommended to recognize how women are burdened by the activities in the household and create a better chance for women to participate in value chain activities by allowing them to make choices on their preferred crop and to take part in the decision making. The present study further recommends the Local Government Authority and project planners to consider youth as a gender group with the potential to drive the economic development through crop commercialization. The Local Government

Authority and the MHH should consider gender aspects on matters concerning land ownership because it hinders effective participation.

DECLARATION

I, Tatu Said Mnimbo, do hereby declare to the Senate of Sokoine University of Agriculture that, this thesis is my own original work, done within the period of registration and that it has neither been submitted nor being concurrently submitted in any other institution.

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DEDICATION

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LIST OF ABBREVIATIONS AND ACRONYMS

ASDP	Agricultural Sector Development Programme
BMBF	The Germany Federal Ministry of Education and Research
BMZ	Federal Ministry for Economic Cooperation and Development
CCI	Crop Commercialization Index
CCT	Christian Council of Tanzania
CSSH	College of Social Sciences and Humanities
DPPM	Department of Policy Planning and Management
FAO	Food and Agriculture Organisation
FGD	Focus Group Discussion
FHH	Female Headed Household
FoPIA	Framework for Participatory Impact Assessment
FVC	Food Value Chain
GAM	Gender Analysis Matrix
GBC	Gender Based Constraints
GDP	Gross Domestic Product
GSVCF	Gender-Sensitive Value Chain Framework
GVP	Gross Value of crop Produced
GVS	Gross Value of crop Sold
HCI	Household Commercialization Index
IFAD	International Fund for Agriculture Development
LGA	Local Government Authority
MAFAP	Monitoring African Food and Agricultural Policies
MHH	Male Headed Household

MPE	Marxist Political Economy
NBS	National Bureau of Statistics
NSG	National Strategy for Gender Development
PCA	Principle Component Analysis
RWH	Rain Water Harvest
Scala-FS	Scaling up expert based assessment food security tool
SDG	Sustainable Development Goal
SLF	Sustainable Livelihood Framework
SPSS	Statistical Package for Social Science
SUA	Sokoine University of Agriculture
TAFSIP	Tanzania Agriculture and Food Security Investment Plan
UNEP	United Nations Environment Programme
UPS	Upgrading strategies
URT	United Republic of Tanzani
USAID	United State Agency for International Development
VCA	Value Chain Analysis

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background Information

Agriculture can be the engine of growth and is necessary for reducing poverty and food insecurity, particularly in sub-Saharan Africa (IFAD, 2001; World Bank, 2007). In Tanzania, agriculture is the dominant sector and a foundation of the country's economy contributing significantly to employment, food production, export, and socio-economic development. Agriculture is a source of livelihood for three quarters of the population, 74.4 % of the households (NBS, 2014). Despite the abundance of unutilized land, small-scale subsistence farmers dominate the agricultural sector in Tanzania. Farmers cultivate farm plots of 2.6 hectares on average, and 85 percent of the farmers own less than 4 hectares of land (NBS, 2014). The vast majority are engaged in sole subsistence farming with just one third of the farmers selling at least some of their production (Kimani and Ruigu, 2017). It is now accepted by many studies and organizations that agriculture is the only realistic driver to reduce mass poverty and develop rural areas in most developing countries (Nakazibwe *et al.*, 2014). Therefore, understanding the dynamics of change in agriculture is crucial to better position the sector for faster growth and sustained development, which is vital for food and livelihoods security.

Generally, most of the development inequalities emerge from gender differences, such as ownership of productive resources or unequal participation (White *et al.*, 2016). These differences in particular affect the distribution of resources between men and women, and are caused by ideological, economic, ethnic, social and religious factors (Sheskin *et al.*, 2016). Hence, gender consideration as a determinant that influences development results particularly, in relation to poverty reduction and food security is

necessary (Frison *et al.*, 2011). In Africa, as elsewhere, both development interventions and research approaches have often adopted a value chain approach in many sectors, including agriculture (Lopez-Gonzalez and Kowalski, 2017). Since most Africans are engaged in agriculture for food security, then one of the most relevant value chains is that related to food.

Food value chains (FVCs) comprise all the activities necessary to bring farm products to consumers, while value chain analysis considers linkages between participating actors (including farmers) and examines how food moves along the chain (Gomez and Ricketts, 2013). The current concept of a value chain is based on a single commodity; however there is a need for a holistic value chain analysis (Neven, 2014; Mango *et al.*, 2017). Households simultaneously participate in multiple value chains and there is interdependence between the various value chains in which farmers participate, for resources such as labour (Neven, 2014). For example, the decision to apply fertilizer in a mixed cropping farming system affects the primary crop, but also all other crops grown in the same field. Therefore, researchers have considered it important to address rural-based multi-commodity food value chains (Goss *et al.*, 2000; Young *et al.*, 2002 and Quisumbing, 2010). Literature shows that women's participation in crop value chains is limited by their low levels of education, access to extension, credit, village markets and improved agricultural technologies (Gondwe *et al.*, 2017). Therefore it is important to study value chain participation of men and women as where and how men and women participate in the chains determines the extent to which they benefit. With regard to chain participation, the factors that determine what benefits accrue to household members through involvement in economic activities operate both within the household and within the value chain itself (Zakaria, 2017). At the chain level, the highest returns are enjoyed by individuals who can access the most lucrative functions (Coles and Mitchell, 2011).

The majority of farmers in rural areas of Tanzania practice mixed cropping, for example, the mixing of maize and pigeon peas, or the mixing of pearl-millet and sunflower in the same field (Tengo and Belfrage, 2004; Mrema *et al.*, 2017). Furthermore, most of what farmers grow is consumed within the household, which implies that the rural food value chains are short (Bloom and Hinrichs, 2011; Neven, 2014). Generally, there is interdependence between different agricultural activities (e.g. land tilling, weeding, harvesting) and nodes (market, production and processing) (Mitchell *et al.*, 2009; Tsikata and Yaro, 2014). Therefore, there was a need for a study on multi-commodity value chains to cover this interdependence (Rosegrant *et al.*, 2012). The current study focuses on multi-commodity value chain analysis in semi-arid and sub-humid agro-ecological zones.

At a general global level, value chain analysis focuses on the movement of goods and the vertical relationships between consumers and producers (Lecoutere *et al.*, 2015). However, in the context of sustainable FVCs in rural areas of sub-Saharan Africa, there is a need for attention on and analysis of the horizontal relationships between actors in the chain (Norell *et al.*, 2016; Khanna *et al.*, 2017). According to Quisumbing *et al.* (2015) horizontal elements include gender, poverty, labour, and the environment. Other studies (e.g. Barrientos *et al.*, 2010; Fontana, 2011) show that in the context of rural FVCs, gender, poverty, labour and the environment are intertwined. In the current study, three gender groups (men, women and youth) are of primary concern.

Gender is one of the important components of sustainable development, involving participation of men and women in the whole process of development (Thow *et al.*, 2017). According to Bolwig *et al.* (2010), there is limited literature linking food value chains and gender, with most value chain gender studies focusing on the horticultural

sector. Traditionally, value chain interventions tend to focus more on value addition by upstream actors, paying less attention on gender. Moreover, during the identification of interventions, consultative sessions are normally not disaggregated by gender (Neven, 2014). However, Tsikata and Yaro (2014) argue that value chain interventions and upgrading strategies that do not consider gender relations are more likely to negatively impact women and youth. Sex and age play a key role as they determine the type of economic activities a household undertakes (Bolwig *et al.*, 2010).

Tanzania's National Strategy for Gender Development (NSGD), describes twenty (20) major areas of gender concerns. These include: institutional framework, decision-making and power, legal and human rights, education, economic empowerment, and access and ownership of resources (URT, 2010). This implies that more interventions are still required to ensure that women farmers are equal partners with men farmers in making a contribution that will transform agriculture therefore, contributing to the country's GDP (Gondwe *et al.*, 2017).

In the current study context, upgrading strategies (UPS) are defined as a set of good practices for securing food at the local to regional level. UPS may, for instance, target increased agricultural productivity (Bwalya and Friedrich 2002; Foley *et al.*, 2011), reduced post-harvest losses (Kumar *et al.*, 2005; Leuenberger and Wohlgemuth, 2006), reduced energy consumption using improved cook stoves (Adkins *et al.*, 2010), and enhanced economic and institutional mechanisms such as investment incentives, trade securities, and policies (Barrett *et al.*, 2000; IFAD 2008 and FAO, 2012).

In rural food value chains, the issue of upgrading strategies encompasses value addition but it also needs to address food security and the sustainable management of natural

resources, especially, soils, water, and forests (Neven 2014; Graef *et al.*, 2014). According to Riisgaard *et al.* (2010:196), upgrading is a “*desirable change in participation that increases rewards and/or reduces exposure to risk where rewards and risks are understood both in financial terms and with regard to outcomes related to poverty, gender and the environment.*” Neven (2014) refers to the three areas of outcomes as a triple bottom-line (economic, social and environment) and argues that there is a need for more research on value chains in order to extend the definition of upgrading strategies to include the important issue of the development of sustainable food value chains. Kaplinsky and Morris (2001) identify four types of upgrading, involving process, product, function, and chain. Herr and Muzira (2009) and Mitchell *et al.* (2009) consider horizontal coordination, vertical coordination, and enabling environment as additional types of upgrading strategies. However, gender related issues, which in value chain analysis are considered under horizontal coordination, are often overlooked (Quisumbing, 2011). In the triple bottom-line, gender is contained within social related outcomes. The triple-bottom line refers to the three areas of outcomes (economic, social and environment) (Neven, 2014).

1.1.1 Agricultural value chain Kilosa and Chamwino

1.1.1.1 Gender and food security

In Tanzania, food insecurity is one of the focal national issues in Tanzania (Knueppel *et al.*, 2010). The Tanzanian government has adopted the Agricultural Sector Development Programme (ASDP) and the current agricultural development initiative ‘*Kilimo Kwanza*’ (Agriculture first). These programmes address the challenges such as food insecurity, the patriarchal system, the customs, and the traditions that discriminate against women thus perpetuating gender inequalities (URT, 2015). In Tanzania, despite constitutional proclamations of gender equality and many laws that promote equal opportunities for

both men and women it remains that for both smallholder farms and large plantations, men and women carry out different types of work, have different preferences and are unequally rewarded for their contributions to the agricultural system (Rubin, 2010; Blacker, 2017). The international community currently lacks consensus about the criteria that are needed to properly evaluate food security at the household level (Carletto *et al.*, 2013). Several authors argue that a fixed set of criteria would be inappropriate to describe unique and complex systems and that food security criteria must be locally specific and relevant (López-Ridaura *et al.*, 2002; Bell and Morse 2008; Cosyns *et al.*, 2013; Agol *et al.*, 2014).

The relationship between gender and food security is undeniable and of utmost importance. The double standard, which affects women's status and their role in agriculture, in fact, gender inequity and the underestimated capacities of women are the most significant obstacles to social and economic development (Gaanderse, 2010). The concept of food security includes both physical and economic access to address people's needs and preferences. The three main pillars towards ensuring food security are food availability, food access, and food utilization (FAO, 2013). According to Coles and Mitchell (2011), upgrading strategies are the interventions to improve efficiency and equity by maximising the benefits received by its participants (and may be typified as process and product upgrading, functional upgrading and chain upgrading).

Various interpretations of gender exist; there is a common understanding that women and men should have equal rights and opportunities (Kleiber *et al.*, 2017). However, women continue to face discrimination and often have less access to power and resources, including those related to food and nutrition security (Jones, 2017). Moreover, the roles, priorities, needs and use of resources do differ between men and women, and the way

women and men are affected by food insecurity actions does also differ (Fischer and Qaim, 2012). The tendency is to focus on women when addressing gender, yet this overlooks the instrumental role of men in closing the gender gap (Jones, 2017). This study observes that the term gender is multi-dimensional and while addressing among men and women, it also includes youth (boys and girls) because they play important roles in the household.

Improving food security requires behaviour change of individuals within the household members that are responsible for food selection, preparation, and storage and allocation tasks. While women play a major role in food decisions in many cultures, it is increasingly recognized that research needs to target both women and men with utilization messaging given the role that men often play in influencing women's decision-making (Tsikata and Yaro, 2014; Farnworth *et al.*, 2016).

1.1.2 Upgrading strategies and choices of crop types

Upgrading refers to the acquisition of technological capabilities and market linkages that enable firms to improve their competitiveness and move into more lucrative part of the value chain, for example; commercialization (Kaplinksy and Morris, 2001). With respect to the chain actors, the introduction of such upgrading strategies may affect actor participation in the value chain in different ways. For example, Bolwig *et al.* (2010) identify four ways in which chain actors may be affected, i.e. inclusion, repositioning, expulsion, and non-participation. In this study, these actions are studied through the choices of chain actors on the preferred crops and corresponding upgrading strategies for some priority crops. Generally, actors' choices may hinder or influence their participation along the value chain depending on the horizontal elements of the chain actors in particular value chain nodes. The conceptual framework (Fig. 1.1) aims to show these

linkages. Generally, the livelihoods of farmers do not depend on just one VC, but rather on either multiple value chains or several value chain activities (Mnimbo *et al.*, 2017).

For example, if farmers upgrade from the use of hand-hoes to the use of ox-ploughs, the participation of the gender groups in the value chain will be affected (Blacker *et al.*, 2017). In this case, there will be more inclusion and participation of men in the primary tillage and less participation by youth and women (Tsikata and Yaro, 2014). Furthermore, the choice of crop can have an influence on the participation of a certain gender (Neven, 2014; Khanna *et al.*, 2017). For example, whereas men may be interested in growing crops with high cash returns, women may be more focused on food security crops that generate less cash but which are of great importance to their households' general well-being.

Upgrading in firms can take place in the form of process upgrading which entails increasing the efficiency of internal processes which are significantly better than those of rivals, both within individual links in the chain, and between the links in the chain (Gereffi *et al.*, 2001). The Product upgrading entails introducing new products or improving old products faster than rivals. This involves changing new product development processes both within individual links in the value chain and in the relationship between different chain links (Bolwig *et al.*, 2010). Functional upgrading increasing value added by changing the mix of activities conducted within the firm or moving the locus of activities to different links in the value chain (Kaplinsky and Morris, 2001; Barrientos *et al.*, 2010). Upgrading entails not only improvements in products, but also investments in people, know-how, processes, equipment and favourable work conditions. For the natural resources and production of the food value chain nodes, any upgrading intervention (such as the use of soil terraces, application of fertilizers, or the

use of equipment and machinery (Fig. 1.1) may simultaneously affect the mixed crops grown either positively or negatively. The same is true for upgrading strategies at the processing, storage, and marketing nodes, as also shown in Fig. 1.1. The dotted arrows entails that there might be a relationship between the choices of value chain upgrading strategies and multi-commodity value chain but they might be influenced by a number of factors like labour, time, income and resources. The study on which this paper is based adopted the process and product upgrading (Bassett, 2009).

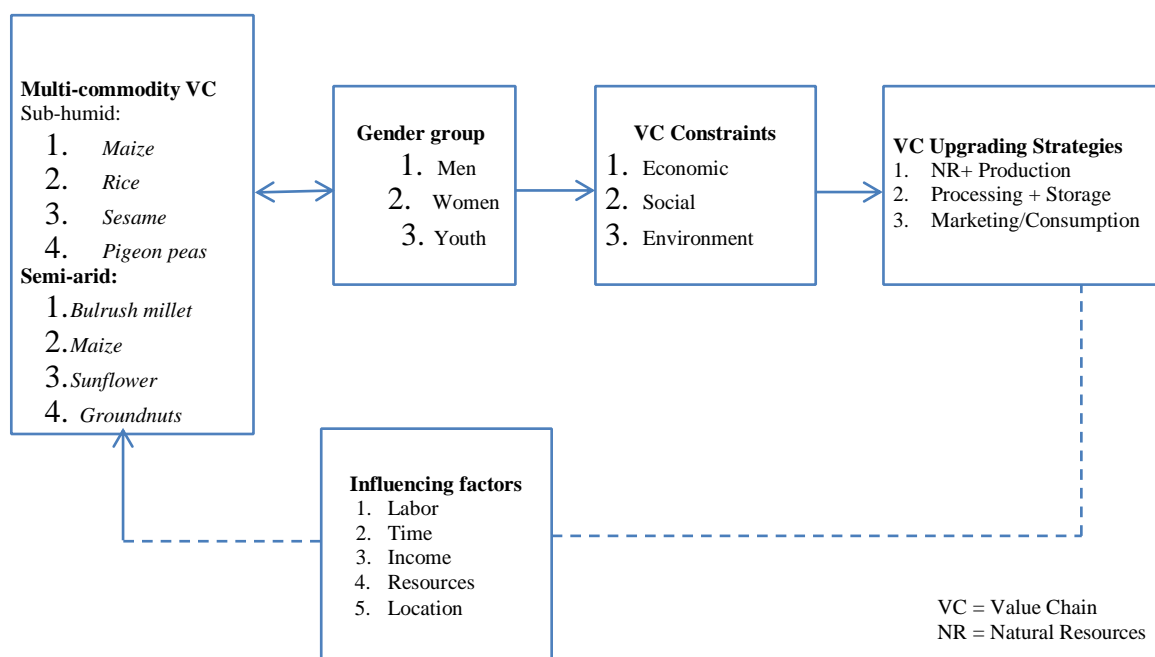


Figure 1.1: The link between multi-commodity rural value chains, gender and upgrading strategies

1.1.3 Gender Assessment on food securing upgrading strategies

The majority of Tanzanian farmers are women who constitute the majority of agricultural labour force (NBS, 2014). Over 90.4 per cent of active women in Tanzania are engaged in agricultural activities, producing about 70 per cent of the country's food requirements. They are also actively involved in the production of cash crops and in the household

activities. Most of these jobs involve strenuous, manual and highly time consuming undertakings (URT, 2015).

Research shows that from 2000 to 2013 the concept of food security includes political, economic and social characteristics (Seymour *et al.*, 2016), before 2000, food security was defined at the individual, household, national, regional and global levels is achieved when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active healthy life. Although food security has the same impacts on people in both developing and developed countries, different social and political factors influence the availability, stability, utilization and access to food (FAO, 2006 ; Hadley and Crooks, 2012). Generally, a good understanding of gender issues in the context of the four food security pillars is extremely important. However, many researchers consider gender to be a complex (and/or delicate) topic and therefore they ignore it in food security research (Forsthe and Martin, 2016). For this reason, nutrition and food security specialists frequently spend limited time addressing gender dimensions, even though gender-sensitive actions are effective and empowering ways to tackle food insecurity (Franworth and Colverson, 2016). While addressing food security or gender singularly can improve nutrition and livelihoods, a holistic approach can accelerate progress (Quisumbing *et al.*, 2014). The present study understands the importance of considering gender issues and that it is a context specific which makes the approach in addressing the issues involved to be tackled holistically.

Generally, the way women and men are affected by food insecurity actions does also differ (Fischer and Qaim, 2012). The tendency of many researchers is to focus on women when addressing gender, yet this overlooks the instrumental role of men in closing the gender gap. Therefore, both men and women are needed to be involved in this process,

acknowledging their respective roles and needs, and fostering mutual awareness and partnership (Quisumbing *et al.*, 2014). Moreover, improving food security requires behaviour change of individuals within the household, members that are responsible for food selection, preparation, storage and allocation of tasks. Though women play a major role in food decisions in many cultures, it is increasingly recognized that research needs to target both women and men with utilization messaging given the role that men often play in influencing women's decision-making (Tsikata and Yaro, 2014; Franworth and Colverson, 2016). The present study recognizes that in a country like Tanzania which is mostly patriarchy, the gender roles and relations are not equal between men and women and that mostly the important decisions on assets and income are done by men making it difficult for the role of women to be visible in value chain.

1.1.4 Gender, asset ownership and commercialization

It is well recognized that ownership of assets improves the lives of women and men who own and control them (Roy *et al.*, 2015). It has also been reported that, just like inequalities with regard to income and consumption, inequalities also exist in distribution of assets, not only between the rich and the poor, but also between men and women, across regions and communities (Quisumbing, 2013). In addition, literature (Doss, 2013; Roy *et al.*, 2015); shows that livelihood strategies such as market-oriented agriculture and commercialization have a strong intersection with asset endowments and the ability to participate in and benefit from agricultural interventions. However, commercialization with a gendered lens has received minimal attention (Fischer and Qaim, 2012).

Generally, assets are fundamental to smallholder farmers' livelihoods, thus, there is a growing interest in understanding how assets help these farmers expand production and successfully engage with agricultural markets in the developing world (Johnson *et al.*,

2016). The commonly accepted concept of household commercialization is that targeting markets in their production decisions and socio-economic situation, rather than being related simply to the amount of product they would likely sell due to surplus production (Pingali and Rosegrant, 1995; Scoones and Tsikata, 2017). What is known about asset ownership and commercialization for farmers is that smallholder resource endowments such as land and other natural capital, labour, physical capital and human capital, are household specific factors that might hinder effective participation in value chains.

Commercializing smallholder agriculture is an indispensable pathway towards economic growth and development for most developing countries relying on the agricultural sector (von Braun, 1995; Pingali and Rosegrant, 1995; Mamo *et al.*, 2017). Food crops are assumed to be used only for home consumption whereas households are considered as net sellers in the cash crop output markets and net buyers in the input markets for cash crop (Urassa *et al.*, 2015). However, some studies (Jaleta *et al.*, 2009 and Carletto *et al.*, 2017) reveal that these situations are far from reality as food crops are also marketed and households could also take any position in their food crop output commercialization participation. In Tanzania the production of food crops has been experiencing an increasing commercialization over the past five years (Kissoly *et al.*, 2017). This involves the shift from staple food crops production to market (trade) purposes. A review of case studies conducted in 10 countries in Africa, Asia, and Latin America found that food crop commercialization increased household incomes in most cases, as a result of increased labour and land productivity on farms as well as increased employment opportunities for hired labour (van Braun, 1994; Forsythe and Martin, 2016). Hence, there is a strong case for promoting food crops commercialization while seeking to ensure that the benefits and costs of the process are equitably distributed (Agwu *et al.*, 2012; Altieri, 2017).

This study adopts the definition of asset from Carter and Barrett (2006) which define assets as “conventional, privately held productive and financial wealth, as well as social, geographic, and market access positions that confer economic advantage”. Moreover, assets can be “anything tangible or intangible that is capable of being owned or controlled to produce value and or held to have a positive economic value. Assets represent value of ownership that can be converted into cash (although cash itself is also considered an asset), (Sullivan and Sheffrin, 2003). This study categorizes assets based on the Sustainable Livelihoods Framework, which covers five types of assets i.e. natural (land, water), physical (agricultural and household durables), financial (cash or savings), human (knowledge, skills), and social (group membership, social networks). Generally, these capitals underlie the ability of households to engage in livelihood strategies (Scoones, 1998). The assets are considered important in commercialization because some of these assets signify ones effective involvement in production activities. For example: land as an asset brings in different involvement for those who own and those who don't or for those own bigger size of land. The same applies for those who own better productive assets such as ox-cart or tractors.

The choice of whether to commercialize or not is caused by farm factors for example, yield and other factors such as time, off-farm work and infrastructure. In addition, literature (Gebremedhin and Hoekstra, 2007; Jaleta and Gebremedhin, 2010; Mitiku, 2014; Carletto *et al.*, 2017) assumes commercialization of food crops to be affected by different socio-economic characteristics such as age, education, farm size, ownership of some assets and output. The cited literature shows that farm size, ownership of assets i.e. land and production equipment's and age have positive effect on market participation of various agricultural commodities. Based on the above, the current study assumes commercialization of food crops to be influenced positively or negative by different

socio-economic and demographic factors. For example; age and a household's involvement in non-farm income are assumed to have a negative influence on commercialization while household labour, use of credit, access to market information, education and sex are assumed to have a positive influence on the same. The study assumes that age might have a negative influence on commercialization on the basis that; younger household heads may be more market oriented compared to their older counterparts. Moreover, access to non-farm income may influence commercialization. The above assumptions are in line with literature (Okozie *et al.*, 2012; Ousman and Hossain, 2015), which reports that socio-economic characteristics influence crop commercialization.

1.1.5 Gender based constraints and farmers participation in crop value chain

Value chains have become a key concept in international discussions on development, in particular in relation to the effects of globalization on employment and poverty reduction (Carayannis *et al.*, 2017). In the context of gendered economies, women and men participate at multiple levels in value chains, often in different tasks, and with different opportunities for upgrading (Barrientos *et al.*, 2003). In Africa, the participation of both women and men in agriculture is critical to production and growth. However, there is limited understanding of the gender dynamics related to crop value chains (Shackleton *et al.*, 2011). While men and women may face similar constraints to upgrading in crop value chains, their capability and incentives to overcome them often differ (Barrientos *et al.*, 2010). Therefore, understanding these gender dynamics can help to get the right incentives to the right actors to promote better positions of men, women and youth in crop value chain (Njuki *et al.*, 2011). In Tanzania, women in rural areas have one thing in common across regions; they have less access than men to productive resources and opportunities in agriculture (Mnimbo *et al.*, 2017). Literature (Njuki *et al.*, 2011;

Quisumbing *et al.*, 2014) on agricultural crop value chains suggests that access to and control of different nodes of the value chain may be highly gendered. Over the past few years, the question of how to promote more gender-equitable agricultural development has emerged as an explicit component of value chain development efforts (Rubin *et al.*, 2009; Chan, 2010; Bullock *et al.*, 2017). Yet many approaches remain limited in their ability to inform implementers about how to formalize and expand chains while overcoming existing constraints especially on gender issues.

This gender gap and constraints identified in literature are found in different dimensions; asset ownership and control, availability of inputs, and services, education, extension and financial services. Furthermore, this imposes costs on the agricultural sector, the broader economy and society, as well as on women themselves (Maertens, 2012; Mnimbo *et al.*, 2017). Further to the above, socio-researchers are increasingly analysing interventions to be able to achieve the dual objectives of economic efficiency and increasing gender equity which are noted in the Sustainable Development Goals (SDG). Ensuring that gender issues are taken into consideration in value chain-related interventions is vital for facilitating the development of inclusive value chains that benefit both women and men (Geoffrey *et al.*, 2013).

Generally, opportunities for men and women in value chains are shaped by their physical, financial and human assets of which access to land and other productive assets (e.g., land, credit, extension, inputs) are key enabling factors (Mnimbo *et al.*, 2017). In addition, social assets and norms can also expand or limit the character and extent of men's and women's involvement (David, 2015). Men and women stand to benefit in a number of ways from participation in value chains through employment, wages or other income, and empowerment, all of which can accrue to an individual or a household

(Quisumbing, 2014). Normally, access to these benefits is determined by the type of participation (e.g., as a wage worker or unpaid family worker), and the gender dynamics and power relations at multiple levels of the value chain that determine who gains, and how these benefits are accessed and distributed (Meaton *et al.*, 2015). As Coles and Mitchell (2011) highlight, gendered patterns of benefit distribution are such that participation in the value chain does not always translate into gains, such as in the case in Kenya where women provided 72 percent of the labour but obtained only 38 percent of the income from their work (Dolan, 2001). At the same time, non-participation does not equate to a lack of benefit (Norell *et al.*, 2017). Therefore what matters is not simply the level of income derived from value chain activities, but a combination of factors related to the perception of ownership or management of a particular commodity and scheduling of payment (Maertens and Swinnen, 2012).

Thus, action for equitable participation in value chain is required at all levels from the household and community up to the national level (MAFAP, 2013). This study focuses on suggesting pathways for addressing constraints faced by men and women towards participation in value chains by taking into account the daunting constraints that prevent them from productive and equitable engagement in agriculture in order to achieve more equitable agriculture systems.

1.2 Problem Statement

Gender issues fundamentally shape the totality of production, distribution, and consumption within an economy but have often been overlooked in value chain development (Quisumbing, 2011). It is also explained that value chain intervention or upgrading strategies that do not consider gender relations are more likely to have negative impacts on women (Tsikata and Yaro, 2014). It is also argued that gender roles and

relations determine distribution of benefits accrued from ones' participation in value chain activities (Jeckoniah *et al.*, 2012). However, many value chain programmes are commonly designed and implemented without taking into consideration gender roles and relations (Jeckoniah *et al.*, 2012).

According to Bowling *et al.* (2010), little attention has been paid on how participation in value chain exposes poor people to risk. For example; few value chain studies such as that of USAID/COMPETE (2010) focused on staple foods value chain analysis in Tanzania with the aim of generating a framework for the development of a strategic plan to improve the volume and value of staple foods marketed in Tanzania. In addition, Humphrey and Napier (2005) focused on the use of benchmarking indicators to assess performance gaps and Raikes *et al.* (2000) focused on the drawbacks of quantitative methodologies in value chain, without linking the impact of food value chain to poverty, gender and the environment.

Generally, there is a shared understanding that failure to address disparities between male headed households (MHHs) and female headed households (FHH) leads to limited effectiveness of participation in agriculture and has serious cost implications which may hinder achievement of better development outcomes that are aimed at reducing the gender gap in assets (Michelson, 2013; Roy *et al.*, 2015; Scott and Shu, 2017). According to Tsikata and Yaro (2014), a significant weakness in the emerging literature is the lack of a gender perspective on implications for agrarian livelihoods including food security. For example, in rural Tanzania, rural food systems are increasingly impaired by various drivers (including increasing pressure on the natural production resources that is land and water, and climate change) (Graef *et al.*, 2000; Boko *et al.*, 2007; Müller *et al.*, 2011). There is lack of rural food security related research that considers participatory action for

poor and vulnerable people in the entire food value chain (Graef *et al.*, 2013). Thus, this study examined the constraints faced by men, women and youth towards equitable participation in value chains and creating pathways that will help them to enable an equitable and sustainable participation in profitable nodes of the value chain. Literature (Scott and Shu, 2017) shows that, there has been minimal focus on the intersection between women's and men's asset endowments and food crop commercialization.

Despite the fact that most smallholder farmers in Africa grow food crops, there is limited empirical study's focusing on their commercialization (Carletto *et al.*, 2017). In Tanzania, food crop commercialization has been experiencing an increase in food crop commercialization over the past five years (Kissoly *et al.*, 2017). According to Njuki *et al.* (2011), agricultural commercialization is often associated with a decline in women's control because when the crop involves cash it usually fall into male domain but, literature (Kirua and Njiraini, 2013) show that women tend to control the income derived from semi-subsistence crops. Hence, there is a strong importance for promoting food crops commercialization while seeking to ensure that the benefits and cost of the process are equitably distributed (Altieri, 2017). Studies show that asset can influence outcomes by determining who participates and who does not participate in value chain (Roy *et al.*, 2015). Thus it is important to look at women and men in food crop commercialization and the relationship between asset ownership.

1.3 Justification for the Study

There is an emerging consensus that promoting gender justice in value chain development is not only a rights issue for women, but makes 'business sense' for households, enterprises, and ultimately the national economy (Mayoux, 2012). Therefore, in line with Tanzania government's priorities as described in the Tanzania National Strategy for

Gender Development (URT, 2008) and the Tanzania Agriculture and Food Security Investment Plan (TAFSIP) (URT, 2011), this study contributes to that body of knowledge and policy recommendations that will assist in promoting equal opportunities in value chain for different gender groups. The strategy referred, recognizes that women in rural and urban areas bear a heavier workload than men, and that women in rural areas spend between 16 to 18 hours per day working compared to men who work between 8 to 10 hours per day (URT, 2008). TAFSIP is a 10 year plan (from 2011/12 to 2020/21) states that “*gender mainstreaming needs to be strengthened ... In particular agribusiness investment policy needs to enable all groups to be involved at the high-value end of the market chain.*” However, the extent to which the different gender groups are involved in the high-value end in the market chain is not well known.

Of more relevance is the study’s contribution in providing part of the roadmap to achieve broader long term on the economic and social vision which is enshrined in the Tanzania Development Vision (TDV) 2025. In the vision, the participation of the people in preparing and implementing for their own development is emphasized.

Moving beyond Tanzania’s specification at policy making level, the present thesis challenges the present traditional integrated rural development approaches which currently lacks consensus about the criteria that are needed to properly evaluate food security at the household level (Carletto *et al.*, 2013). The assumption of policy makers that argue that a fixed set of criteria would be inappropriate to describe unique and complex systems and that food security criteria must be locally specific and relevant (López-Ridaura *et al.*, 2002; Bell and Morse 2008; Cosyns *et al.*, 2013; Agol *et al.*, 2014).

Further to the above, the present thesis seeks to contribute towards the development of methodological approaches to support the selection of site-specific criteria for food

security which involve local farmers are reportedly lacking in particular (López-Ridaura *et al.*, 2002). Such participatory approaches have higher potential for enhancing sustainable agriculture and food security (Chambers, 1995; Neef and Neubert, 2011). Only context-related criteria can be useful for systematic impact assessment, monitoring and evaluation of development measures to improve food security.

The present thesis is also an attempt to contribute to the goals set in the ‘North-South’ research collaboration through German Federal Ministry of Education and research (BMBF) which funded Trans-SEC project. The thesis’s title falls under the theme ‘Gendered perspectives in Value Chain’ which is one of the research areas of the Trans-SEC project. The purpose of the platform was basically to conduct a PhD study that investigates gender issues in value chain in rural Tanzania.

1.4 Objectives of the Research

1.4.1 Overall objective

The overall objective of the study was to conduct a gendered analysis of smallholder farmers’ participation in the crop value chains, in Chamwino and Kilosa Districts in Tanzania.

1.4.2 Specific objectives

Specifically, the study sought to:

- (i) To analyse the influence of gender on roles in upgrading strategies on multiple-commodity food value chains;
- (ii) To assess the gendered impact for participation on food securing upgrading strategies using different gender tools;

- (iii) To analyse asset ownership in relation to participation in food crop commercialization; and
- (iv) To determine pathways for addressing gender based constraints for equitable and sustainable participation in profitable crop value chains.

1.5 Theoretical Framework

1.5.1 Marxist political economy (MPE)

Marxist Political Economy (MPE) denotes a range of political economy perspectives that are broadly connected to and in the tradition of the writings (notably *The Communist Manifesto*, *Grundrisse* and *Capital*) and insights of Karl Marx (Martey *et al.*, 2014). The present study adopted the theory because, to have an understanding of the economy, how capital is reproduced, how profitability is maintained, and how crises develop. The theory perspective shows capital and labour representing two antagonistic classes, the former is primarily characterized by ownership of the means of production, while the latter comprises free wage labourers in a double sense (Chafertz, 2004). The MPE theory has variables that analyses the class struggle, involving the exploitation of labour by capital within the capitalist mode of production in order to have an understanding of dynamics within the community. This theory guides the study on understanding the gender dynamics in the household and the community which helps to identify the ones constraint according to their gender (class struggle). Furthermore, other variants of MPE such that which assumes that labour is not only exploited but also faces alienation and that labour is not only exploited but also faces alienation. In the present study, women are generally missing on what are considered to be profitable nodes of the value chain like activities which involve commercialization ,this implies that wage labourers are not the directors of their own work; instead, they are employed in the capitalist mode of

production, performing specialized tasks in commodity production, without owning the products.

The present study borrows the ‘untainted market logic’ from the MPE theory which assumes commoditisation and social relations to be transformed into commercial relationships, relationships of exchange and relationships of buying and selling. This is because, food crops were formerly assumed to be only for household consumption and not for sell therefore this part of the theory informs the study.

The study objective which focuses on ownership of productive resources and paid labour are well suited to inform the study. The decision of this thesis to be based on the productive asset, time and labour use of men and women, the focus on men and women, the recognition that men and women perform differentiated roles and tasks and that these tasks could lead into differentiated benefits which might lead to exploitation and alienation and lastly the need for removing the gender based constraints. This area of focus originates from the MPE theory.

1.5.2 Neo-classical theories

The neo-classical models have been adopted, the multi-person household model and the household-farm models. The multi-person model is based on competitive assumptions for male and female agricultural workers from farm and non-farm households while the household-farm models focuses on small-scale, low productivity agriculture, frequently operating under marginal conditions and the household-operated commercial farms producing food for both domestic consumption and agro-industry and export markets Barnum and Squire (1979). These models were adopted because they are good for the description of farming systems which provide a livelihood to the majority of rural

populations in the developing world .The neo-classical framework through the multi-person model assumes the household to have a utilized market (for pay) labour supply behaviour and this should be in two-person households (in the case of the current study, the female headed household and male headed household). The model further looks into households owning land, which make up a major portion of rural households, and the comparison of landless and landholding which assumes that they will not have the same advantage in food crop marketing. Household-farm models assume household assets and budgets to be endogenous and depending on production decisions that contribute to income through farm profits.

The household-farm model further assumes the household to obtain perfect substitutes for family labour in local labour markets and it can sell its own labour at a given market wage which can increase production (and demand more labour) while at the same time consuming more leisure, by hiring workers to fill the resulting excess demand for labour, (Barnum and Squire, 1979). However, the household-farm is both a consumer and a producer of food. As a consumer, it is adversely affected by a higher food price, but as a producer, it profits from food production increases. This adds a positive “farm profit” effect to the negative effects on food demand, pushing the budget constraint outward (Squire and Strauss, 1986). Moreover, Griffin (1986) used the household-farm model to analyze the influence of households’ economic characteristics (wealth) through household socio-demographic characteristics (e.g., education and sex-composition) and the results showed that they are linked. The model further explains that households, like countries, are better off with access to food crop markets than without. The model further suggests that intuitively, missing markets impose constraints on households. However, the disadvantage of the model is that, it assumes that preferences and incomes are shared by all household members equally. The reality however is income and preferences are not

shared equally within the household because men and women are reported to have different share (Forsythe and Martin, 2016). The study borrowed the household-farm model from the theory to show how family labour can be used as a means of taking part in food crop commercialization as it was used in the theory to show how the local labour markets sell its own labour by using the number of people in the household.

1.6 Analytical Framework

1.6.1. Sustainable livelihoods framework

Household assets were categorized based on the Sustainable Livelihoods Framework (SLF) which includes five types of assets i.e. natural (land, water), physical (agricultural and household durables), financial (cash or savings), human (knowledge, skills), and social (group membership, social networks) (Sonnino, 2016). Generally, these capitals underlie the ability of households to engage in livelihood strategies (Scoones, 1998). A livelihood here is defined according to Chambers (1991) in which ‘a livelihood comprises the capabilities, assets (stores, resources, claims and access) and activities required for a means of living. A livelihood is sustainable when it can cope with and recover from stress and shocks, maintain or enhance its capabilities and assets, and provide sustainable livelihood opportunities for the next generation; and which contributes net benefits to their livelihoods at the local and global levels and in the short and long term. The present study adopted the sustainable livelihood analytical approach to frame the household assets endowments by focusing on sex (male and female). This is because the livelihood approach provides an insight of rural households, in this manner; the present study adopted three parameters from the framework, which explains the portfolio of activities of household, income sources and outcomes. The first is the capital stock (livelihood assets) which shows the household endowment which consists of the natural, physical, human, financial and social capital which is the focus of the thesis.

The other two are the vulnerability context and the portfolio of income generating activities. The study adopted these livelihood assets to inform the study on the basic household livelihoods endowments to focus on, such as; who owns what assets, what are the most important assets and what gender category is deprived of what asset. *Natural asset*: refers to natural resource available within the communities that support various livelihood options related to the environment (Scoones, 1998). *Physical asset*: This refers to the infrastructure and facilities such as the housing communications, transportation systems and production equipment's. *Human asset*: refers to the knowledge and skills, quality of labour and the ability to pursue other livelihood activities (Scoones, 1998). *Financial assets*: Based on the framework, this refers to the financial resources available in form of stocks i.e. savings and flow of cash, credit, remittances which enables people to invest in different livelihood strategies (Scoones, 1998; Sullivan and Sheffrin, 2003). *Social asset*: In the framework, the social asset refers to the networks, membership to social group or trust that are believed to reduce transaction cost and that acts as insurance against shock events for the poor (Sullivan and Sheffrin, 2003).

1.6.2 Gender-Sensitive Value Chain Framework (GSVC)

The present study adopted the Gender-sensitive value chain framework for gender analysis, developed by FAO which features two levels: the household and individual level (FAO, 2017). The GSVC framework highlights the importance of the household level. Each individual woman or man is part of a household in which specific dynamics and power relations are in place. Gender roles and responsibilities are assigned within the household and determine how and to what extent household members are involved in the value chain, as well as who makes decisions and controls the benefits of this participation (Norell, 2016). The present study borrowed the gender based constraints aspect from the

GSVC which brings attention the presence of gender-based constraints throughout the value chain by addressing multiple root causes of the GBC; For example, when faced with women's lack of active participation in the value chain.

The framework assumes GBCs to appear at one level, but have underlying causes in another. This implies that the causes lie at the individual and household level, since these are the core factors which determine access to productive resources and decision-making power. At the same time, the social, environmental and political factors greatly influence the participation of women and men involvement in the different nodes of the chain, often reinforcing GBCs. For this reason, it is important for value chain analysis to take into consideration all levels and how they relate to each other in facilitating or limiting women's and men's opportunities.

1.7 Conceptual Framework

Conceptual framework for this study is shown in Figure 1.2. According to the figure whereas farmers might be concerned only with production: prepare land, plant seeds, apply fertilizer, control pests and weeds, and harvest the crop. But might also be involved in activities higher up in a chain, including sorting and grading, processing or trading their produce. Therefore, mapping priority value chains is important to understand the organization of the value chains and the involvement of farmers and the different gender groups in the value chains. Gender differences in access to and control over assets generally, dictates power asymmetries and negotiating power between men and women within the household and community in general.

In addition, gender roles do influence how people are regarded and treated by formal and informal laws, policies, and institutions. Moreover, gender affects rights to legal

documents, ownership and inheritance, representation, and due process. The conceptual framework generally shows both the structural and individual constraints and opportunities for men and women to upgrade in a value chain. Based on the above, interventions can be designed that aim to achieve gender equality.

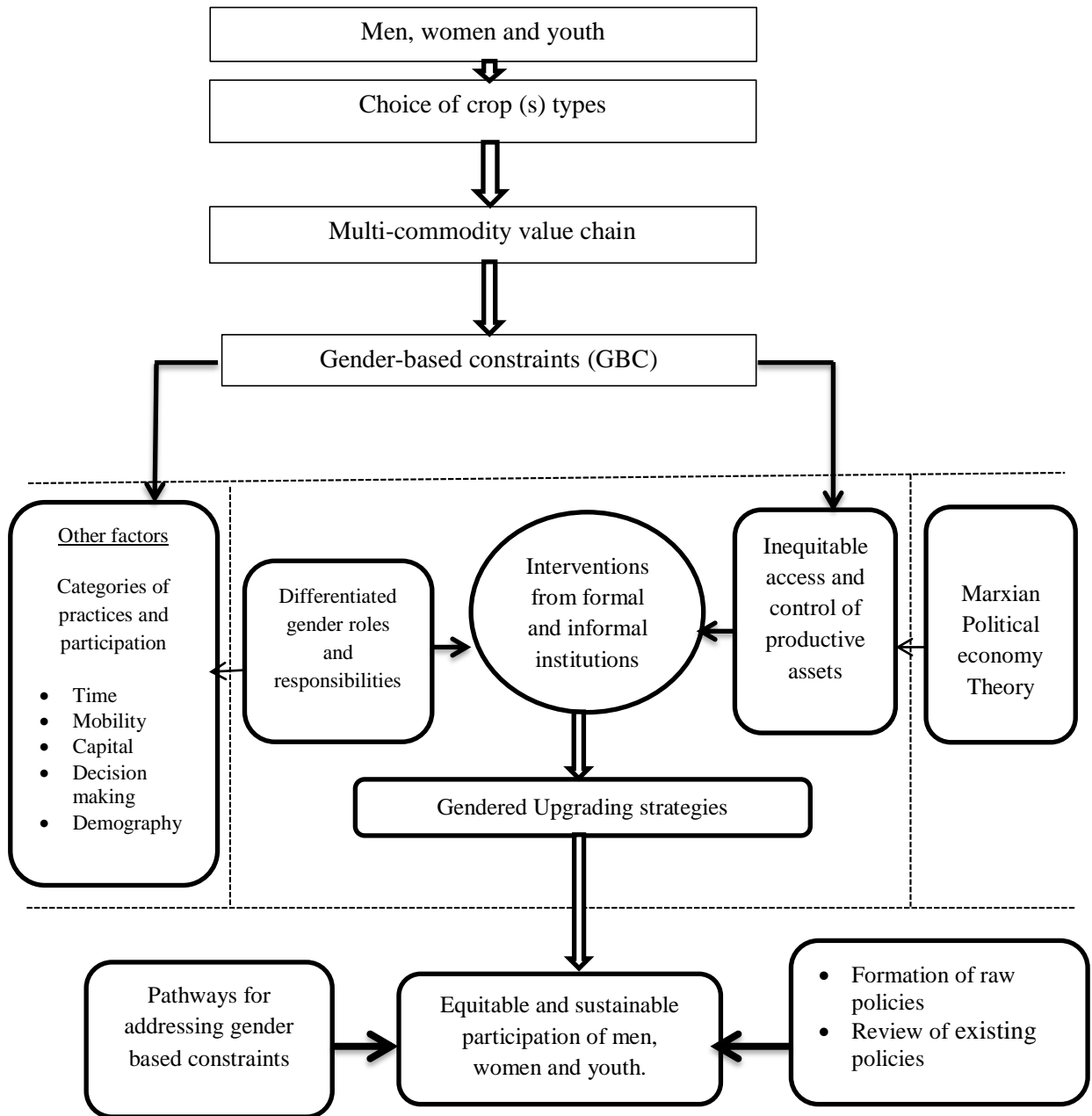


Figure 1.2: The study's conceptual framework

1.8 Location of the Study

The current study was conducted in two districts, Kilosa (Morogoro Region) and Chamwino (Dodoma Region). The food systems in the predominantly semi-humid Kilosa District which is characterized with flat plains, highlands and dry alluvial valleys are more diverse and primarily based on maize, sorghum, legumes, paddy and horticulture, partly with livestock keeping. The semi-arid Chamwino is a district is characterized with flat plains and the food system is primarily based on sorghum, millet and maize with a deep attachment to livestock keeping (Mnenwa and Maliti, 2010). The study area was selected due to the food pattern diversity between Chamwino and Kilosa diversity. Whilst Chamwino (Dodoma region) is particularly sensitive to food insecurity, Kilosa (Morogoro region) has both food-insecure and food-secure areas, furthermore the study villages in Kilosa are closer to market compared to those in Chamwino which might make their commercialization level different (Mnenwa and Maliti, 2010).

1.8.1 Study design

The present study was a pseudo-longitudinal design. The design was selected for the study because it allows comparison of variables in the same population groups in different times, for example, gender roles, crop commercialization status and income in relation to the study topic (Baxter and Jack, 2008). This study design provides a snapshot of the distribution of factors and outcomes in a population (Baxter, 2008). Furthermore, the study design allows prevalence of specific factors and outcomes to be calculated for a given population and give rise to inferences when examining men, women and youth's participation in crop value chains.

1.8.2 Selection of the study sampling frame

According to USAID (2008) the two districts represent the majority of farming systems in Tanzania. In addition, the area sets a good example of matrilineal (Kilosa) with tribes like *Luguru*, Ngulu and Kaguru where women have better chances to asset ownership (Beidelman, 1967) and patriarchal (Chamwino) with tribes such as the *Gogo* where men dominate decision making in the household and women have slight opportunity to participate in decision making especially on matters related to income, asset or duties that men are also involved (Mbilinyi, 1972).

1.8.3 Sampling techniques and sample size

The sample unit of analysis was the household, both the husband and wife. This was in order to capture well the decision making aspect. The appropriate sample size was selected following the method described by Krejcie and Morgan (1970), which explains the sample size, which is applicable to any population of a defined (finite) size, based on a formula:

$$S = \frac{X^2 NP(1 - P)}{d^2(N - 1) + X^2 P(1 - P)}$$

Where X^2 is a constant value; N represents the population size; P is the population parameter; d is a 95% confidence interval (0.05) a probability that the samples represent the population. No calculations are required to use this table (Appendix 6). A cluster sampling method was used to select four villages in Kilosa and Chamwino districts. The households were randomly selected from the village household list provided by the village leaders. The lists contained names of the household heads and the corresponding sub-village of residence. After sorting the lists alphabetically for each sub-village, 150

households were selected randomly for each of the village. Based on the above the ultimate sample size of the study was 600. In addition, focus group discussion (FGD) was conducted whereby each FGD had 12 members for each group. A total of 8 FGD's were conducted, the FGD's were conducted having separate sessions for men and women in the four study villages. Two key informants interviews (KII) were conducted in each of the four study villages making a total of 8 interviews.

1.9 Data Collection

1.9.1 Survey and interview

A structured questionnaire with closed and open-ended questions was used to collect data among smallholder farming households using face-to-face interviews. Prior to the survey the questionnaire was pre-tested in Ndebwe village because it could not be tested in the same study villages (Beatty and Willis, 2007). The questionnaire was then validated and amended appropriately after the pre-testing so that every interviewee understood it and gave clear answers without confusion. To collect data on information on who does what in the different nodes of the value chain the Harvard Analytical Framework was used; this data was disaggregated by gender (sex and age). Qualitative data were collected through focus group discussions (FGDs). In addition, the asset based wealth Index was used to collect wealth related information for household economic status. Generally, a household's ranking on the wealth index indicates to what extent the household possesses a basic set of assets, valued highly by the people (Smits and Steendijk, 2015).

1.9.2 Data analysis

Quantitative data collected from gendered household dynamics were computed using Statistical Package for Social Sciences (SPSS) (version 16.0).

1.9.3 Intra-household decision making

Cross-tabulation using Statistical Package for Social Sciences (SPSS) was done to compute the intra-household decision making. Weights were assigned to '1' meaning joint decision, '2' meaning women made the decision and '3' meaning men made the decision in the household. Household decisions were analyzed based on the three aspects (decision on what to produce, where to sell and how much to spend).

1.9.4 Construction of the wealth index

The study employed the household asset Indicator method (Filmer and Pritchett, 2001). As suggested in the literature (Vyass and Kumaranayake, 2006), all variables were first dichotomized (1=Yes, 0=No) to indicate ownership of each household asset. Weights (effectively defined by factor scores) for each asset were computed separately for men and women because assets are assumed to not only be unequally distributed between rich and poor, but they are also unequally distributed between men and women (Meinzen – Dick *et.al.*, 2011). In order to make weights on wealth non-arbitrary and replicable, they were calculated systematically, based on the Principal Component Analysis (PCA) method. The estimation of relative wealth using PCA is based on the first principal component, and is formulated as follows:

$$y_i = \alpha_1 \left(\frac{x_i - \bar{x}_1}{s_1} \right)$$

The first principal component y yields a wealth index that assigns a larger weight where, x_1 and s_1 are the mean and standard deviation of asset x , and α represents the weight for each variable for the first principal component to assets that vary the most across households so that an asset found in all households is given a weight of zero (McKenzie, 2005).

In order to assess the internal validity of the wealth index, three categories (Rich, Progressive and Poor) of wealth were computed based on the index to assess the characteristics of the poor and rich.

1.9.5 Development of the commercialization index

The demographic and socio-economic factors related to commercialization (Crop Commercialization Index (CCI) of farming households, employed Household Commercialization Index (HCI), which equals to Gross Value of crop Sold (GVS) over the Gross Value of crops Produced. Model specification;

$$\text{HCI} = \frac{\text{GVS}}{\text{GVP}} \times 100$$

Generally, a household commercialization index (HCI) can be used to determine household specific level of commercialization (Govereh *et al.*, 1999; Strasberg *et al.*, 1999). The index measures the ratio of the gross value of crop sales by household *i* in year *j* to the gross value of all crops produced by the same household *i* in the same year *j* expressed as a percentage. The index measures the extent to which household crop production is oriented toward the market. A value of zero would signify a totally subsistence oriented household and the closer the index is to 100, the higher the degree of commercialization. The advantage of this approach is that commercialization is treated as a continuum thereby avoiding crude distinction between “commercialized” and “non-commercialized” households. The HCI was used in the present study to assess the household degree of food crop commercialization. The outcomes obtained from the HCI would be expected to show the variables that are significantly influence household food crop commercialization positively or negatively.

1.10 Study Limitations

Since the current study was based on a gender lens it was important to use research tools that are not seen as threatening or embarrassing for women or men. In the study area, women were found to be less-active compared to men. To deal with this the study used interactive tools like the Gender Analysis Matrix and also by separating men from women during the FGD's so that women do not feel intimidated. This approach is supported by literature (Quisuimbing *et al.*, 2015) that there is often a need for built-in measures to compensate for the historical and social disadvantages of women in the community in order to have a balanced participation. In addition, David (2015) argues that often women and men need to receive different treatment in order to fully contribute their ideas.

1.11 Overall Description and Organisation of the Thesis

The thesis is organized into 6 chapters. With exception of Chapter 1 and 6, each of the other chapters is organized into publishable manuscript. Chapter one introduces the context of the study and provides a rationale for undertaking the study and its objectives. These objectives are separately addressed in appropriate chapters with exception of the two last objectives which are combined in one chapter. Chapter two presents the first research objective that examines the influence of gender roles in the choices of crop types and upgrading strategies. Chapter three addresses the second specific objective which explores the gendered impact on food securing upgrading strategies using different gender tools. This is followed by chapter four that addresses the third objective on analysing gender in asset ownership and participation in market oriented crop value chains. Chapter five, on the other hand, examines the pathways for addressing gender based constraints for equitable and equitable participation in profitable nodes of the crop value chain, which is the fourth and last objective. Lastly, chapter six presents the conclusion of the entire analysis of the thesis, the policy implications of the findings and the recommendations.

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CHAPTER TWO

2.0 Influence of Gender on Roles, Choices of Crop Types and Value Chain

Upgrading Strategies in Semi-Arid and Sub-Humid Tanzania

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2.1 Abstract

Upgrading strategies for a given product value chain might not result in the intended impact on different gender groups, if gender analysis is not undertaken. This study investigated the gender influence on preferred food and cash crops, as well as upgrading strategies in sub-humid Kilosa and semi-arid Chamwino Districts, Tanzania. A mixed methods research design was used to collect information from 595 respondents, while content analysis was used to qualitatively analyze qualitative data obtained from focus group discussions and key informant interviews. The findings show that farmers from Kilosa and Chamwino had no differences with respect to preferences expressed by men and women for their first priority cash crop. Gender differences for choices were evident in relation to the second priority food crop, in the semi-arid area and the third priority food crop in the sub-humid area, where women and youth differed from men on their views toward maize versus sorghum in the semi-arid region. Here, youth differed from

women and men in how they viewed cassava versus rice. For upgrading strategies, which were only conducted with the first priority crops, most of the strategies preferred by men differed from those preferred by women and youth. In both areas, youth and women preferred upgrading strategies related to crop harvesting, transportation and primary processing, whereas men preferred upgrading strategies for farm inputs and crop marketing. Therefore, it is recommended that site-specific gendered analysis on upgrading strategies in agricultural value chains should be completed prior to introducing an intervention.

Keywords: Gender roles, Crop types. Value chain, Upgrading strategies

2.2 Introduction

It is now accepted by many people and organizations that agriculture is the only realistic driver to reduce mass poverty and develop rural areas in most developing countries (Nakazibwe, 2014). In Africa, as elsewhere, both development interventions and research approaches have often adopted a value chain approach in many sectors, including agriculture. In Tanzania, agriculture is the dominant sector and a pillar of the country's economy. It provides employment opportunity to around 80% of its citizens, with 84.2% of women and 80.2% of men involved in agriculture (Ellis *et al.*, 2007). Since most Africans are engaged in agriculture for food security, then one of the most relevant value chains is that related to food.

Crop value chains comprise all the activities necessary to bring farm products to consumers, while value chain analysis considers linkages between participating actors (including farmers) and examines how food moves along the chain (Gómez and Ricketts, 2013). The current concept of a value chain is based on a single commodity; however there

is need for holistic value chain analysis (Neven, 2014). Households simultaneously participate in multiple value chains and there is interdependence between the various value chains in which farmers participate, for resources such as labour (Neven, 2014). For example, the decision to apply fertilizer in a mixed cropping farming system affects the primary crop, but also all other crops in the same field. Therefore, researchers have considered it important to address rural-based multi-commodity food value chains (Goss *et al.*, 2000; Young and Hobbs 2002; Quisumbing and Pandolfelli, 2010).

Most value chain studies address upgrading strategies. Commercially, upgrading refers to the capacity to innovate at a rate higher than that of the competitors (Kaplinsky and Morris 2000). In rural food value chains, the issue of upgrading strategies encompasses value addition but it also needs to address food security and the sustainable management of natural resources, especially soils, water, and forests (Neven 2014; Graef *et al.*, 2014). According to Riisgaard *et al.* (2010), upgrading is a desirable change in participation that increases rewards and/or reduces exposure to risk where rewards and risks are understood both in financial terms and with regard to outcomes related to poverty, gender and the environment. Neven (2014) refers to the three areas of outcomes as a triple bottom-line (economic, social and environment) and argues that there is a need for more research on value chains in order to extend the definition of upgrading strategies to include the important issue of the development of sustainable food value chains. Kaplinsky and Morris (2000) identify four types of upgrading, involving process, product, function, and chain. Herr and Muzira (2009) and Mitchell *et al.* (2009) consider horizontal coordination, vertical co-ordination, and enabling environment as additional types of upgrading strategies.

Gender related issues, which in value chain analysis are considered under horizontal coordination, are often overlooked (Quisumbing, 2011). In the triple bottom-line, gender is contained within social related outcomes. As Bolwig *et al.* (2010) note, there is limited literature linking food value chains and gender, with most value chain gender studies focusing on the horticultural sector. Traditionally, value chain interventions tend to focus more on value addition to upstream actors, paying less attention to gender. During the identification of interventions, consultative sessions are normally not disaggregated by gender (Neven, 2014). However, Tsikata and Yaro (2014) observe that value chain interventions and upgrading strategies that do not consider gender relations are more likely to negatively impact women and youth. Sex and age play a key role as they determine the type of economic activities a household undertakes (Bolwig *et al.*, 2010). Therefore, it is not only the household, but also the members of the household who must set priorities about what to cultivate based on resource endowments, resource allocation, income, risk and the distribution of benefits. This means that a gendered analysis of sustainable crop value chains in rural areas is required since much is not known.

Based on the foregoing discussion, this paper reports a participatory ex-ante gender analysis of crop value chains, including their required upgrading strategies. The paper looks at gender priorities for food and cash crops, the constraints that relate to the triple bottom-line outcomes among economic, social and environment aspects, as well as their corresponding upgrading strategies. The findings of our study will be important to guide programmes and projects that introduce upgrading strategies incorporating a broad stakeholder base, especially women farmers. Women are both the main custodians of household food security and also major participants in value chain upgrading strategies for food and cash crops in the community and the household.

2.3 Upgrading Strategies in the Context of Food Value Chain

The majority of farmers in rural areas of Tanzania practice mixed cropping involving, for example, the mixing of maize and pigeon pea, or the mixing of pearl-millet and sunflower in the same field. Furthermore, most of what farmers grow is consumed within the household, which implies that the rural food value chains are short (Neven, 2014). Generally, there is interdependence between different agricultural activities (e.g. land tilling, weeding, harvesting) and nodes (marketing, production, processing) (Mitchell *et al.*, 2009; Tsikata and Yaro, 2014); therefore there was a need for a study on multi-commodity value chains. Our study focuses on multi-commodity value chain analysis in semi-arid and semi-humid agro-ecological zones, as shown in Fig. 1. The figure shows several crops grown in either of the two agro-ecological zones, some mixed cropped and others mono-cropped.

At a general global level, value chain analysis focuses on the movement of goods and the vertical relationships between consumers and producers (Kowalski *et al.*, 2015). However, in the context of sustainable FVCs in rural areas of sub-Saharan Africa, there is a need for attention on and analysis of the horizontal relationships among actors in the chain. According to Kowalski *et al.* (2015), horizontal elements include gender, poverty, labour, and the environment. Other studies (e.g. Van Staveren *et al.*, 2007; Fontana, 2011) show that in the context of rural FVCs, gender, poverty, labour, and the environment are intertwined. In our study, three gender groups men, women, and youth are of primary concern (Fig. 2.1).

Smallholder farmers consume a large portion of what they produce because of their difficult economic circumstances; hence only a small proportion finds its way to the market (Neven, 2014). This means that most of rural food value chains are local in nature

and their sustainability significantly depends on how natural resources are exploited. In this paper, the local processes focused on include soil fertility and water availability. For the natural resources and production of the food value chain nodes, any upgrading intervention (such as the use of soil terraces, application of fertilizers, or the use of equipment and machinery (Fig. 2.1) may simultaneously affect the mixed crops grown either positively or negatively. The same is true for upgrading strategies at the processing, storage, and marketing nodes, as also shown in Fig. 2.1.

With respect to the chain actors, the introduction of such upgrading strategies may affect actor participation in the value chain in different ways. Kowalski *et al.* (2015) identify four ways in which chain actors may be affected: inclusion, repositioning, expulsion, and non-participation. In our research, these actions are studied through the choices of chain actors on the preferred crops and corresponding upgrading strategies for some priority crops. These might hinder or influence participation of chain actors in the value chain depending on the horizontal elements of the chain actors in the value chain node. The conceptual framework (Fig. 2.1) aims to show these linkages. Generally, the livelihoods of farmers do not depend on just one VC, but rather on either multiple value chains or several value chain activities. For example, if farmers upgrade from the use of hand-hoes to the use of ox-ploughs, the participation of the gender groups in the value chain will be affected. In this case, there will be more inclusion and participation of youth in the primary tillage and less participation by older men and women (Tsikata and Yaro, 2014). Furthermore, the choice of crop can have an influence on the participation of a certain gender or vice versa. For example, whereas men may be interested in growing crops with high cash returns, women may be more focused on food security crops that generate less cash.

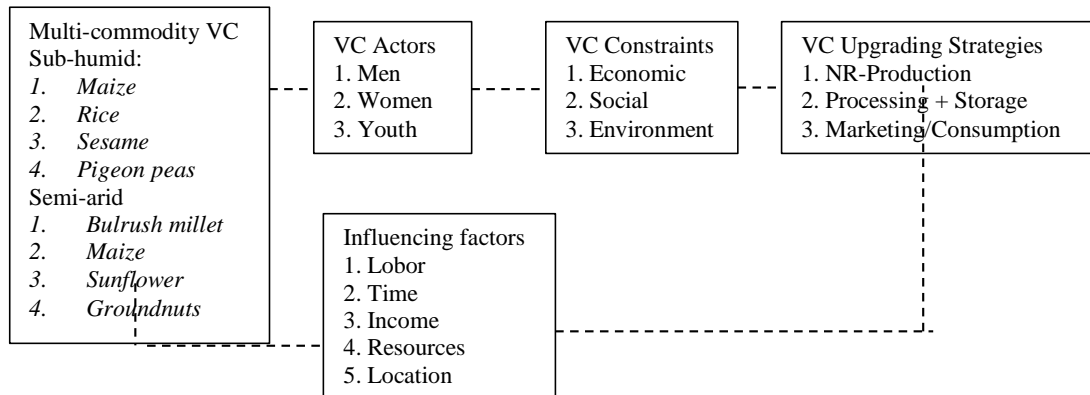


Figure 2.1: The link between multi-commodity rural value chains, gender and upgrading strategies

2.4 Research Methodology

2.4.1 Description of the study areas

The study was conducted in the Chamwino District of Dodoma Region and Kilosa District, Morogoro Region, in Tanzania. The Chamwino District is located between latitudes 5°0'0"S to 7°30'0"S and between longitudes 34°00'0"E to 36°30'0"E. Kilosa is located between latitudes 6°0'0"S to 7°50'0"S and longitudes 36°30'0"E to 37°30'0"E (Fig. 2). Four villages were purposefully selected for the study, two from each district. The selection of villages was based on agro-ecological zones, food security dimensions, and access to markets. These three characteristics were considered because they provide a broad coverage of the food value chains typically found in rural areas in sub-Saharan Africa. While the Chamwino District represented semi-arid areas, which is generally less food secure, Kilosa represents sub-humid areas, which are relatively more food secure. The villages selected were Idifu and Ilo in Chamwino District, and Changarawe and Ilakala in Kilosa District. Ilo and Changarawe villages have better access to markets than Idifu and Ilakala, thus enabling a good comparison in terms of their choices of crops and upgrading strategies.

The Gogo are the dominant ethnic group in Chamwino, while Kilosa District is dominated by the Luguru, Ngindo, Bogoro, Yao, Sagara, and Sukuma. Traditionally semi-pastoralists and patrilineal, the Gogo generally practice settled livestock keeping and crop production, while also participating in value chain activities (Mnenwa and Maliti, 2010). The Gogo are a good example of patriarchal societies in Tanzania, where men dominate the decision making process in the household, with women having less opportunity to participate, especially in matters related to income generation, asset ownership or other duties generally considered to be the responsibility of men (e.g marketing, easy mobility) (Shayo and Martin, 2009). In Kilosa District, some ethnic groups, such as the Ngindo and Luguru, are matrilineal; this is particularly expressed in matters related to property ownership. In the traditions of these groups, land is property owned by women, with ownership passing from mothers to daughters, unlike in the case of the Gogo. In the Luguru culture baby girls are generally preferred to baby boys (Hamdani, 2006).

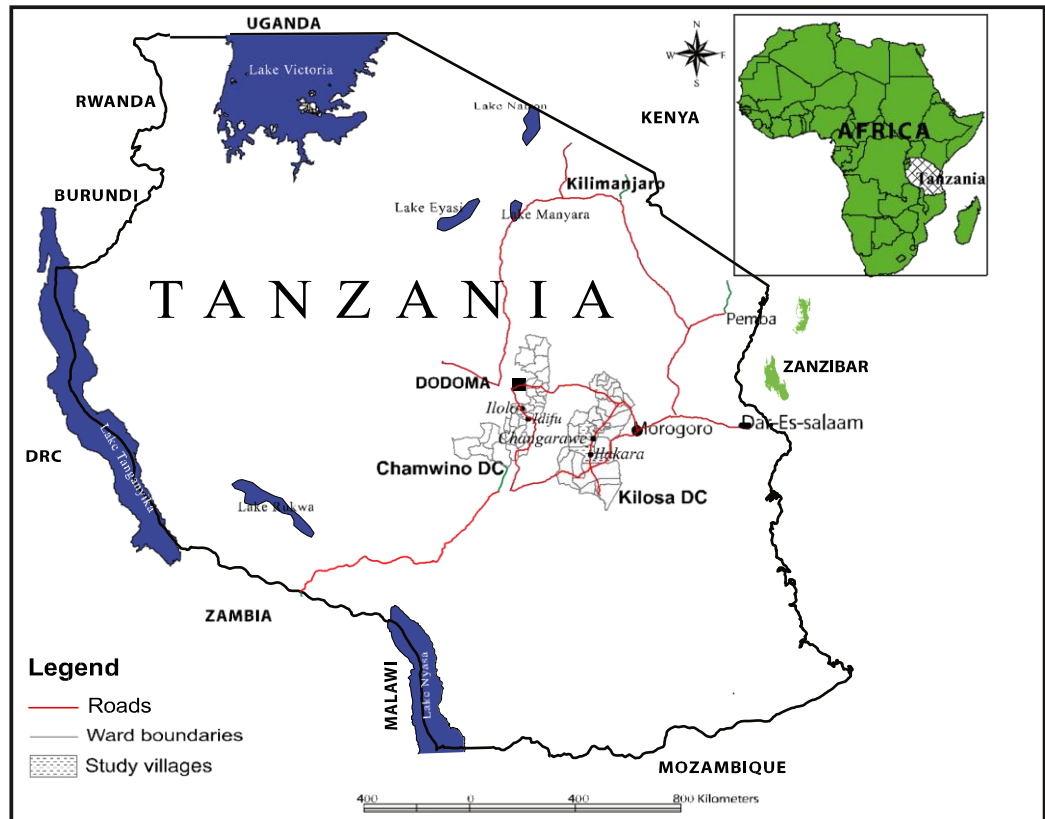


Figure 2.2: Map showing case study sites in the districts of Kilosa and Chamwino, Tanzania

2.4.2 Research design

The study used a cross-sectional research design whereby data were collected once using a mixed methods approach. According to Creswell and Plano Clark (2011), a mixed method approach is one that collects, analyzes, mixes, and draws inferences from both quantitative and qualitative data in a single study or programme of inquiry. Cross-sectional designs are well suited to describing variables and patterns of their distribution (Hulley *et al.*, 2013).

2.5 Data collection

Both quantitative and qualitative data were collected. As Creswell and Plano Clark (2011) emphasize, qualitative data can help researchers understand processes, especially those emerging over time, to gain detailed information about the setting or context, and to emphasize the voices of participants through quotes. Quantitative data help with the formal, objective, and systematic process of obtaining information about the study community. They also help in describing, testing, and examining cause and effect relationships (Hulley *et al.*, 2013). A household questionnaire was used to collect quantitative data, while focus group discussions and key informant interviews were used to collect qualitative data. The use of focus groups helps to evaluate different research situations, to supply interpretations of participant results from initial studies, and for generating additional information on a wide scale (Frertas *et al.*, 1998). Use of key informants is an important research method in social sciences because it provides room for in-depth interviews from community leaders (Marshall, 1996).

A questionnaire was used to collect information on characteristics of households, their socio-economic activities (especially on food value chains), problems, coping strategies during food shortages, as well as the planned and adopted adaptive strategies for the production, processing, storage, and marketing of food crop products. Data were collected in January and February 2014. Researchers interviewed 595 randomly selected households in the four villages: 150 households each in Ilakala, Idifu and Changarawe; and 145 households in Iloilo. The age and sex categories of respondents are shown in Table 1. As in the Tanzania youth development policy of 2007, in this study youth is defined as people aged between 15 and 35. In collecting qualitative data, a total of eight focus group discussions (FGDs) were conducted, two in

each village, administered concurrently. Each focus group had 12 participants. Key informant interviews (KIIs) involved 10 key informants per village. The aim of the FGDs and KIIs was to help researchers explore in detail what determined the choice of crops and upgrading strategies, as well as to determine whether the choices were linked to the roles and responsibilities of the different gender groups.

Table 2.1: Age and sex of respondents in the questions survey (n = 595)

Age (years)	Male		Female		Total	
	Frequency	%	Frequency	%	Frequency	%
15 - 35	135	28.8	20	15.7	155	26.1
36 - 60	221	47.2	58	45.7	279	46.9
Over 60	112	23.9	49	38.6	161	27.1

2.6 Data Analysis

Bivariate analysis using cross-tabulation, was used to examine the relationship between men and women. Cross- tabulation tables present the relationship between men and women as percentages and, in some cases, frequencies. Chi-square tests were performed to check for levels of significance between men and women in relation to processing, marketing, and production. A chi-square test was useful when there is a need to determine whether or not there is a significant difference between the expected frequencies and the observed frequencies in one or more categories (Moore *et al.*, 2013). Content analysis method was used to analyze data collected during focus group discussions and key informant interviews by using the conventional approach. The approach was chosen among the three content analysis approaches (directed and summative) because coding categories are derived directly from the text data (Hsieh and Shannon, 2005). Our findings on categorizing the preference of different gender groups with respect to crops and upgrading strategies are presented in tables.

2.7 Results of Upgrading Strategies and Cropping Systems

2.7.1 Cropping, consumption and sales

The choices of crops in general differed by region and some- times by sex, although in most cases they were statistically insignificant. Tables 2 and 3 give the crops commonly grown in the two districts. Maize (*Zea mays*) and sesame (*Sesamum indicum*) are widely grown in Kilosa, while bulrush millet and groundnut are grown in Chamwino. Many of the food crops are consumed locally, with the exception of bulrush millet (*Pennisetum glaucum*), groundnut (*Arachis hypogaea*), and sunflower (*Helianthus spp*), whereby about 50% of what is produced is sold. Out-migration of young men from rural areas is leading to permanent changes in the responsibilities and duties of women to include those previously recognized to be those of men, e.g. tilling of land.

Table 2.2: Frequency and percentage of crops grown by farmers in Kilosa and Chamwino Districts, Tanzania

Crop	Kilosa (n _k =300)		Chamwino (n _c = 295)		
	Frequency	%	Crop	Frequency	%
Maize	283	44.1	Bulrush millet	274	24.9
Rice	47	7.3	Sorghum	134	12.2
Sorghum/millet	20	3.1	Maize	124	11.3
Sesame	135	21.1	Groundnut	229	20.8
Pigeon pea	45	7.0	Bambara nut	111	10.1
Cowpea	27	4.2	Sunflower	101	9.2
Sunflower	15	2.3	Simsim	49	4.4
Others	69	10.8	Others	80	7.3

2.7.2 Gender relations and cropping systems

The findings on the preferred food and cash crops for value chain upgrading strategies show no gender differences for crops considered among the first priority of farmers. In the semi-arid area of Chamwino District in Dodoma, most farmers grow bulrush millet, which is considered to be a drought resistant crop (Table 2.3). Similarly, the preferred cash crop was groundnut in both villages, even though other cash crops, such as sesame, sunflower (*Helianthus spp*) and roselle (*Hibiscus sabdariffa*) (*choya* in Gogo-Language), were also grown. Therefore, any interventions involving upgrading strategies

along the value chain should aim at safeguarding food and income security, and should first consider bulrush millet and groundnut because these are the priority crops for both male and female farmers.

In contrast to first priority crops, we found important gender differences for the second and third ranked food and cash crops. Youth and women preferred maize to sorghum as a second food crop in Chamwino District. During key informant interviews we learned the main reason men had a preference for sorghum was because of its role in household food security. Women considered sorghum to taste bad and to be susceptible to damage by storage pests. Similar findings were reported by Shiferaw *et al.* (2014), who found sorghum was very susceptible to damage by storage pests, mainly greater grain weevils such as the rice weevil (*Sitophilus oryzae*), the flour beetle (*Tribolium castaneum*), and the grain moth (*Sitotroga cerealella*). Grain that is heavily attacked loses much of its content and becomes unfit for sale and consumption.

Table 2.3: Consumption and sales of the priority crops in Chamwino and Kilosa Districts, Tanzania

District	Crop	Frequency	Proportion		
		Consumed	(%)	Sold (%)	Others uses (%)
Kilosa (n _k =300)	Maize	284	57.9	28.3	13.8
	Bulrush millet	-	-	-	-
	Rice	48	70.8	19.2	10.1
Chamwino (n _c =295)	Maize	125	67.5	21.1	11.3
	Bulrush millet	237	35.7	55.9	8.4
	Rice	8	83.0	5.3	11.7
Kilosa	Sesame	136	59.2	25.4	15.4
	Groundnut	-	-	-	-
	Sunflower	16	81.5	9.6	8.9
Chamwino	Sesame	50	56.6	24.4	18.9
	Groundnut	230	43.9	49.4	6.8
	Sunflower	102	43.2	50.3	6.5

Men ranked maize poorly because they considered it to be less tolerant of drought and unsuitable to be grown in most of the soils found in their villages. Nonetheless, men also pointed out that maize tasted better than sorghum. Women also argued that maize was also more profitable when rains were good and that it is also resistant to the elegant grasshopper (*Zonocerus elegans*), locally known as *makombelele*, which attacks sorghum. Furthermore, maize matures more quickly (in February/March), and in times of hunger people can eat green maize. This implies that there is a change in food preference over time, which is why the youth and women prefer maize.

Table 2.4: Preferred food and cash crops in Chamwino District, Tanzania

Crop type	Ranking	Ilo			Idifu		
		Youth	Women	Men	Youth	Women	men
Food crop	1	B/millet	B/millet	B/ Maize	B/millet	B/ Maize	B/millet
	2	Maize	Maize	Sorghum	Maize	Sorghum	Maize
	3	Sorghum	Sorghum	millet	Sorghum	millet	Sorghum
Cash crop	1	G/nut	G/nut	G/nut	G/nut	G/nut	G/nut
	2	Sesame	Sesame	Sesame	Sesame	Sesame	Sesame
	3	Sunflower	Sunflower	Sunflower	Sunflower	Sunflower	Sunflower

As with Chamwino District, there were no gender differences for the first priority crops for food and cash in Kilosa (Table 5). The priority crops were maize for food and sesame for cash, although maize is also sold for cash in Changarawe and Ilakala villages in Kilosa (Mnenwa and Maliti, 2010). Again, similar to Chamwino, the preferences for the second most preferred food and cash crops in Kilosa district did not match for men and women. The difference was based on the nature of the study villages, with the exception of Ilakala. The choice of rice as the second most preferred crop in Changarawe and sorghum in Ilakala was likely due to the differences in bio-physical and agro-climatic conditions between the two villages; Ilakala is more of a uni-modal rainfall area and is located on hills and valleys, while Changarawe has a large area of flood plain and a bi-modal rainfall pattern.

During key informant interviews, we found that sesame was preferred because it has a high cash return. In the 2014/15 season for example, one bag of sesame sold for about TZS 120 000; one bag of pigeon pea sold for about TZS 60 000. In terms of labour, women preferred sesame and sunflower over pigeon pea because sesame and sunflower required one weeding while pigeon pea required three. Furthermore, women were not ready to grow sesame on their own because it needs greater cash investment (provided by male spouses) to purchase pesticides. As the third most preferred food crop, cassava was highly preferred in Changarawe, while in Ilakala both men and women preferred rice; although the youth preferred cassava (Table 2.5). The youth in Ilakala preferred cassava because the crop is considered by them to be more drought resistant and requires less labour than rice, thus giving the youth time to do other things (including leisure activities).

Table 2.5: Preferred food and cash crops in Kilosa District, Tanzania

Crop type	Ranking	Changarawe			Ilakala		
		Youth	Women	Men	Youth	Women	men
Food crop	1	Maize	Maize	Maize	Maize	Maize	Maize
	2	Rice	Rice	Rice	Rice	Rice	Rice
	3	Cassava	Cassava	Cassava	Cassava	Cassava	Cassava
Cash crop	1	Sesame	Sesame	Sesame	Sesame	Sesame	Sesame
	2	Egg plant	Egg plant	Egg plant	Egg plant	Egg plant	Egg plant
	3	Onion	Onion	Onion	Onion	Onion	Onion

Studies conducted in Africa (including the study conducted in Uganda by Blackden and Canagarajah (2003) show that there is also fluidity between cash and food cropping. For example, in many places where both traditional local varieties and newer high-yield varieties of maize are grown, the local varieties preferred for home consumption are considered to be women's crops, while high-yield varieties grown for sale are considered to be men's crops (Doss 2002; Fafchamps and Hill, 2005).

Generally, the first preferred food and cash crops in both districts were the same for men and women within the studied villages. Gender considerations appeared unimportant for value chain upgrading strategies focusing on the first priority crops. However, beyond the first preferred cash and food crops, we saw important gender differences in preferences, and there is a need for gender to be considered if the strategies are to succeed. In general, the findings from our study show that women tend to focus on crops that are not capital intensive, but that also tend to have low cash return. Men focus more on cash crops with high returns, which also require some cash input. For example, the women in Ilolo village opted to grow *roselle*, which they used to make a local brew. According to the key informants the preferred *roselle* is intercropped with staple crops or planted along field boundaries; it requires little care, with its leaves, seed capsules and stems used in several local dishes, making local brew and as traditional medicine. Women farmers in Ilakala prefer sesame (*Sesamum indicum*) over pigeon pea (*Cajanus cajan*) because sesame requires little weeding. The choice of a crop that requires less weeding could be due to women's triple gender roles (Women's triple role refers to reproductive, productive and community managing roles), which generally cause unequal distribution of time between men and women in production activities.

In Ilakala FGDs, it was further explained that domestic tasks and household chores, including food preparation, water and fuel collection, as well as caring for children and the elderly, were primarily carried out by women. This implies that a crop requiring less weeding will mean less time and labour consumed and therefore be preferred by women. According to FAO's (2011) study on gender activity in Tanzania in general, weeding and harvesting are predominantly female activities; and that the overall labor burden of rural women exceeds that of men. In addition, women in Kilosa growing sesame depend on their spouse because they require cash investment, moreover, women consider it to be a

man crop because sesame is usually bought on-farm and men are the ones involved with receiving the cash, when women produce sesame. The husband engages in its marketing because he is the one who provides the capital. Only FHH (Female headed households) can be free in sesame marketing. This shows the existence of some inequity issues, especially in access to capital, as well as access to and control over production tools.

2.7.3 Gender and the choices of upgrading strategies

The analysis of gender and preferred upgrading strategies include the analysis of farmers' constraints on the three core food value chain nodes: natural resources and production; processing and storage; and marketing. The subsequent sub- sections present the findings on the constraints and their corresponding preferred upgrading strategies. Most of these are process-based upgrading strategies, with others acting as an 'enabling environment' upgrading strategy; both aim to increase the efficiency of the chains.

2.7.4 Upgrading strategies for natural resources and production

Since the study on which the paper is based focuses on process upgrading, based on the three types of upgrading, namely: product, process and function (Coles and Mitchell, 2011). The production node in the value chain is explained under natural resources. Table 2.6 shows gender disaggregated constraints with natural resources and production in the FVC node. The results are from the analysis of data from the questionnaire survey. For production and natural resources upgrading strategies in Kilosa, male farmers focus more on the challenges with natural resources than did female farmers. For example, men showed more concern about insufficient rainfall and how it can lead to low agricultural productivity. However, there was no statistical difference between the two groups in relation to natural resources, in contrast to Chamwino District, where a statistical difference ($p=0.05$) between male and female farmers was observed. In Chamwino,

around 18% of female farmers reported constraints related to the low availability and high costs of agricultural inputs; only 8 % of male farmers in the district reported the same concerns.

This implies that more female farmers may be unable to afford agricultural inputs or travel to Mvumi (the nearest market town) to purchase the needed inputs, unlike men. Similar findings on women's difficulties in accessing inputs are reported in other studies (e.g. Ishengoma 2004; Fulton *et al.*, 2012; Simiyu, 2013) showing that women's inability to access inputs are financial and lack of mobility (traveling outside the village) and these prevent women from succeeding in agriculture.

Table 2.6: Natural resource and crop production constraints (n=595), Tanzania

Constraints	Kilosa (n _k =300)				Chamwino (n _c =295)			
	Female		Male		Female		Male	
	Freq	%	Freq	%	Freq	%	Freq	%
Crop pests and diseases	30	17.3	84	15.4	35	8.5	56	9.3
Livestock disease	14	8.1	59	10.8	41	10.0	43	7.1
Insufficient rainfall	49	28.3	219	40.0	216	52.4	294	48.6
Declining soil fertility	7	4.0	13	2.4	24	5.8	41	6.8
No problem	41	23.7	105	19.2	22	5.3	123	20.3
Others	32	18.5	67	12.2	74	18.0	48	7.9

During focus group discussions, farmers were presented with a series of constraints and asked to indicate which upgrading strategies are needed to overcome onset. Table 2.7 shows gender-disaggregated natural resource upgrading strategies required for maize and sesame production in Kilosa District, and bulrush millet and sunflower in Chamwino, as determined by the focus groups. In Kilosa, the common upgrading strategies varied little based on gender, and were land use planning, irrigation, improved seeds, use of ploughs, the use of fertilizer, and weed control techniques. Common upgrading strategies in Chamwino were manure, farm input shops, and early maturing crop varieties.

Farm input shops for improved seeds, especially for maize, sesame and sunflower, as well as herbicides and pesticides, were seen as very important for creating an ‘enabling environment’ for upgrading strategies across all genders and farming groups. Pests and diseases were ranked second among the production constraints and were equally important for both male and female farmers (Table 2.6). A male farmer from Idifu village said:

Farm input shops are located at the small township of Mvumi, which is 20 km from the village, and there is no regular transport service linking our village and Mvumi. Furthermore, there is limited option for pesticides and insecticides at Mvumi and we sometimes have to go to Dodoma, which is 44 km from Mvumi and the fare is Tshs 4,000.

(Male FGD participant, Focus group discussion at Idifu village, Chamwino District. February 2014).

Table 2.7: Natural resource and crop production upgrading strategies from the focus group discussions in Kilosa and Chamwino Tanzania

District	Crop	Youth	Women	Men
Kilosa	Maize	Terraces, land-use plan, improved seeds, ploughs, herbicides, mechanical weeders	Irrigation, fertilizer, manure, improved seeds, ploughs, herbicides, mechanical weeders	Irrigation, fertilizer, land-use plan, improved seeds, ploughs, herbicides, mechanical weeders
	Sesame	To find hilly areas, land use planning, education, farm input shops	Land use planning, education, farm inputs shops	Land use planning education, farm inputs shops
Chamwino	Bulrush millet	Manure transportation, education, short maturing, water tolerant varieties, terraces/ridges, ploughs	Manure transportation, education, pesticides	Short maturing, water tolerant varieties, terraces/ridges, pesticides
	Sunflower	Manure, farm input shops	Manure, early maturing varieties, farm input shops	Manure, farm input shops

A gender difference was seen with the terrace technology upgrading strategy. Only the youth in Kilosa, as well as the youth and older men in Dodoma, indicated terrace technology to be an upgrading strategy. This technology is capable of increasing crop yield, but it also increases investment cost (labour and/or finance), which most female farmers might not be able to afford (Table 2.7). However, with respect to the triple bottom-line (social, environmental and financial), the environmental dimension of sustainable food value chains has gender differences, women in Kilosa complaining about their male spouses, noting that they did not like to be involved in field activities, such as land preparation. One female FGD participant said:

Here in Ilakala, most men are not used to field activities. Women always work in the field and men come to the field just to assist their spouse. However, nowadays we have started to push them to go the field. When we wake up in the morning we also wake our husbands so that we can go together to the field. (Female FGD participant, Focus group discussion at Ilakala village, Kilosa District. March, 2014). This implies that female farmers have been the main suppliers of labour for field activities, probably because of the matrilineal dominated culture in Kilosa District, unlike the patrilineal culture of Chamwino District. Another reason might be the common use of oxen in Chamwino District for primary tillage, which attracts men, while in Kilosa the hand-hoe, which discourages men, is the tool of choice.

2.7.5 Processing and storage

The differences in the roles performed by men and women in Tanzanian agriculture also extends to processing and storage. According to the FGDs, the processing of maize, sorghum, millet, and groundnut is predominantly the domain of women. Women carry grain in containers on their heads, transporting it to various places within the village.

Men tend to be involved in transporting grain to the hammer mill when improved transport such as a bicycle or ox-cart is available. Transport of harvested crops to homesteads and storing of grain involve both women and men. However, shelling grain for marketing is predominantly a female activity, while transportation of shelled products to market tends to be male dominated, especially since marketing the grain is generally done by male household heads. Table 2.8 shows the processing and storage constraints faced by farmers in the two districts. Female farmers in Chamwino are more concerned about processing and storage, with more than 50% of female farmers indicating processing and storage to be a problem, compared with only 26% of male farmers. A chi-square test showed a statistical difference ($p=0.05$) between male and female responses in Chamwino, with the results implying that women in Chamwino are highly involved with processing and storage tasks or are more affected by processing and storage constraints than men.

Table 2.9 presents findings from the FGDs on upgrading strategies for processing and storage conducted in Kilosa and Chamwino Districts. Processing and storage components included harvesting, transportation from the field, drying, shelling, as well as storage and milling. In this value chain node, we found that older men had different opinions about upgrading strategies than the youth and older women, who had very similar upgrading strategies. The findings from the FGDs directly reflect those from the household survey, which showed female farmers to be more concerned with processing and storage constraints (Table 2.8). The reason for this difference in processing and storage is rooted in gender roles, responsibilities, and ownership of assets. Women and children do most harvesting. If a household owns a bicycle then the man will transport the harvest by bicycle; otherwise the women and children carry most of the harvest on their heads, as reflected in a female informant's observation:

During harvesting most men (who are household heads) help with transporting maize if they have a means of transport, for example, bicycle or motorbike. They will initially assist us with harvesting but as soon as enough load for the bicycle or motorbike has been obtained, they will completely shift to transportation and leave behind the harvesting task to us and our kids, leaving some of the crop in the field since women are very sensitive with the produce, they are forced to go back to the field and carry on their heads (A female key informant, Ilakala village, Kilosa District, March 2014).

Table 2.8: Processing and storage challenges facing farmers in Kilosa and Chamwino Districts (%) Tanzania

Constraints	Kilosa (n _k =300)				Chamwino (n _c =295)			
	Female		Male		Female		Male	
	Freq	%	Freq	%	Freq	%	Freq	%
High processing cost	4	2.6	9	1.8	13	3.8	5	0.9
Limited processing facilities	5	3.2	14	2.8	26	7.6	14	2.6
Limited processing knowledge	3	1.9	22	4.4	34	9.9	4	0.7
Limited storage facilities	1	0.6	8	1.6	20	5.8	15	2.8
Losses due to insects	32	20.5	42	8.5	87	25.3	92	17.0
Others	2	1.3	7	1.4	4	1.2	9	1.7
No problem	109	69.9	395	79.5	160	46.5	402	74.3

Thus, it is important that upgrading strategies which address the transport of produce from the field should meet the needs of female farmers and youth. Additionally, women and the youth are responsible for most of the drying and shelling. Since drying takes several days, women and children are responsible for moving the maize in and out of the house each day until it dries, as observed by a male interviewee:

When it comes to shelling maize for household consumption, it is women and the youth who perform that activity. Men only pay attention when there is a need for money for travelling or to attend a sick person. Even during that time, the best that they can do is to hire youth and pay them about Tshs 2000 per day to do the shelling on their behalf and

still it will be the duty of the woman to supervise the work and make sure it is properly done (A male key informant interviewee, Changarawe village, Kilosa District, March 2014).

Table 2.9: Proposes upgrading strategies for processing and storage of farmers crops in Tanzania

District	Crop	Youth	Women	Men
Kilosa	Maize	Tractors, trailers material for drying and storage	Tractors, trailers, materials for drying and storage	Electricity. Solar supply shelling and packing machines Education
	Sesame	Transport , drying and storage facilities, education	Transport , drying and storage facilities,	
Chamwino	Bulrush millet	Transportation carts, machine, storage bags and pesticides	Carts, machines, storage bags and pesticides	Proper sorting and grading machines to help acceptance in market
	Sunflower	Ox-carts for transporting produce for oil extraction, packing gallons, increase number of pressing machines to reduce long queues	Ox-carts, threshing machines storage bags, increase number of processors	Increase number of machine processors for oil extraction

This observation suggests that improved processing and storage technologies are needed, in addition to transportation technologies. Delayed processing and poor storage contribute to large losses after harvest. In Africa, post-harvest losses for maize range from 20% to 30% (Mwololo *et al.*, 2010). As Neven (2014) argues, even though the main observation of a value chain is to increase the value of the commodity, post-harvest losses can cause the loss of some of the generated value at the production node. Moreover, value can be added with good processing and storage facilities because this allows farmers to wait for better prices. Studies such as those by Cagley *et al.* (2010), Daley (2008), and Lyimo-Macha and Mdoe, 2002) consistently found that in Tanzania a woman's time burden far exceeds that of men, with women having little or no leisure time. Estimates of women's time burden vary, but one common estimate puts women's labour time as high as 12–16 hours per day, as opposed to that of men, who work almost

half the time of women. This shows that gender roles and responsibilities on choices of upgrading strategies differ, suggesting that women would benefit more from an upgrading strategy that reduced their workload and time expended.

2.7.6 Upgrading strategies at the marketing node

Table 2.10 shows the constraints that farmers in Kilosa and Chamwino face with marketing. More than half of farmers (63%) did not report any problems related to markets. Nonetheless, the main reported constraints concern low prices for agricultural produce. At this node, there were no statistical differences with respect to the constraints faced by either sex. A comparison of the two locations showed that market issues are more problematic in Chamwino than in Kilosa with 33.5% of farmers in Chamwino and 29.4% in Kilosa indicating marketing problems that need to be addressed. One possible reason for this may be because about 50% of the bulrush millet (*Pennisetum gaucum*), groundnut (*Arachis hypogaea*), and sunflower (*Helianthus spp*) produced in Chamwino is sold with the rest either consumed or kept as seed for planting the next season. In contrast, in Kilosa only between 20% and 40% of the agricultural produce is sold, with the rest retained for household consumption and as seed for future plantings.

Table 2.10: Constraints faced by farmers (n=595) at the marketing node in Tanzania

Constraints	Kilosa (n _k =300)				Chamwino (n _c =295)			
	Female		Male		Female		Male	
	Freq	%	Freq	%	Freq	%	Freq	%
Cheating (weight, money)	8	5.6	13	2.6	4	1.3	20	4.1
Fewer buyers	3	2.1	35	7.0	28	8.8	44	9.1
Low prices	26	18.2	87	17.4	67	21.1	100	20.7
Other	5	3.5	7	1.4	10	3.2	13	2.7
No problem	101	70.6	358	71.6	208	65.6	307	63.4

During the FGD in the four villages, farmers indicated that the required enabling environment for upgrading strategies needed to include the establishment of markets and linking farmers with markets. In Chamwino District, we found more gender equality in

marketing millet since husbands and wives normally make joint decisions on what to sell and how to sell it. During years with good rainfall, farmers enjoy good harvests but face marketing challenges and falling prices; a female farmer in Idifu said:

In order to add value to our millet we had to convert it into and sell it as local brew. Generally, using two millet tins of 15 kg each leads to realization of a profit of Tshs 18 000 compared to Tshs 6000 if we would have decided to sell it as is. Normally, we divide the profit more or less on equal basis between the husband and wife. However, in some instances the woman gets more because of the household responsibility.

Furthermore, men have the responsibility of providing the initial capital but brew preparation (brewing) is done by the woman. The initial capital is required to cover the cost of milling (Tshs 2000), firewood (Tshs 6000), renting cooking utensils (Tshs 1000) and local tax (Tshs 1000). (Female key informant, Idifu Village, Chamwino District, February 17, 2014.)

This shows that millet crop does not have gender selection differences. Thus, most market upgrading strategies could benefit both male and female farmers. However, for sunflower oil pressing activities, men and male youth take the lead. According to the women, this is because it is linked to selling, which means money to males. Thus sunflower commercialization is mainly male-based although female farmers are the ones heavily involved in production and processing. Therefore any new intervention on sunflower should specifically consider female farmers. Most traders and agents normally buy the sesame crop while still in the field. In general, farmers indicated that the lack of proper markets, the lack of market information, price setting by traders, and weighing scales that do not meet Tanzanian government standards as challenges connected to sesame in the market value chain.

A closer look at the three value chain nodes (natural resources and production, processing and storage, and marketing) shows that farmers think that the main constraints relate to or are linked to natural resources and production. Between 76% and 95% (Table 6) of the respondents indicated these as the leading concern, followed by processing (between 20% and 53%; see Table 2.8); and, lastly, the marketing node (between 28% and 37%; see Table 10).

2.8 Discussion

2.8.1 Food value chain and choices of crops

Our study considered short food value chains, where a significant amount of what is produced is consumed locally, including various forms of distribution, characterized by few (or no) intermediaries between consumers and producers, and short geographical distances between them. Aubry and Kebir (2013) considered food value chains to be short when the geographic distance between the farm and the consumer is low and/or when the number of intermediaries between the producer and the consumer is reduced (ideally a maximum of one).

The present study found that problems linked to natural resources and production were the most challenging compared to other nodes in the food security value chain. This might be because these constraints directly impact farmers and influence their choice of crops. For example, men in Chamwino chose sorghum over maize, explaining that it is good for food security because it is drought resistant. In line with our study, Shiferaw *et al.* (2014) found that sorghum could be grown successfully on a wide range of soil types. In addition, sorghum tolerates a range of soil pH from 5.0 to 8.5 and can be grown in more saline soils than maize (Shiferaw *et al.*, 2014). Sorghum can also adapt to infertile soils and can produce grain on soils where many other crops would fail. Sorghum also

provides better food security in dry areas. However, women and the youth said sorghum is not palatable.

The present study found out that male farmers dominated commercial crops such as sesame (*Sesamum indicum*), bullrush millet (*Pennisetum glaucum*), groundnuts (*Arachis hypogaea*) and sunflower (*Helianthus spp*), and when food crops, such as maize (*Zea mays*), which is considered a women's crop also become cash crops, they become men's crops. Evidence suggests that men may take over production and marketing, even of traditional women's crops, when it becomes financially lucrative to do so (The World Bank *et al.*, 2009). Similar results were observed in a study conducted in the Rukwa region in Tanzania by Daley (2008) which showed groundnut yields determine whether men or women control the crop: when yields are high, men sell the produce, and when yields were low, women retained control. In a number of contexts social norms dictate choices of food and cash crops, and therefore traditionally imply more male involvement in some of the decision making, production and sale processes. Female participation in cash crop markets is often lower than male participation (The World Bank *et al.*, 2009).

As an example, women only represent 20% of cocoa farmers in Ghana (Vigneri and Holmes, 2009), and female headed households are significantly less likely to farm coffee than households headed by men in Uganda. This study found that there are gender based cropping patterns in Tanzania but acknowledges that it is difficult to divide crops into those grown by men and those grown by women. Rather a crop can be dominated by a certain gender due to traditional norms and decisions in the community e.g. men being heavily involved in cash crop production.

2.8.2 Gender roles and farming

The present study found differences in gender roles through the food value chain nodes. For example, women were more involved in the processing node and therefore they seem to be mostly affected by constraints in processing and storage (50%) compared to male farmers (26%). In relation to the changing roles of women, similar results are observed from literature by Booth (1999); FAO (2009) ;Schneider *et al.* (2014) showing that women play the major role in food production and processing activities, which tend to be regarded as extensions of their household responsibilities. A study on cassava farming by Nweke *et al.* (2002), examining six African countries, found that women provided more than 50% of the labour required during post-harvest operations. New farming technologies may affect gender participation. For example, the study found that women work more in Kilosa than in Chamwino because of the farming tools used in these areas.

Oxen are used for tilling in Chamwino district which attracts the involvement of men whereas in Kilosa the hand-hoe is mainly used which discourages men. Application of upgrading strategies can increase agriculture efficiency by increasing production per unit area but application of these strategies may sometimes lead to increased production, which could outweigh the increased income (Gilbert and Morgan, 2010; FAO, 2011). Further, other studies (e.g. Ludena, 2010; Nkamleu, 2010) show that the use of the mentioned strategies will not automatically increase production efficiency. For example the impact of new agricultural technologies is less apparent in some parts of sub-Saharan Africa, which are dependent upon rainfed agriculture. Here agricultural productivity has stagnated, if not fallen (de Haen *et al.* 2003; Moyo *et al.*, 2015). Since women have a high overall labour participation rate in sub-Saharan Africa, performing 60–80% of the agricultural work (Emerole *et al.*, 2014) and men are traditionally the final decision makers (Tsikata and Yaro, 2014) our study used a gender approach. This enabled us to

get insights into female- male differences in knowledge and perceptions and their contribution in their specific communities.

2.9 Conclusions and Recommendations

The present study has established who participates and gains in food value chains and show that studying value chains on an individual basis is insufficient for understanding the manner in which gender dynamics shape the benefits experienced by men and women. With upgrading strategies, we arrive at the conclusion that the preferred ones are based on gender, in terms of the different roles and responsibilities people play in each community. The present study found women and youth in both districts to be heavily involved with the lower-end value chain components such as production, processing and storage. Hence, integrating gender into value chain analysis should be routine rather than the exception. We also conclude that with improved production tools and machinery (e.g. millet threshers, shellers), the involvement of males in agriculture increases. It is, therefore, recommended that upgrading strategies in the agricultural value chain should always consider gender roles and responsibilities. Each gender may experience differing positive or negative effects.

It is, therefore, recommended that categories such as ‘the household’, ‘male’ and ‘female’ need to be disaggregated and understood separately. Even when women may not directly control assets and income, their households can benefit from female engagement in the value chains through better nutritional outcomes and increased food security that result from increased aggregate household production and income.

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CHAPTER THREE

3.0 Gendered Impact Assessment on Food Securing Upgrading Strategies: Results from Three Methodological Approaches.

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3.1 Abstract

In developing countries, rural women and men play different roles in guaranteeing food security for their households and communities. The gendered aspects of food security are visible along the four pillars of food security: availability, access, utilization and stability but one cause reported to hamper ineffectiveness is overlooking gender dynamics. Therefore this study aims to explore the gendered arguments towards food security by using different methodological tools while focusing on the food security criteria and the three sustainable development criteria (economic, social and environmental aspects). The specific objectives were to analyse differences between scientist and farmer perspectives in relation to the three upgrading strategies namely rainwater harvesting (RWH), improved processing, and household nutrition education and kitchen gardening) and to find out the difference

in results when triangulating the tools on target group in order to set preferences in local contexts which helps to anticipate what measures would be needed to improve food security. The study used diverse assessment approaches namely a) a participatory stakeholder approach using the FoPIA tool (Framework for Participatory Impact Assessment) b) a scientific expert based approach using ScalA-FS (scaling up assessment-Food security tool) and c) Gender Analysis Matrix (GAM). Focus group discussions, key informant interviews and household survey were the main methods of data collection. The study found that female and male participants scored the criteria differently. Men considered social relations in the community and in the household more important for food security than women did. Women scored several production-related aspects as more important than men. Gender-based inequalities along the food value chain 'from farm to plate' that impede the attainment of food and nutritional security must therefore be addressed through effective gender responsive policies and programs.

Keywords: Impact assessment; gender; upgrading strategies; food value chain; Tanzania; participatory research

3.2 Introduction

Agriculture can be the engine of growth and is necessary for reducing poverty and food insecurity, particularly in sub-Saharan Africa (IFAD 2001; World Bank 2007a). Therefore, understanding the dynamics of change is crucial to better position the sector for faster growth and sustained development, which is vital for food and livelihoods security. Generally, many of the development inequalities emerge from gender differences. These differences in particular affect the distribution of resources between men and women, and are caused by ideological, economic, ethnic, social and religious factors. Hence gender's consideration as a determinant that influences

development results, particularly in relation to poverty reduction and food security (Frison *et al.*, 2011).

In Tanzania, food insecurity is one of the focal national issues. The Tanzanian government has adopted the Agricultural Sector Development Programme (ASDP) and the current agricultural development initiative Kilimo Kwanza (Agriculture first). These programmes address the challenges such as food insecurity, the patriarchal system, the customs, and the traditions that discriminate against women and perpetuate gender inequalities (URT, 2015). In Tanzania, despite constitutional proclamations of gender equality and many laws that promote equal opportunities for both men and women it remains that for both smallholder farms and large plantations, men and women carry out different types of work, have different preferences and are unequally rewarded for their contributions to the agricultural system (Rubin, 2010).

The international community currently lacks consensus about the criteria that are needed to properly evaluate food security at the household level (Carletto *et al.*, 2013). Several authors argue that a fixed set of criteria would be inappropriate to describe unique and complex systems and that food security criteria must be locally specific and relevant (López-Ridaura *et al.*, 2005; Bell and Morse 2008; Cosyns *et al.*, 2013; Agol *et al.*, 2014).

Little effort has been directed towards the development of methodological approaches to support the selection of site-specific criteria (López-Ridaura *et al.*, 2005) in the agricultural development context, and simple, applicable field approaches that actively involve local farmers are lacking in particular. Such participatory approaches have higher potential for enhancing sustainable agriculture and food

security (Chambers, 1995; Neef and Neubert, 2011). Only context-related criteria can be useful for systematic impact assessment, monitoring and evaluation of development measures to improve food security.

The relationship between gender and food security is undeniable and of utmost importance (Gaanderse, 2010). The concept of food security includes both physical and economic access to address people's needs and preferences. In that way, a household should have the possibility to consider all its members at all times. The three main pillars towards ensuring food security are food availability, food access, and food utilization (FAO, 2013). According to Coles and Mitchell (2011), upgrading strategies are the interventions to improve efficiency and equity by maximising the benefits received by its participants (and may be typified as process and product upgrading, functional upgrading and chain upgrading).

The present study adopted the process and product upgrading (process and product upgrading (Bassett, 2009). Theoretically, in Sub-Saharan, women generally have the right to dispose of the product and income from their own economic activities (Dey, 1992). For example; Dolan (2001) reported how traditional household income distribution arrangements in Meru District, Kenya permitted women to retain money from the sale of local food crops to spend on household subsistence needs. However, male appropriation of the new French bean income, sometimes through violence toward their wives, has resulted in a situation where women perform 72 percent of labour and enjoying only 38 percent of the income. Therefore, it is important to examine what food security criteria in the UPS will be advantageous to women and men in achieving food security. The objective of this paper is to examine the gender-differentiated impacts of food securing UPS. Specifically, the paper explores quantitative

and qualitative data in endeavor of getting a better understanding of the food security problem and examines processes/experiences along with the impact assessment outcomes of gender issues (Clark, 2010).

3.3 Gender in the Context of Food Securing Upgrading Strategies

The majority of Tanzanian farmers are women who constitute the majority of agricultural labour force. Over 90.4 per cent of active women in Tanzania are engaged in agricultural activities, producing about 70 percent of the country food crop requirements. They are also actively involved in the production of cash crops and in household activities. Most of these jobs involve strenuous, manual and highly time consuming undertakings (NAP, 2013; URT, 2013).

Research shows that from 2000 to 2013 the concept of food security includes political, economic and social characteristics (Farnworth *et al.*, 2016). Although food security has the same impacts on people in both developing and developed countries, different social and political factors influence the availability, stability, utilization and access to food (Hadley and Crooks 2012; FAO 2006). Generally, a good understanding of gender issues in the context of the four food security pillars is extremely important. However, many researchers consider gender to be a complex (and/or delicate) topic (Touzard and Templez, 2012). For this reason, nutrition and food security specialists frequently spend limited time addressing gender dimensions, even though gender-sensitive actions are effective and empowering ways to tackle food insecurity (Farnworth *et al.*, 2016). While addressing food security or gender singularly can improve nutrition and livelihoods, a holistic approach can accelerate progress (Quisumbing *et al.*, 2014).

Nonetheless, various interpretations of gender exist; there is a common understanding that women and men should have equal rights and opportunities. Women continue to face discrimination and often have less access to power and resources, including those related to food and nutrition security. Moreover, the roles, priorities, needs and use of resources do differ between men and women, and the way women and men are affected by food insecurity actions does also differ (Fischer and Qaim, 2012). The tendency is to focus on women when addressing gender, yet this overlooks the instrumental role of men in closing the gender gap. Therefore, both men and women need to be involved in this process, acknowledging their respective roles and needs, and fostering mutual awareness and partnership (Quisumbing *et al.*, 2014). Improving food security requires behaviour change of individuals within the household members that are responsible for food selection, preparation, and storage and allocation tasks. While women play a major role in food decisions in many cultures, it is increasingly recognized that research needs to target both women and men with utilization messaging given the role that men often play in influencing women's decision-making (Tsikata and Yaro; 2014 and Farnworth *et al.*, 2016).

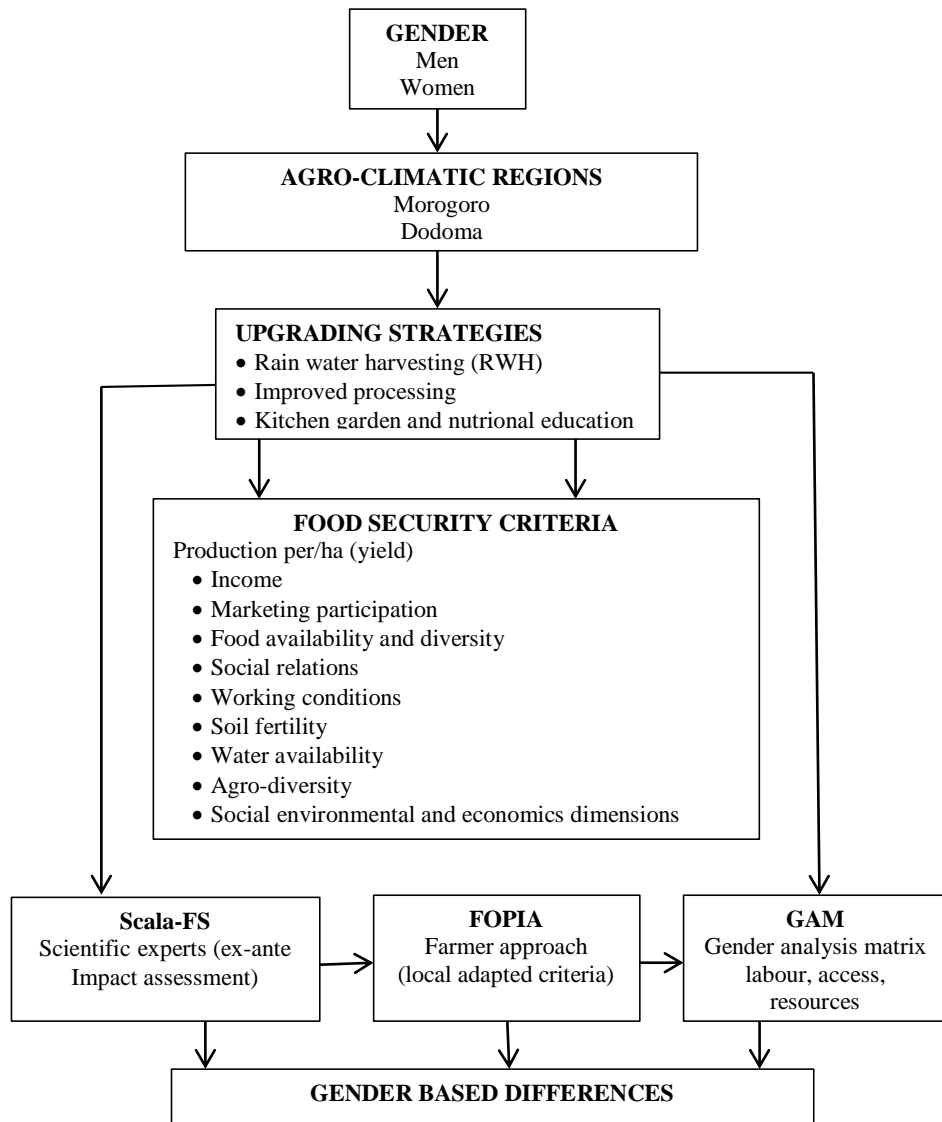


Figure 3.1: Gender assessment conceptual framework

3.4 Research Methodology

3.4.1 Study area and food systems

3.4.1.1 Description of the study areas

Approximately 90 per cent of Tanzania's poor people live in rural areas. The incidence of poverty varies greatly across the country but is highest among rural families who live in arid and semi-arid regions and depend exclusively on livestock and food crop production (URT, 2014).

The smallholder agricultural sector provides 95% of the national food requirements while approximately 83% of individuals live below the basic needs poverty line (NBS, 2011). The study was conducted in the Chamwino District of Dodoma Region and Kilosa District, Morogoro region, in Tanzania. The two regions represent the majority of farming systems in Tanzania (USAID, 2008). The Dodoma Region is particularly sensitive to food insecurity, whereas Morogoro has both food-insecure and food-secure areas. The Chamwino District is located between latitudes 5°0'0"S to 7°30'0"S and between longitudes 34°00'0"E to 36°30'0"E. Kilosa is located between latitudes 6°0'0"S to 7°50'0"S and longitudes 36°30'0"E to 37°30'0"E (Fig. 2). Four villages were purposefully selected for the study, two from each district. The selection of villages was based on agro-ecological zones, food security (Liwenga 2003; Mnenwa and Maliti, 2010; Mnimbo *et al.*, 2017) dimensions, and access to markets. The selected villages were Idifu and Iloilo in Chamwino District, and Changarawe and Ilakala in Kilosa District.

The villages Ilakala and Changarawe are located in the semi-humid (600-800 mm) Morogoro Region. Morogoro region is characterised by flat plains, highlands and dry alluvial valleys with mainly loamy soils. The long-term rainfall starts in February and continues into May. The short-term rain season lasts from October until December with much lighter and unreliable rainfalls compared to the long-term rainy season. Agriculture is the main economic activity, and most people engage in farming of both subsistence and cash crops, partly with livestock (Shindler, 2015). The cropping systems are primarily based on maize, sorghum, legumes, rice and horticulture. Sesame and sunflower are major cash crops that are grown by smallholder farmers (Mnenwa and Maliti, 2010). Farmers use mainly animal powers for tillage, but tractors are also used by very few farmers. There is a lack of transformation and value-adding infrastructure, such

as oil milling machines. The village Changarawe has relatively good market access and is relatively better off in terms of food availability, whereas Ilakala has relatively poor market access and has exceedingly severe problems of food security.

The other two case study villages, Iloilo and Idifu, are situated in the semi-arid Dodoma region, located on the central plateau of Tanzania. The landscape in Dodoma is characterised by flat plains and only small hills. Rainfall (350-500 mm) in this climate is unreliable (Shindler 2015; Mnenwa and Maliti; Graef, 2014). The food system is primarily based on sorghum and millet, with a long history of livestock husbandry (Mnenwa and Maliti, 2010). Crop production and livestock, particularly cattle, constitute the mainstay of the economy in providing income, employment and ensuring adequate food supplies. The farmers also grow sunflower and sesame as cash crops. Farmers use mainly animal power for tillage and hand hoes for field preparation. Iloilo is relatively better positioned in terms of market access compared with Idifu (Shindler, 2015). In Morogoro, 18% of men and 24% of women have never had access to education, whereas in Dodoma 33% of males and 40% of females have no education (URT, 2011). Dodoma has the highest rate of stunted under-fives (approximately 80%) among regions in Tanzania. The level of child stunting in Morogoro is slightly above the national average of approximately 60% (URT, 2011). Both regions have a low population density, with fewer than 50 people per square kilometre. The average household size in Morogoro is 4.3 people and in Dodoma 4.6 people per family (NBS, 2014). Dodoma is characterised by a higher level of outmigration compared with Morogoro (URT, 2006).

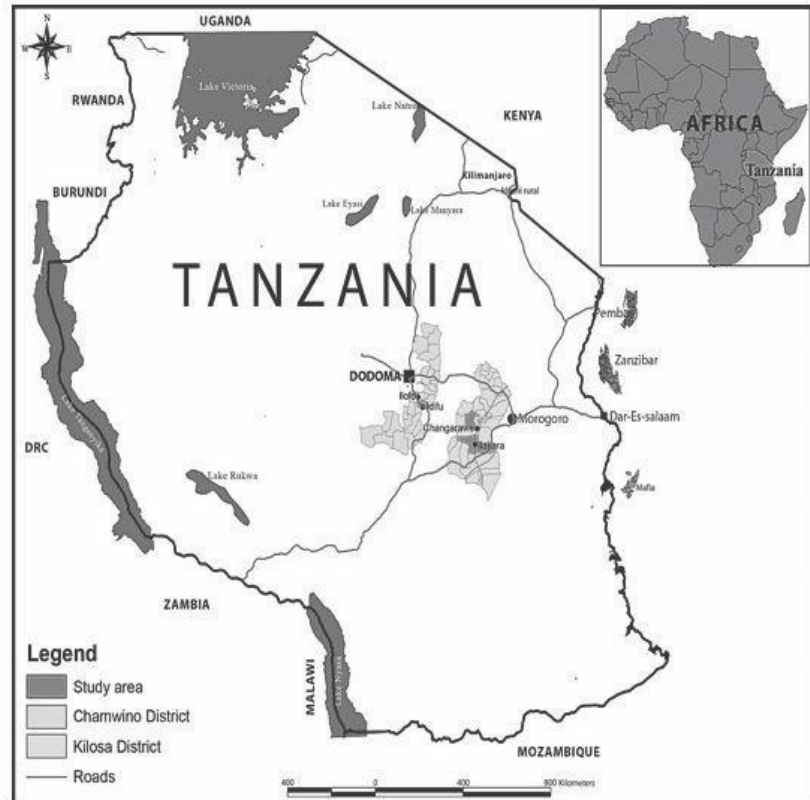


Figure 3.2: Map showing the study Districts

The study Districts Kilosa is located in Morogoro (Changarawe and Ilakala villages) and Chamwino District is located in Dodoma consisting of Iloilo and Idifu villages.

3.5 Research Design

The study which this paper is based used a cross-sectional research design whereby data were collected once using a mixed methods approach. According to Creswell and Clark (2011), a mixed method is an approach that allows collection, analysis and triangulation of information, from both quantitative and qualitative data in a single study or program of inquiry. In addition cross-sectional designs are well suited to describing variables and patterns of their distribution (Hulley *et al.*, 2013).

3.6 Data Collection

Both quantitative and qualitative data were collected. In collecting qualitative data, a total of 32 focus group discussions (FGDs) administered on the 4 UPS group, gender desegregated making a total of 8 focus group per village (4 villages). Each focus group had 12 participants. The study used three contrasting approaches namely a) a participatory stakeholder approach using FoPIA (Framework for participatory impact assessment tool; (Morris *et al.*, 2011) b) Scientific expert based approach using ScalA-FS (Graef *et al.*, 2016) and (c) The Gender Analysis Matrix. The above approaches are briefly described below.

3.6.1 Scala-FS

Although criticisms of top-down approaches and over-reliance on expert knowledge have been around for some time, methods that measure the differences between local and scientific knowledge remain under-developed (Onianhod *et al.*, 2004; Chambers, 2012). The “scaling up assessment tool for food security” Scala (Sieber *et al.*, 2015) was adapted and reprogrammed to serve both the food security context and the social, economic, and environmental sustainability dimensions (Agol *et al.*, 2014; Schindler *et al.*, 2015): Also assessments such as on the UPS the food security context and the social, economic, and environmental sustainability dimensions.

3.6.2 Adapting the existing FoPIA

FoPIA was selected as the most appropriate for participatory approach on farming interventions (Morris *et al.*, 2011; König *et al.*, 2012; König *et al.*, 2013) (Schindler *et al.*, 2015) FoPIA has not yet been systematically applied at farmers’ level or in the food security context. Therefore, it was further adapted it to the needs. Originally, FoPIA

was developed for land-use policy impact assessment among policymakers in Europe (Pérez- Soba *et al.*, 2008; Helming and Pérez-Soba, 2011). The framework was described in this regard by Morris *et al.* (2011). At the same time, the FoPIA framework was adapted by König *et al.* (2010) and further developed for application in the development context (König *et al.*, 2012; Purushothaman *et al.*, 2012; König *et al.*, 2013). FoPIA provides a series of methods for conducting sustainability impact assessment by following three consecutive steps: 1) scenario development (case study selection, problem definition, scenario narratives of policy induced land management options); 2) specification of the sustainability context (analysis of land use functions, development of land use function assessment criteria); and 3) scenario impact assessment (impact assessment with and without trade-offs) (König *et al.*, 2012).

In order to be applicable at farmers' level, the existing FoPIA was adapted and modified consisting of only two main steps: 1) analysis of the geographical and food security context and 2) impact assessment of local food security upgrading strategies. In this study, we present the result obtained from the refinement of the first part of FoPIA, which addresses criteria development for application at the community level, particularly with smallholders to elaborate food security criteria.

This newly developed tool named ScalA-FS (Scaling up Assessment Tool for Food Security) and FoPIA were used for expert-based ex-ante impacts assessments on a) social criteria such as on food diversity (sufficient, safe, nutritious food); social relations (socio-cultural acceptance); and working conditions (working hours and quality), b) economic criteria such as on production (agricultural yield i.e. kg/ha); income (household income); and market participation (surplus sold in markets or inputs purchase), c) environmental criteria such as on soil fertility (chemical soil

properties); available soil water (available water for plants over the growing season); agro-biodiversity (Number of crops and wild species). The assessment scale ranged from -3 to +3 (-3 very high negative impact, -2 medium negative impact, -1 small negative impact, 0 no impact, +1 small positive impact, +2 medium positive impact, +3 high positive impact), while the experts were asked how UPS affected the criteria and its related indicators (y) in Dodoma/Morogoro.

3.6.3 GAM (Gender Analysis Matrix)

This tool was developed by Rani Parker in 1993, and it aimed at helping determine the impact development interventions have on women and men, by providing a community-based technique for identifying and analyzing gender differences (Candida, 2003). The GAM tool was used to collect data by looking based impact on four major areas: labour, time, resources (considering both access and control), and socio-cultural factors. The information on impact was collected focusing on women, men, households, and community. Food securing UPS were selected through a participatory process involving both local subsistence farmers and experts (Table 1).

13 food Value Chain-upgrading strategies were selected (This process involved screening and inventorying of UPS in Morogoro and Dodoma regions (the case study sites (CSS), the expert-based specification and prioritization of UPS, and finally the stakeholder-based prioritisation of 13 UPS for implementation and testing. The later ones were used for this ex-ante impact assessment.

Table 3.1: Upgrading strategies across FVC components and their selection (√) in different climate regions

Upgrading strategies	Sub-humid region	Semi-arid region
Rainwater harvesting (RWH): in-situ RWH using tied ridges in the sub-humid region and infiltration pits in the semi-arid region (Mahoo <i>et al.</i> , 2012)	√	√
Improved processing devices: mobile maize shelling machines in sub-humid region and millet shelling machines in the semi-arid region including participatory business plans for investment and pay-offs (Mejia, 2003)	√	√
Household nutrition education: increase awareness of nutrient-rich including indigenous foods, and making better use of these crops to improve nutritional status especially of under-five children (Roy <i>et al.</i> , 2005).	√	√

3.6.4 Identification of the food criteria

This present study supports the need to link sustainability and food security in agricultural development (IAASTD 2009; Cavatassi 2010; FAO 2013). The criteria are related to the 4 internationally recognized food security dimensions (WFP 2013, 2014) All four food security dimensions (availability, access, utilisation and stability) were represented by the locally identified criteria, most being related to “access” and “stability”. A total of 13 food security criteria were identified by the farmers across the Ilakala, Changarawe, Idifu and Ilolo villages structured along the three dimensions of sustainability i.e. social, economic and environmental (Table 3.2). Three criteria (food diversity, social relations and working conditions) represent the social dimension while (yield, income and market participation represent the economic dimension.

Three criteria (soil fertility, soil water and agro-diversity) represent the environmental dimension. This alignment shows that rural communities think holistically and consider multiple criteria and dimensions when assessing their particular food security situation

(Millstone *et al.*, 2010). Organising the criteria along the three sustainability dimensions (social, economic and environmental) facilitated a structured analysis and helped to identify which dimension, social, economic or environmental, was given the highest priority for improving food security and therefore highlighting the need to consider all three dimensions to find solutions (López-Ridaura *et al.*, 2002; Schindler *et al.*, 2015; Hacking and Guthrie 2008; Bond and Morrison-Saunders 2011; Bond *et al.*, 2012).

Literature from FAO (2008) suggests that it is important to link the criterias to food security dimensions because all criterion must be fulfilled simultaneously and most of these criteria could not be simply attributed to a single food security dimension. For example: regarding the farmers' definition, interrelations between the dimensions, e.g, the criterion soil fertility is related to the two dimensions availability and stability. Each local community does not set the same priority for each dimension. The criteria, as indicated by the farmers, demonstrate the close interrelationship between sustainability and food security.

Table 3.2: Food security criteria and explanation (adapted from Schindler *et al.*, 2015)

Criteria	Sustainability dimension	Definition (FoPIA, ScaA-FS)	Definition (GAM)
Yield, production	Economic	Amount of food produced and available for family consumption and for selling	Labour provider (s) (male/female)
Income	Economic	Family financial resources earned from agricultural production and off-farm activities	Distribution of earned financial resources from agricultural production and off-farm activities.
Market participation	Economic	Selling and buying agricultural products and other needs; knowledge of market prices for improved negotiation power of farmers towards buyer	Who participate in marketing (men and women) and how much time they use in marketing activities.
Food diversity and availability	Social	Sufficient number of meals (=3) per day offering a diversified and balanced diet	The contribution of men and women in increase or decrease of food (assurance of three meal a day)
Social relations	Social	Community support during family need (i.e. drought, family incidences such as illness, death). Family support and understanding of decision-making about households resources	How will the relationship between men and women be affected due to different UPS
Working conditions	Social	Access to appropriate technology/equipment and agricultural practices, reducing working hours and workload	Amount of hours spent by men and women in agricultural activity
Soil fertility	Environmental	Quality of the soil for agricultural production	Not defined
Water availability	Environmental	Soil water availability for agricultural production	Not defined
Agrodiversity	Environmental	Cultivation of crop variety for family consumption and for selling; risk management in case of crop failure	Not defined

3.7 Data Analysis

The data from FoPIA and ScalA-FS were analyzed with IBM SPSS statistics 22. The arithmetic average for each region and each criterion were calculated to find the arithmetic average. Minimum and maximum scoring values of the assessed impacts for all selected UPS. The assessment results for each criterion were numbered on a Likert scale were ordinal scaled from 0 to 3. The scoring results could therefore be considered as quasi-metric (Lisch, 2014). Since the study villages had non-normal distribution, the nonparametric Mann-Whitney U test was used to analyze similarities and differences.

3.8 Results and Discussion

The three upgrading strategies (Rain water harvesting, nutritional education and kitchen gardening, and shelling/threshing machines (improved processing) and food security criteria were analyzed across the three methodological tools (Scala-FS, FoPIA and GAM) analyzing farmers responses sex wise (men and women) and comparing the two case study areas Morogoro and Dodoma.

3.8.1 Rain water harvesting

3.8.1.1 Scala-FS

Expert based ratings on RWH differed widely between all criteria ranging from low negative impact (working conditions) to high positive impact, with soil water, crop yield, food diversity, income, and social relations being given highest ratings. The economic criteria ratings for income and market participation differed between male and female scientists, with females giving generally lower ratings than males both in Chamwino and Kilosa, although this was not statistically significant (Table 3). This variation might be due to female scientist doubting this UPS can bring about a high stipulated change of

income. Result on the study conducted in Kenya by (Nyamieri, 2013) revealed that the rainwater harvesting technology is seen by the community members to be a good initiative in improving agricultural practices in periods of water scarcity. However, the technology's sustainability and wide spread adoption seems unlikely, as its success is mainly directed and depended on the social factors. Similar results were observed by (Cosyns *et al.*, 2013). Among social criteria, there were rating differences for both regions in social relations and on working conditions with female scientists even indicating a slight negative impact on the latter (Table 3.5). This difference might be due to the thought of increment of workload brought about by the activities /technologies in RWH with preparation of tied ridges. The environmental criteria for RWH did not differ between the sexes (Table 3.7) except for agro-diversity in both regions (significant difference for Chamwino, $p = 0.05$).

The ratings differed between sexes of the respondents ($p=0.05$) background of expertise (scientists and farmers) and the preference in the UPS were evident in the ratings. The hypothesis on the difference in ratings by the scientist and the farmers is the difference in the community knowledge whereas the farmers were giving an indigenous based knowledge and the scientist the expert based. The SDs in most cases was higher among the male scientist, especially for working conditions and agro-diversity, indicating somewhat more contrasting perceptions on the RWH impacts.

Farmer based ratings on RWH were mainly based on social and environmental criteria, with soil water, food diversity, agro-diversity, soil fertility and social relations being ranked to have high positive impact. On the economic criteria, there is a slight difference between sex on income in Chamwino, with female farmers rating higher positive impact on market participation compared to male farmers

(Table 3.3). With regards to environmental criteria (Table 3.7), both female and male farmers gave overall high ratings in both districts except for agro-diversity. In Chamwino district where men gave only moderate ratings significant difference at ($p=0.05$). This difference might be caused by ecological characteristic of Chamwino (350–500mm of annual precipitation) and that men and women assuming this as a risk management opportunity in case of crop failure. The SDs in Kilosa were low except for Chamwino farmers in assessing agro-diversity (male farmers), yield (female farmers), and market participation (male farmers), indicating somewhat more contrasting perceptions in that agro-climate. According to Neef and Neubert (2011); Jacobsen (2012) and Chambers (2012) in essence, rain water harvesting can supply water to accelerate social and economic development, to alleviate poverty and generate income for rural farmers by enhancing crop yield, modifying the method of production, as well as promoting environmental conservation. The scaling up of such technology will bring about impacts to a larger community through involvement of various stakeholders.

Table 3.3: Gender related difference in impact assessment of UPS on economic criteria for case study districts Kilosa (M) and Chamwino (D)

UPS	a	Scala-FS			(1) Production yield			(2) Income			(3) Market participation								
		Female			Male			Female			Male			Female			Male		
		Mean	SD	(N)	Mean	SD	(N)	Mean	SD	(N)	Mean	SD	(N)	Mean	SD	N	Mean	SD	N
Rainwater harvesting (RWH)	M	2.2	±0.8	(6)	2.5	±0.6	(14)	1.8	±0.4	(6)	2.3	±0.6	(14)	1.5	±0.8	(6)	2.0	±0.7	(13)
	D	2.1	±0.7	(7)	2.5	±0.9	(15)	1.7	±0.5	(7)	2.2	±0.9	(15)	1.6	±1.0	(7)	2.2	±1.0	(12)
Improved processing	M	1.8	±1.3	(4)	1.3	±1.0	(14)	2.3	±1.0	(4)	2.0	±0.9	(14)	2.3	±1.0	(4)	2.4	±0.8	(14)
	D	1.8	±1.3	(5)	1.4	±1.1	(15)	2.0	±1.2	(5)	2.3	±0.7	(15)	2.0	±1.2	(5)	2.3	±0.9	(15)
Household nutrition education	M	1.1	±1.0	(7)	0.8	±0.9	(10)	0.4	±0.5	(7)	0.2	±0.6	(10)	0.3	±0.5	(7)	0.1	±0.3	(10)
	D	9.6	±1.0	(7)	0.8	±1.0	(11)	0.1	±0.4	(7)	2.6	±1.3	(11)	0.1	±0.4	(7)	0.5	±1.0	(11)
UPS		FoPIA																	
		Mean	SD	(N)	Mean	SD	(N)	Mean	SD	(N)	Mean	SD	(N)	Mean	SD	N	Mean	SD	N
Rainwater harvesting (RWH)	M	2.9	±0.32	(10)	2.6	±0.97	(10)	3.0	±0.0	(10)	2.6	±0.97	(10)	2.9	±0.32	(10)	2.7	±0.68	(10)
	D	2.0	±1.27	(11)	2.14	±0.86	(14)	2.55	±0.52	(11)	2.43	±0.76	(14)	2.64	±0.51	(11)	2.0	±1.18	(14)
Improved processing	M	2.55	±0.52	(11)	2.86	±0.36	(14)	2.0**	±0.63	(11)	2.7**	±0.61	(14)	2.36	±0.92	(11)	2.64	±0.84	(14)
	D	2.67	±0.65	(12)	2.5	±0.91	(12)	2.75	±0.45	(12)	2.17	±1.19	(12)	2.92	±0.29	(12)	2.5	±1.0	(12)
Household nutrition education	M	3.0	±0.0	(13)	2.5	±1.07	(8)	2.62	±0.77	(13)	3.0	±0.0	(8)	2.31	±1.32	(13)	2.13	±0.36	(8)
	D	2.56	±1.01	(9)	2.09	±1.04	(11)	2.44	±1.13	(9)	2.55	±0.69	(11)	2.78	(11)	(9)	2.55	±0.52	(11)

3.8.1.2 Gender analysis matrix

The gender differentiated ratings on RWH upgrading strategy, only covers economic and social criteria, whereby high ratings were given on, time invested in rain water harvest, food diversity, labour/amount of workload attained and farmer for market participation. There is high positive rating by men on economic assessment on labour, men from both districts (Kilosa and Chamwino) ranked labour higher than women although it was not statistically different. This is because, in RWH men experienced more workload than female farmers (Table 3.4). For example, it was revealed that male farmers are the ones undertaking the role of preparing the tie ridges.

Results from GAM on (Table 3.6) shows there was a highly significant difference on time used to render rain water activities for men and women in Chamwino ($p=0.05$), this is because men used more time in RWH than women. In rating the economic criteria on market participation (Table 3.3) there was a significant difference between men and women in Chamwino ($p=0.05$) where as in Kilosa men rated RWH high in market participation although not statistically significant. These differences can be assumed to be brought about by the cash crops produced using the RWH technology which sometimes is considered to be men oriented crop (Mnimbo *et al.*, 2017). According to (UNEP, 2009), in agriculture rainwater harvesting has demonstrated the potential of doubling food production by 100% compared to the 10% increase from irrigation.

On the social criteria, there was a significant difference between men and women ($p=0.05$) in Chamwino on food diversity with men rating higher than women (Table 3.5). There was a high positive assessment for men and women in both districts

on social relations although not statistically significant. This may show that women had other roles to play in the household for example, cooking, fetching water, fetching firewood and taking care of the children in the house. The SDs in few cases was higher in Kilosa for men on (Labour, time and market participation and food diversity) and slightly high for women in Chamwino on market participation and food diversity. According to Croppenstedt (2013) and Ezezika *et al.* (2013), rainwater harvesting has in many cases not only increased human well-being and ecosystem services, but also acted as a way of improving equality and gender balance and of strengthening social capital in a community.

Table 3.4: Gender related differences in impact assessment of UPS on economic criteria for case study regions Morogoro (M) and Dodoma (d) using GAM

UPS		Labour						Time						Market participation					
		Female			Male			Female			Male			Female			Male		
		Mean	SD	(N)	mean	SD	(N)	mean	SD	(N)	mean	SD	(N)	mean	SD	(N)	mean	SD	(N)
Rainwater Harvesting (RWH)	M	2.3	±0.45	(12)	2.5	±1.04	(10)	2.3*	±0.45	(12)	2.7*	±0.95	(10)	1.9	±1.67	(12)	2.5	±0.90	(10)
	D	2.4	±0.61	(30)	2.6	±0.69	(27)	2.1*	±0.44	(30)	2.7*	±0.59	(27)	1.8*	±0.56	(30)	2.9*	±0.28	(27)
Improved processing	M	1.6*	±0.71	(24)	0.9*	±0.28	(24)	1.4*	±0.88	(24)	3.0*	±0.20	(24)	0.8*	±0.71	(24)	3.0*	±0.00	(24)
	D	2.2*	±0.37	(20)	0.9*	±0.37	(20)	2.0*	±0.58	(20)	2.8*	±0.38	(20)	2.3*	±0.59	(20)	2.8*	±1.51	(20)
Household nutrition education	M	2.7*	±0.61	(28)	2.1*	±0.69	(26)	2.8*	±0.52	(28)	1.8*	±0.75	(26)	2.7*	±0.65	(28)	1.3*	±0.67	(26)
	D	2.8*	±1.37	(37)	1.9*	±1.14	(35)	2.9*	±0.28	(37)	1.6*	±1.06	(35)	2.7*	±0.88	(37)	1.0*	1.12	(35)

3.8.1.3 Comparison of ScalA-FS, FoPIA and GAM findings in relation to UPS

Comparing the three assessment tools on UPS, it was found those FoPIA farmers' ratings were mostly high and more optimistic, followed by GAM and then scientists (ScalA-FS) ratings. Also, FoPIA ratings were more homogeneous in terms of ranges of rating of the food security criterion and across the single assessing focus group discussion (lower SDs, which indicates that the data points are close to the mean because the farmer scores/ratings were different), compared to GAM and in particular ScalA-FS. This indicates that the farmer oriented tools (GAM and FoPIA) being highly rated by farmers indicates that the knowledge of ecosystem dynamics gained from historical experience become culturally embedded and are adaptive within the community (Berkes *et al.*, 2000).

3.9 Threshing and Shelling Machines

3.9.1 Scala-FS

Expert based ratings on improved threshing and shelling machines differed ranging from very low rated environmental criteria (agro-diversity) to high positive ratings with market participation, income, working condition, food diversity (for female scientist) and social relations (for male scientists) being given highest ratings. In both districts, female scientists had high ratings on threshing and shelling compared to the male counterparts in both districts (Table 3.2), this might be due to the assumption that these machines might lead to a better participation and involvement of men and women in agricultural activities and therefore lead to better production results. This was also suggested by Tibaijuka (1994) who reports that new technologies and innovations helps in improving gender roles in agriculture, i.e. lack of substitutability between men and women for certain tasks, lead to production losses in Tanzania. There was difference in ratings on social criteria (food diversity). High ratings for female and low for male

scientist although not statistically significant moreover, male scientists rated high positive on the social relation in threshing/shelling, this might be because there is more involvement of men in threshing machines activities than women and therefore the anticipation is that the social networks and relation is anticipated to be more advantageous to men than women. Contrary to this the study by Blackden *et al.* (2006) shows that the adoption and use of improved technologies is positively correlated with education but is also dependent on time constraints. There was low SDs on agro-diversity in both Chamwino and Kilosa for female scientist and high SDs on working conditions and social relations for male scientist in Chamwino.

3.9.2 FoPIA

The ratings by female and male farmers on the criteria ranged from low negative rated (soil water) by male farmers in Chamwino to high positive ratings on working condition, market participation (only female in Chamwino) and yield. Table 3 shows the economic criteria with high significance difference between men and women ratings on income associated with threshing/shelling machine in Kilosa whereby female farmers rated low positive compared to men ($p=0.01$). This indicates that in Kilosa there is less involvement of female farmers on income associated with threshing compared to men and also compared to Chamwino where female farmers had high ratings on income than male farmers, this might be caused by time constraints associated with household chores or engagement in other activities which its income comes directly to women e.g. snacks selling or tailoring. The studies by (Browne, 2006; Croson and Gneezy, 2009; Fletschner *et al.*, 2010) suggest in line this study that cultural and societal norms and family obligations limit the economic activities in which women can engage. (Table 5) shows on the social criteria there was significant difference in rating for male and female in Chamwino on food diversity ($p=0.05$)

with female being higher than male this might be because women are generally responsible for food selection and preparation and for the care and feeding of children. The GAM results (Table 3.6) There is high significance difference ($p=0.01$) in social relation, with male farmers being higher than the female farmers in Kilosa, this is because male farmers are more involved with the processing activities and have a lot to communicate and socialize about the machine compared to women for example; the mechanization of the machines, repair and market. Working condition criteria was rated high by female and male in both districts this is because of the mobility and operation of the threshing machine. The environment criteria was found to have significant negative impact for soil water in Chamwino ($p=0.05$) (Table 3.7). High SDs were observed for both sexes in Chamwino on market participation and income, for female in Kilosa and male in Chamwino on food diversity and social relation, Generally, environment criteria were found to have high SD except for Chamwino which had very low SD on soil water.

Table 3.5: Gender related differences in impact assessment of UPS on social criteria for case study regions Kilosa (M) Chamwino (D)

UPS	a	Scala-FS																	
		(1) Food diversity						(2) Social relations						(3) Working conditions					
		Female			Male			Female			Male			Female			Male		
		Mean	SD	(N)	Mean	SD	(N)	Mean	SD	(N)	Mean	SD	(N)	Mean	SD	N	Mean	SD	N
Rainwater harvesting (RWH)	M	2.0	±0.6	(7)	2.1	±1.1	(13)	1.8	±0.4	(6)	2.3	±0.6	(14)	-0.9	±1.6	(7)	0.0	±2.0	(13)
	D	1.9	±0.4	(3)	2.2	±1.0	(14)	1.0	±1.9	(6)	2.0	±1.0	(14)	-0.9	±1.6	(7)	0.3	±2.1	(14)
Improved processing	M	2.2	±0.4	(5)	1.6	±0.9	(12)	1.3	±1.7	(4)	2.0	±1.2	(12)	2.2	±1.1	(5)	2.3	±0.9	(12)
	D	2.0	±0.6	(6)	1.9	±0.7	(14)	1.3	±1.7	(4)	2.2	±0.7	(13)	1.5	±1.5	(6)	2.4	±1.1	(14)
Household nutrition education	M	2.4	±0.8	(8)	2.8	±0.6	(10)	2.2	±1.3	(6)	2.2	±0.9	(10)	1.0	±1.1	(8)	0.1	±1.2	(10)
	D	2.7	±0.6	(8)	2.9	±0.5	(11)	2.2	±1.3	(6)	2.5	±0.8	(11)	0.8	±1.0	(8)	1.9	±1.14	(11)
UPS		FoPIA																	
		Mean	SD	(N)	Mean	SD	(N)	Mean	SD	(N)	Mean	SD	(N)	Mean	SD	N	Mean	SD	N
Rainwater harvesting (RWH)	M	3.0	±0.0	(10)	3.0	±0.0	(10)	2.7	±0.48	(10)	2.9	±0.61	(10)	2.9	±0.32	(10)	2.8	±0.42	(10)
	D	2.91	±0.3	(11)	2.43	±0.76	(14)	2.55	±0.82	(11)	2.57	±0.94	(14)	2.82	±0.41	(11)	2.36	±1.84	(14)
Improved processing	M	1.73	±1.27	(11)	2.57	±0.85	(14)	1.5**	±1.37	(11)	2.8**	±0.8	(14)	3.0	±0.0	(11)	2.86	±0.36	(14)
	D	2.83*	±0.39	(12)	1.67*	±1.37	(12)	2.33	±0.99	(12)	2.33	±1.23	(12)	2.83	±0.58	(12)	2.5	±1.8	(12)
Household nutrition education	M	2.77	±0.6	(13)	3.0	±0.0	(8)	2.77	±0.44	(13)	3.0	±0.0	(8)	2.54	±0.97	(13)	3.0	±0.0	(8)
	D	2.56	±1.01	(9)	2.91	±1.30	(11)	3.0	±0.0	(9)	2.36	±0.03	(11)	3.0*	±0.0	(9)	2.45*	±0.69	(11)

3.9.3 Gender analysis matrix

The GAM ratings for men and women on threshing and shelling machines shows the low negative ranked criteria to be market participation and labour (by women) and time by men and women in Kilosa. The highly positive rated criteria include social relations, food diversity and labour and market participation (Chamwino). On the economic criteria, there was a significant different of ratings in labour, time and market participation ($p=0.05$) (Table 3.3) in Chamwino, in which there were higher ratings for male than female on the threshing/shelling machines (Table 3.4). This might mean a change of gender roles, because formally, these processing activities were done by women (Mnimbo *et al.*, 2017), other reasons could be the assumption that women are involved in other multi-dimensional activities in and outside the household and that women are more risk averse than men.

Although results from GAM shows men to use more time than women on threshing and shelling activities (Table 3.6), the findings from FAO (2013) confirm the popular perception that women overwhelmingly provide the greatest proportion of household time spent on food processing and preparation. If these aspects of food preparation are included, labour share for women could as well exceed 60 percent in many African countries and could approach 60 percent in Asian ones. Contrary to this study, Lambrecht *et al.* (2016) suggest that female participation is not conducive to promoting adoption of capital-intensive technologies, but it is for labour-intensive technologies and traditionally female-dominated crops. This may be due to the fact that men often dominate the decision making space of capital-intensive purchases, whereas women are responsible for manual tasks such as weeding and planting. In general, the SD are high in Chamwino compared to Kilosa, sex wise men had lower SD in market participation in Kilosa.

Table 3.6: Gender related difference in impact assessment of UPS on social criteria for case study district using GAM

UPS		(1) Food diversity						(2) Social relations					
		Female			Male			Female			Male		
		Mean	SD	(N)	Mean	SD	(N)	Mean	SD	(N)	Mean	SD	(N)
Rainwater	M	2.3	±0.45	(12)	2.6	±0.39	(11)	2.6	±0.7	(12)	2.5	±0.5	(11)
Harvesting (RWH)	D	1.8*	±0.59	(22)	2.8*	±0.39	(23)	2.7	±0.56	(22)	2.5	±0.51	(23)
Improved processing	M	2.0	±0.60	(12)	1.9	±0.92	(14)	2.4	±0.80	(12)	2.3	±0.69	(14)
	D	2.6	±0.51	(25)	2.5	±0.51	(25)	2.8	±0.44	(25)	2.6	±0.58	(25)
Household nutrition education	M	2.6	±0.70	(11)	2.0	±0.82	(13)	2.8*	±0.37	(11)	2.2*	±0.73	(13)
	D	2.7	±0.46	(38)	2.1	±1.19	(35)	2.9*	±0.34	(38)	2.4*	±1.64	(35)

3.9.4 Comparison of Scala-FS, FoPIA and GAM findings

In comparison between Scala-Fs, FoPIA and GAM assessment tools on processing, it was found that the farmer ratings in FoPIA were the highest region wise and also had high ratings on food security criteria, followed by GAM ratings and then the scientist ratings on Scala-FS. High SD's were in Scala-FS and FoPIA while GAM had overall very low SDs in all food security criteria (the Low SD indicates that most of the ratings were very close to the average mean).

3.10 Nutritional Education and Kitchen Gardening

3.10.1 Scala-FS

Expert based ratings on kitchen garden and nutritional education differed across the criteria ranging from low rated in environmental criteria (soil fertility, soil water and agro-diversity) and economic criteria (yield, income and market participation) and working condition, to moderate on food diversity and social relations in both regions. Table 3.7 shows there was generally low negative ratings by female and male scientist on soil fertility and soil water although not statistically significant based on chi-square. There was significant difference for female and male in Chamwino on agro-diversity ($p=0.05$) this might be because of ecological reasons (semi-aridity). The negative ratings for nutritional education and kitchen garden by scientist on the food security criteria might be caused by the anticipation that farmers may not have difficulties getting the improved seed varieties and go back to the traditional ones (sustainability). A study by (FAO, 2011; Vijayalakshmi and Thooyavathy, 2012) on the Sahelian countries (where annual rainfall is below 500 mm) shows similar observation on kitchen garden on agro-diversity by reporting that the biological diversity and complexity of home gardens decline with the transition from humid to semi-arid and arid areas. And that insufficient water is a major constraint to successful

gardening in dry areas, yet, even in these areas, crops can be kept growing through effective soil and water management. High SD was observed, for female scientist in relation to yield in Kilosa, for male scientist on market participation ,income and agro-diversity in Chamwino, for female on social relations and in general for both men and women in Kilosa and Chamwino on working conditions. Low SD on soil water and soil fertility criteria for female in both districts.

3.10.2 FoPIA

The farmer based ratings for kitchen gardening on the food security criteria ranged from low ratings on soil fertility and soil water to high ratings on agro-diversity, social relations, working condition, food diversity and income. There are different ratings between men and women in both districts whereby women ratings on yield are slightly higher compared to men although not statistically different (Table 3.3). On the environment criteria (Table 3.7), there is a negative rating for soil water for female and male farmers, which means that lack or less of water availability could affect the soil and hinder the proper growth of the kitchen garden. There is a high statistical significance between female and male farmers in Chamwino high ratings for soil water ($p=0.01$). The high ratings might be due to the dry spells in Chamwino and proximity to water sources which is quiet challenging in Chamwino compared to Kilosa. According to Keller (2012) kitchen garden depend on the natural ecology of the location, available family resources such as labor, and the skills, preferences, and enthusiasm of family members. There were high ratings for male and female farmers for working conditions in Chamwino with a significance difference of ($p=0.05$) (Table 3.3) which means the working condition might be the same for male and female. Keller (2012) points out that in some cultures, women are the sole

caretakers of kitchen gardens and the activities associated with it while, men and youth play more or less a supportive role.

There were high positive ratings for male in Kilosa for working conditions although not significant different. This might be due to the reason that female farmers work on the kitchen garden more than male and therefore they face the situations associated with kitchen gardening more. In line with these results, Howard's (2006) analysis of 13 kitchen gardens case studies in South America revealed that women are the main managers of kitchen gardens across the region because the activities are vital and fit well with their day-to-day domestic activities and employment patterns along with their cultural and aesthetic values.

The social relations (Table 3.4) were highly rated in both regions except for men in Chamwino had moderate ratings. The reason might be because in Chamwino the new species of fresh vegetables like amaranthus (*Amaranthus retroflexus*) and night shed (*Solanaceae*), African spider plant (*Cleome gynandra*) are mostly preferred compared to their traditional species example dried green- pea leaves (*safwe*) and *chiwandagulu* and also kitchen garden means less water use and less space consumed as they are also livestock keepers. Studies by (Neef and Neubert, 2011; Shindler, 2015) shows that the realities of farmers are local, complex, dynamic and diverse. SD difference between Kilosa and Chamwino where observed. Men and women in Chamwino and men in Kilosa had high SD on yield (income for women in Chamwino). Men and women in Kilosa had high SD on market participation compared to men and women scientist in Chamwino. There is high SD for men and women in both regions on soil fertility and soil water (excluding women in Dodoma on soil water) and for women in Dodoma on food diversity and social relations. Low SD were observed

on agro-biodiversity in both regions, on female farmers in Kilosa on food diversity, on female farmers in Dodoma and male farmers in Kilosa on social relations and working condition.

Table 3.7: Gender related differences in impact assessment of UPS of environmental criteria for case study regions Kilosa (M) and Chamwino (D)

UPS	a	Scala-FS			(2) Social relations						(3) Working conditions								
		(1) Food diversity			Male			Female			Male			Female			Male		
		Mean	SD	(N)	Mean	SD	(N)	Mean	SD	(N)	Mean	SD	(N)	Mean	SD	N	Mean	SD	N
Rainwater harvesting (RWH)	M	1.6	±0.5	(5)	1.3	±1.4	(13)	2.3	±0.8	(6)	2.8	±0.8	(14)	-0.8	±0.8	(5)	1.7	±1.2	(12)
	D	1.3	±0.5	(5)	1.4	±1.3	(14)	2.4	±0.8	(7)	2.7	±0.5	(15)	-0.5*	±0.8	(6)	1.7*	±1.3	(13)
Improved processing	M	0.5	±1.0	(4)	0.4	±1.0	(12)	0.3	±0.5	(4)	0.2	±0.6	(12)	0.0	±0.0	(4)	0.3	±0.7	(12)
	D	0.4	±0.9	(5)	0.2	±0.6	(13)	0.2	±0.4	(5)	0.2	±0.6	(13)	0.0	±0.0	(5)	0.1	±0.3	(12)
Household nutrition education	M	0.0	±0.0	(7)	0.4	±0.8	(10)	0.0	±0.0	(7)	0.4	±0.8	(10)	0.4	±0.8	(7)	1.0	±0.7	(10)
	D	0.0	±0.0	(7)	0.3	±0.7	(10)	0.0	±0.0	(7)	0.4	±1.0	(10)	0.3*	±0.8	(7)	1.2*	±1.1	(10)
UPS		FoPIA			Male			Female			Male			Female			Male		
		Mean	SD	(N)	Mean	SD	(N)	Mean	SD	(N)	Mean	SD	(N)	Mean	SD	N	Mean	SD	N
Rainwater harvesting (RWH)	M	2.9	±0.32	(10)	2.7	±0.95	(10)	3.0	±0.0	(10)	3.0	±0.0	(10)	2.9	±0.32	(10)	2.9	±0.32	(10)
	D	2.91	±0.3	(11)	2.86	±0.36	(14)	3.0	±0.0	(11)	2.93	±0.27	(14)	3.0	±0.0	(11)	2.3*	±1.12	(14)
Improved processing	M	1.64	±1.21	(11)	1.5	±1.45	(14)	0.91	±1.38	(11)	1.71	±1.54	(14)	1.64	±1.43	(11)	1.93	±0.39	(14)
	D	1.67	±1.44	(12)	3.75	±1.36	(12)	1.2**	±1.34	(12)	0.0**	±0.0	(12)	2.25	±1.14	(12)	2.08	±1.38	(12)
Household nutrition education	M	0.69	±1.32	(13)	1.88	±1.55	(8)	0.69	±1.32	(13)	1.5	±1.6	(8)	3.0	±0.0	(13)	3.0	±0.0	(8)
	D	0.67	±1.32	(9)	0.73	±1.27	(11)	0.7**	±1.32	(9)	2.6**	±0.93	(11)	2.78	±0.68	(9)	3.0	±0.0	(11)

3.10.3 Gender analysis matrix

The ratings among the five criteria on kitchen garden range from highly rated social relations, food diversity and labour (for female in Kilosa and Chamwino) and Low ratings for male farmers on time aspects and market participation in Kilosa and Chamwino. In Chamwino men ratings were negatively low on labour, which shows that women performed more tasks associated in kitchen gardening (Table 3.3). A study by Keller (1999) reported that all Tanzanian societies have proverbs on gender relationships. One example is from Tarime: “The wife is the most important implement in the house which is supposed to be used intelligently and wisely” this might be the case in Chamwino. There is a significance difference in ratings between men and women on social relations in both regions ($p=0.05$) (Table 3.5) with women rating high compared to men. The reason for the high ratings on the mentioned criterion is that societal and cultural norms may impose on women the role of ensuring adequate share of food among household members and that women opt to spend more time in their kitchen gardens in order to be relieved of the drudgery of travelling a distance of 6-10 kms to buying vegetables or waiting for the bicycle-vegetable vendors to pass by which is never certain. Similar results were observed on studies by FAO (2011), Quisumbing and Pandolfelli (2010) where as kitchen gardens were reported to have become a source of strengthening family and social bonding because men and women help each other to take care of the pocket garden in the household and they exchange vegetables with neighbours and sometimes helping them earn reasonable income. High SD's were observed for men in Dodoma on labour, time and market participation and on food diversity.

3.10.4 Comparison of Scala-FS, FoPIA and GAM findings

Tool wise overall rating for nutritional education and kitchen gardening UPS, shows the farmer oriented tool (FoPIA) had high ratings followed by GAM and the scientist ratings (Scala-FS) on the food security criteria. Lower SDs were observed in GAM tool while Scala-FS and FoPIA had high SD interchangeably between districts and sex inducing a high hypothesis support upon issues discussed between men and women.

3.11 Synthesis of all UPS Impact Assessments

3.11.1 Gender oriented findings across food criteria and UPS

The ratings of in Chamwino and Kilosa study sites on food criteria and UPS were found to be gender and geographical specific (Mnimbo *et al.*, 2017). In Chamwino results show the highly rated food criteria to be economic and social criteria. The two criterions were rated high on the UPS that involved social interaction of activities and that have direct connection with income, time or yield. For example; women highly rated social criteria on (nutritional education and kitchen gardening) for example; there 8 high ratings in all of the expert based Scala-FS tool and 4 of these ratings are on social criteria rated by men followed by economic criteria (on threshing/shelling machine) rated highly by men on time used to perform the activity and labour compared to women.

The processing activities like threshing, shelling and winnowing, which were traditionally done by women in both districts (Mnimbo *et al.*, 2017) are now done by men because of the invasion of machine. Similar results were observed by (Farnworth *et al.*, 2016) that when there is a new technology the gender roles change. The reasons for the above ratings on food security criteria can be assumed to

be due to ecological reasons (on the environmental criteria), the community observation on the importance of cultural interactions and socialization and financial, time and infrastructural aspects.

3.11.2 Difference in tool specific findings

There are interesting differences between the two ex-antes (Scala-FS and FoPIA) and the ex-post tool assessment (GAM). FoPIA and GAM to had similar high assessment across the food security criteria. The Scala-FS generally shows lower ratings on all three UPS most especially in nutritional education and kitchen gardening, FoPIA and GAM had higher ratings in nutritional education and kitchen gardening and RWH, threshing and shelling machines were moderately rated in these two tools. Interestingly for Scala-FS, all the high rated food criteria on the UPS were rated by male scientist (soil water, food diversity and yield) except for food diversity which was ranked high by female scientist in Chamwino. In the GAM and FoPIA tools male rank processing high than women. According to (Quisimbing, 2014: Farnworth 2016). A holistic approach toward addressing food security enables the understanding of local meanings and might reveal important and unnoticed aspects of resource allocation, as well as provide guidance for initiatives that seek to provide locally relevant approaches to improving gender equity.

3.11.3 Methodological findings

All three methodological approaches Scala-FS, FoPIA and GAM supported a constructive and interactive way that enables getting both the perspectives from scientific expert and from the actual farmer on the ground, and as such they complement each other. With the combination of the gender based tool like GAM, the study is enriched by enabling to capture the inter-household and

intra-household perspectives. Bringing into a context a gendered lens is of essential because otherwise unsound gender analyses can miss the point, resulting in flawed understanding of the real issues and ineffective or even damaging interventions (Coles and Mitchell, 2010). Essentially the tools were based on cross-sectional data to the exclusion of time series, and presented static ex ante and ex post gender information on food security criteria and on the UPS consequently, but the tools failed to adequately project the impacts of the UPS on food security over a longer time horizon. As noted by some experts, however, changes in intensity of production and improvement of food security are best evaluated over time and at locations where UPS (like the threshing/shelling machines and the use of RWH) use and density have established a mature equilibrium (Jones *et al.*, 2013). The study did not quantify the benefits from non- agricultural use of the technologies (threshing/shelling machines, kitchen garden and RWH) for example supplementary income from machinery hiring services, this is because non-agricultural use of equipment is essential in order to ensure utilization rates that justify the required capital investments (Vink, 2012).

3.12 Conclusions and Recommendations

The tools used in this study were found to complement each other and bring out the ways in which different representations of the community (farmers) and scientist (expert) are organized, and socially influenced make them useful for understanding the food security criterion (economic, social and environmental). The use of holistic participatory approach in food security is crucial because food issues are context specific; communities have their own priorities in improving their livelihood situations and so do's scientist.

It was observed in the present study that economic and social criteria were highly rated by the farmers implying that farmers tend to rate higher the criteria involving the UPS that involved social interaction of activities and that have direct connection with income or yield. Generally, the food criterion are found to be interrelated and it was observed that gender wise farmers favor /adopt to what is perceived to have causal-effect connections to them as individuals (for example, to increases in future income streams, evidence on productivity which in turn might lead to being food secured and reducing workload). Furthermore, the intentions to reduce food insecurity which may or may not coincide with these predicted outcomes may create positive or negative feedback, which would either support the adoption of successful upgrading strategies or create individual change respectively.

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CHAPTER FOUR

4.0 Commercialization of Food Crops by Gender: A Case of Chamwino and Kilosa Districts, Tanzania

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4.1 Abstract

Commercialization of agriculture is that targeting markets in their production decisions and socio-economic situation, rather than being related simply to the amount of product they would likely sell due to surplus production. With asset ownership, women are disadvantaged because of the existing traditional gender disparities on ownership and control of resources. Assets are said to be one of the important determinants of household commercialization yet, the intersection between men and women's asset endowments and their ability or why they commercialize food crops receives minimal attention. The present study aimed at analyzing the relationship between asset ownership and commercialization of food crops. Specifically, it aimed to analyze how gendered social-economic dynamics and how they are associated in food crop commercialization; assess male and female asset ownership in relation to food crop commercialization and analyze household wealth and commercialization. Results show that having assets such as mobile phones, radios and bicycles does not guarantee

commercialization while having assets such as livestock and land are positively associated with commercialization. Results further show that, households with 1-5 working age members are more likely to commercialize food crops compared to those with more (6-13) members. Results show that both the in sub-humid Kilosa and semi-arid Chamwino, male headed households (MHH) are wealthier than female headed households (FHH). It is concluded that it is not always the case that women do not commercialize food crops and that they are mostly adjuncts to their spouses and male-kin but rather, they can also actively participate in commercialization. It is also concluded that, wealth status determines food crop commercialization. It is concluded that FHH are not negatively affected in food crops commercialization by not owning communication assets. The study recommends that more research be conducted on how FHH use their assets based on their wealth groups and asset ownership in relation to commercialization. To enhance commercialization benefits, the government need to socio-economic constraints encountered by smallholder farmers by establishing functional markets and market information. On asset ownership, the study recommends strengthening rural womens potential to access and own productive assets by giving non-formal and formal education to boost confidence and skills for better negotiation and bargaining at household level.

Key words: Gender, Asset ownership, Wealth, Commercialization, Food crops.

4.2 Introduction

It is well recognized that ownership of assets improves the lives of women and men who own and control them (Roy *et al.*, 2015). It has also been reported that, just like inequalities with regard to income and consumption, inequalities also exist in distribution of assets, not only between the rich and the poor, but also between men and women, across regions and communities (Quisumbing, 2013). In addition, literature (Doss, 2013; Roy *et al.*, 2015) shows that livelihood strategies such as market-oriented agriculture and

commercialization have a strong intersection with asset endowments and the ability to participate in and benefit from agricultural interventions however, commercialization with a gendered lens has received minimal attention.

In addition to the dissimilarities in ownership of assets, men and women also use their assets differently, which has implications on a household's well-being, in particular food security, nutrition and education (Quisumbing, 2015). According to (Meinzen-Dick *et al.*, 2011; Roy *et al.*, 2015; Quisumbing, 2015; Scott and Shu, 2017), closing the gap between men's and women's ownership of assets is not only important for women's empowerment and well-being but is also a necessary step towards achieving the Sustainable Development (SDGs) Goal 5 which focuses on women and girl empowerment that are deeply rooted to counter gender-based discrimination that results from patriarchal attitudes and related norms. Other SDGs include reduced inequalities, quality education, responsible consumption and production and reduced gender inequalities. Generally, there is a shared understanding that failure to address disparities between male headed household (MHH) and female headed household (FHH) leads to limited effectiveness in agriculture development and has serious cost implications in achieving gender equality which may hinder achievement of better development outcomes that are aimed at reducing gender gaps in assets (Michelson, 2013; Roy *et al.*, 2015; Scott and Shu, 2017).

The present study's focus on assets rather than income is due to recent research which has recognized the critical role of assets in both accumulating wealth and managing vulnerability. Generally, assets are fundamental to smallholder farmers' livelihoods, thus, there is a growing interest in understanding how assets for example; Land, help these farmers expand production and successfully engage with agricultural markets in the developing world (Johnson *et al.*, 2016). Literature (Scott and Shu, 2017), shows that

there has been minimal focus on the intersection between women's and men's asset endowments and food crop. The commonly accepted concept of household commercialization is that targeting markets in their production decisions and socio-economic situation, rather than being related simply to the amount of product they would likely sell due to surplus production (Pingali and Rosegrant, 1995; Scoones and Tsikata, 2017).

Commercializing smallholder agriculture is an indispensable pathway towards economic growth and development for most developing countries relying on the agricultural sector (von Braun, 1995; Pingali and Rosegrant, 1995; Mamo *et al.*, 2017). Despite the fact that most smallholder farmers in Africa grow food crops, there are limited empirical studies focusing on their commercialization (Carletto *et al.*, 2017). In Tanzania, there is a need to look on the food crop commercialization because in Kilosa District, which is reported to rank highest with regard to commercialization in Morogoro region, only 26% of the 73 730 households surveyed participated in crop sales (URT, 2012). Food crops are assumed to be used only for home consumption whereas households are considered as net sellers in the cash crop output markets and net buyers in the input markets for cash crop (Urassa *et al.*, 2015). However, some studies (Jaleta *et al.*, 2009; Carletto *et al.*, 2017) reveal that these situations are far from reality as food crops are also marketed and households could also take any position in their food crop output commercialization participation.

In Tanzania, the production of food crops has been experiencing an increasing commercialization over the past five years (Kissoly *et al.*, 2017). This involves the shift from staple food crops production to market (trade) purposes. A review of case studies conducted in 10 countries in Africa, Asia, and Latin America found that food crop

commercialization increased household incomes in most cases, as a result of increased labour and land productivity on farms as well as increased employment opportunities for hired labour (Von Braun, 1994; Forsythe and Martin, 2016). Hence there is a strong case for promoting food crops commercialization while seeking to ensure that the benefits and costs of the process are equitably distributed (Agwu *et al.*, 2012; Altieri, 2017). Furthermore, gaps in the literature still exist particularly in comprehensive and concurrent results on the extent and drivers of the food crop market participation at a household level and across different socio-economic and agro-ecological zones (Kirui and Njiraini, 2013).

The present study analysed gendered socio economic characteristics influencing participation in food crop commercialization, analysed different wealth categories in relation to food crop commercialization and the influence of households' assets ownership on food crop commercialization by gender. The study's conceptual framework (Fig. 3.1) shows the importance of looking at ownership, control and access to assets at the household level, but also highlights the gendered character of asset ownership, recognizing that men and women not only control, own, or dispose of assets in different ways, but also access, control, and own different kinds of assets and could therefore lead to different levels of commercialization. This study adapts the definition of asset from Carter and Barrett (2006) who defines assets as "conventional, privately held productive and financial wealth, as well as social, geographic, and market access positions that confer economic advantage". Moreover asset can be "anything tangible or intangible that is capable of being owned or controlled to produce value and or held to have a positive economic value.

Assets represent value of ownership that can be converted into cash (although cash itself is also considered an asset) (Sullivan and Sheffrin, 2003). The current study

categories assets based on the Sustainable Livelihoods Framework, which includes five types of assets which are natural (land, water), physical (agricultural and household durables), financial (cash or savings), human (knowledge, skills), and social (group membership, social networks). Generally, these capitals underlie the ability of households to engage in livelihood strategies (Scoones, 1998).

The choice of whether to commercialize or not is caused by farm factors for example, yield and other factors such as time, off-farm work and infrastructure. In addition, literature (Gebre-medhin *et al.*, 2007; Jaleta, 2010; Mitiku, 2014; and Carletto *et al.*, 2017) embark on commercialization of food crops to be affected by different socio-economic characteristics such as age, education, farm size, ownership of some assets and output which in their studies were observed to have positive effect on market participation of various agricultural commodities. The current study assumes commercialization of food crops to be influenced positively or negative by different socio-economic and demographic factors. For example; age and a household's involvement in non-farm income are assumed to have a negative influence on commercialization while household labour, use of credit, access to market information, education and sex are assumed to have a positive influence on the same. The study assumes that age might have a negative influence on commercialization such that; younger household heads may be more market oriented compared to their older counterparts. Moreover, access to non-farm income may influence commercialization. The above assumptions are in line with literature (Okozie *et al.*, 2012; Ousman and Hossain, 2015), which reports that socio-economic characteristics influence crop commercialization. The present study acknowledges that some of the socio-economic factors do influence food crop commercialization, for example sex, economic status and family size.

4.3 Study's Theoretical Framework

The current study is guided by the neo-classical theories in which two models have been adopted, the multi-person household model and the household-farm models. The multi-person model is based on competitive assumptions for male and female agricultural workers from farm and non-farm households while the household-farm models focuses on small-scale, low productivity agriculture, frequently operating under marginal conditions and the household-operated commercial farms producing food for both domestic consumption and agro-industry and export markets. These models were adopted because they are good in the description of farming systems for which most rural populations in the developing world earn their living from. In addition, the models were a good fit to guide the study's objectives.

The neo-classical framework through the multi-person model assumes the household to have a utilized market (for pay) labour supply behaviour and this should be in two-person households (in the case of the current study, the FHH and MHH). The model further looks into households owning land, which make up a major portion of rural households, and the comparison of landless and landholding which assumes that they will not have the same advantage in food crop marketing. Household-farm models assume household assets and budgets to be endogenous and depending on production decisions that contribute to income through farm profits. The household-farm model further assumes the household to obtain perfect substitutes for family labour in local labor markets and it can sell its own labour at a given market wage which can increase production (and demand more labour) while at the same time consuming more leisure, by hiring workers to fill the resulting excess demand for labour (Barnum and Squire, 1979). However, the household-farm is both a consumer and a producer of food. As a consumer, it is adversely affected by a higher food price, but as producer, its profit from food production increases.

This adds a positive “farm profit” effect to the negative effects on food demand, pushing the budget constraint outward (Squire and Strauss, 1986). Moreover, Griffin (1986) used the household-farm model to analyze the influence of households’ economic characteristics (wealth) through household socio-demographic characteristics (e.g., education and sex-composition) and the results showed that they are linked.

The model further explains that households, like countries, are better off with access to food crop markets than without, the model further suggests that Intuitively, missing markets impose constraints on households. However, the disadvantage of the model is that, it assumes that preferences and incomes are shared by all household members equally. Nonetheless, the reality is income and preferences are not shared equally within the household because men and women are reported to have different shares (Forsythe and Martin, 2016). This was not included in the study although the theory that fits in intra household dynamics and commercialization is the patriarchal theories using the collective model.

4.4 Research Methodology

4.4.1 Description of the study area

The study was conducted in Chamwino District-Dodoma which in this study is regarded as a semi-arid area and Kilosa District-Morogoro which is regarded as sub-humid Kilosa (Fig. 4.1). The semi-arid Chamwino District was selected due the presence of the Kibaigwa maize international grain market to see whether presence of the market has somehow influenced smallholder household’s commercialization of food crops such as maize. Four villages were purposively selected for the study, two from semi-arid Chamwino and two from Sub-humid Kilosa.

The selection was based on their agro-ecological zones, and market access, levels of food crop commercialization, availability of infrastructure, and accessibility to regional markets thus a good possibility for comparison.

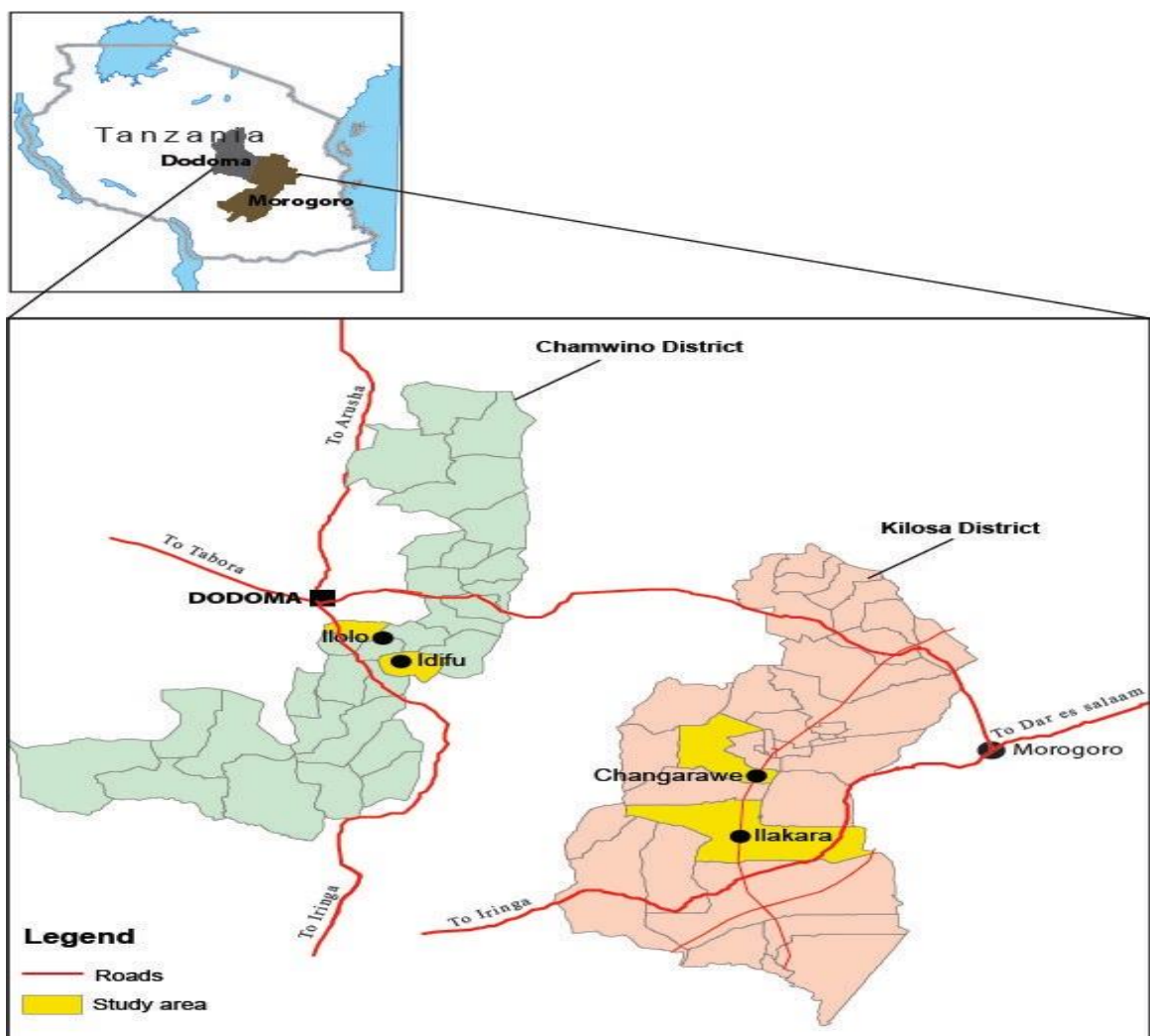


Figure 4.1: The study districts and villages

4.5 Sampling of Households

The study areas were purposively selected while the households were randomly sampled from availed village household lists. The lists contained information of the names of household heads as per their sub-village. In each village, a proportionate sample of 150 households was selected from each of the 4 villages to make a total of 600 households from the two study areas. However, data was only collected from 594 households as 6 of the household heads were not available during the actual data collection.

Table 4.1: Gender category of the household head (n=594)

Categories	Sub-humid	Semi-arid
Female headed household (FHH)	58	70
Male headed household (MHH)	241	225
Total	299	295

4.6 Data Collection

The study adopted a cross-sectional research design whereby data were collected using a mixed methods approach. Thus, both quantitative and qualitative data were collected. The survey was conducted in February 2014. A range of data typologies was collected. These include household-related activities and resources (e.g. agriculture, off-farm activities and assets). Qualitative data were collected through focus group discussions (FGDs) in this regard a total of eight FGDs were conducted, four per each of the two study districts: the FGD's involved separate groups of men and women, with each group having 12 participants. Asset based wealth Index was used to collect wealth related information for household economic status. Generally, a household's ranking on the wealth index indicates to what extent the household possesses a basic set of assets, valued highly by the people (Smits and Steendijk, 2015). For example, a household's possession

of durables, access to basic services, and characteristics of the house in which it is living were considered in allocating a household to a particular wealth index.

4.7 Data Analysis

4.7.1 Construction of the wealth index

The study employed the household asset Indicator method as per Filmer and Pritchett (2001). As suggested in the literature, all variables were first dichotomized (1=Yes, 0=No) to indicate the ownership of each household asset (Vyass and Kumaranayake, 2006). Weights (effectively defined by factor scores) for each asset were computed separately for men and women. In order to make weights on wealth non-arbitrary and replicable, they were calculated systematically, based on the Principal Component Analysis (PCA) method. The estimation of relative wealth using PCA is based on the first principal component.

$$y_i = \alpha_1 \left(\frac{x_1 - \bar{x}_1}{s_1} \right)$$

The first principal component y yields a wealth index that assigns a larger weight Where, \bar{x}_1 and s_1 are the mean and standard deviation of asset x , and α represents the weight for each variable for the first principal component to assets that vary the most across households so that an asset found in all households is given a weight of zero (McKenzie, 2005). The first principal component or wealth index can take a positive as well as negative value. In order to assess the internal validity of the wealth index, three categories (Rich, Progressive and Poor) of wealth were computed based on the index to assess the characteristics of the poor and rich.

4.7.2 Development of the commercialization index

The demographic and socio-economic factors related to commercialization (Crop commercialization Index (CCI) of farming households, employed household commercialization index (HCI). Model Specification;

$$\text{HCI} = \frac{\text{GVS}}{\text{GVP}} \times 100$$

Generally, a household commercialization index (HCI) can be used to determine household specific level of commercialization (Govere *et al.*, 1999; Strasberg *et al.*, 1999). The index measures the ratio of the gross value of crop sales by household *i* in year *j* to the gross value of all crops produced by the same household *i* in the same year *j* expressed as a percentage. The index measures the extent to which household crop production is oriented toward the market. A value of zero would signify a totally subsistence oriented household and the closer the index is to 100, the higher the degree of commercialization. The advantage of this approach is that commercialization is treated as a continuum thereby avoiding crude distinction between “commercialized” and “non-commercialized” households.

4.7.3 Analysis of gendered relationship between commercialization and wealth

Cross-tabulation using the Statistical Package for Social Science (SPSS) was done to compute the relationship between commercialization and a household’s wealth base on the household heads gender (i.e MHH and FHH).

4.7.4 Gender relation between commercialization and asset ownership

The commercial categories obtained from the commercial index were cross-tabulated with the ownership of asset of men and women in SPSS to get their relationship toward commercialization.

4.7.5 Model of socio-economic influences for participating in food crop commercialization

Socio-economic factors influencing participation in food commercialization were modeled based on the binary choices which are ‘commercializing ‘or not commercializing or the so called 1-0 dependent variable.’0’ indicated the household commercialize or 1 indicated not commercializing. A Similar method was used to model socio-economic determinants of commercialization in Nigeria (Agwu *et al.*, 2012).

The model was represented by:

$$\log\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \varepsilon$$

Where, $\text{Log} [p/ (1-p)]$ = Natural logarithm of the odds of probability of commercialization.

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8, \beta_9, \beta_{10}$ and β_{11} are parameters to be estimated and ε is the error term. The explanatory variables $X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}$ and X_{11} were as follows.

X_1 =Farm size

X_2 =Household labour

X_3 =Age

X_4 = Education

X_5 =Gender

X_6 = Non-farm income

X_7 = Farm income

X_8 = Use of credit

X_9 = Market information

X_{10} = Livestock

X_{11} = Wealth

ε = an error term

These explanatory variables are specified in Table 4.2 with their expected sign of influence assumed.

Table 4.2: Definition of Hypothesized Effects of Explanatory Variables on Commercialization

Variable Name	Variable Definition	Variable Type	Hypothesized effect on commercialization
Household's farm size	Amount of land cultivated by household)	Continuous	+
Household's labour	Number of active family members working on the family farm(aged 15-60)	Continuous	+
Age of household head	Years (of the household head)	Continuous	-
Household head's education	(Literate=1 Illiterate=0)	Dummy	+
Sex of household head	(male=1,female=0)	Dummy	-
Household's non-farm income	Total income earned from non-farm activities	Continuous	-
Household use of credit	1 if household took credit and 0 if not	Dummy	+
Household's access to market information	1 if household access market information and 0 if not	Dummy	+
Household's livestock ownership	1 if household owned livestock and 0 if not	Dummy	+
Household's Wealth	Number /value of assets owned	Continuous	+

4.8 Results and Discussion

4.8.1 Gender and wealth

In this study gender is considered as males and females only and not other categories (e.g. youth). Generally, female households in sub-humid areas are in the poor wealth category which is higher than male and even female of the semi-arid. In both regions male headed households (MHH's) are richer than those headed by females. However, FHH and MHH in the sub-humid Kilosa are equally progressive while in Chamwino MHH and FHH are equally poor (Table 4.3).

Table 4.2: Wealth categories by gender in percentage (n=594)

Variable	Kilosa n _k =299		Chamwino n _c =295	
	MHH	FHH	MHH	FHH
Poor	30.1	51.2	49.8	49.8
Progressive	37.2	37.2	35.3	25.2
Rich	32.8	11.6	15.0	3.9

NB: n^k= sample size Kilosa, n^c= sample size Chamwino

4.8.2 Commercialization by gender

Table 4.4 shows commercialization levels of MHH and FHH in the study districts Kilosa (Sub-humid) and Chamwino (Semi-arid). The majority (85%) of FHH in sub-humid fall under the 51-74% commercialization of food crops categories while most MHH fall in the 75% and above category. The observation might be because of the type of food crops produced in the area whereby some are also considered as commercial crops (i.e. food cash crops) for example, maize and rice. In the Semi-arid Chamwino, FHH's commercialize more than MHH's. (Table 4.4), 23.5% of FHH's had commercialization index of above 75%. During the FGDs, it was explained that this happens because in the semi-arid Chamwino, the food crop sold (maize), is not produced in high quantities due to climatic conditions compared to groundnuts, pigeon peas, cowpeas and sunflower. Furthermore, in Chamwino District the FGD participants pointed out that more females were involved in food crop commercialization because they sell in small quantities while male prefer selling in bulk. In addition, the presence of the Kibaigwa international market which started operations in 2004 (Chitimbe and Liwenga, 2013) is based on maize which is not highly produced in the villages which might be the reason for low interest in men's participation in food crop commercialization hence their concentration on cash crops such as sunflower and livestock keeping.

Further to the above explanation, observations from the FGD's conducted in the sub-humid Kilosa, revealed that male farmers have higher chances of selling food crops in the

sub-humid Kilosa town where better prices are available due to mobility (being able to move in and out of the village) and having more contacts with both buyers and agents whom they often meet in trading centers compared to female farmers. The study results are in line with the study by Sabatta *et al.* (2014) who reported that female farmers lack such contacts and are in most cases excluded from direct transactional negotiations with buyers. Moreover, other studies (Doss, 2001; Geoffrey *et al.*, 2013) suggest that MHH's are more market oriented than FHH's hence, they participate more in the market for cash crops. The above notwithstanding the result on gender and commercialization, as per the current study shows that FHH's commercialize food crops although not as much as MHH's and that is why they are often tangled up as non-commercial producers.

Table 4.3: Food crop commercialization categories by gender (n=594)

Commercialization Categories	Kilosa		Chamwino	
	MHH	FHH	MHH	FHH
0-25%	60.9	60.0	40.0	39.1
26-50%	55.3	40.0	44.7	60.0
51-74%	73.6	85.0	26.4	15.0
75% and above	82.8	76.5	17.2	23.5

NB: The numbers to the right indicate %

Results in Table 3.5, as per household wealth ranking, show a strong relationship between wealth and commercialization. Generally, it was observed that in both study sites when the FHH and MHH fall in the rich wealth category they do not commercialize and if they do commercialize it is to a very small scale and not above 74%. In sub-humid Kilosa, MHH and FHH fall in the same commercializing category of food crops (75% and above) when they are in the progressive, rich or poor wealth status. According to the FGD's conducted in the semi- arid Chamwino, the wealth groups can be categorized into three, the rich (*Wagoli*), progressive (*Walichiba*) and Poor (*Watoka*). In semi-arid Chamwino, MHH commercialize more than FHH at 75% and above when they are poor, while FHH commercialize more than MHH when they are progressive. Furthermore, FHH

commercialize more than MHH at 0-25% when they are poor. This implies that MHH commercialize more food crops when they have fewer assets because of the household needs (to get financial security) while FHH commercialize when they have a bit of household assurance and food security (when they have food security). Literature (Mudege *et al.*, 2015; Forsythe and Martin 2016) shows that FHH commercialize when they get larger output from their farms as this increases their probability to participate in food crop marketing. The current study's result, concurs with the study by Coles and Mitchell (2011) which suggests that MHH are willing to deviate from specializing in profit maximizing resource allocation to maintain household food security based on own production of food crops when insurance markets are absent or unable to cover negative shocks from own crop failure or during a negative price shock at the market.

Table 4.4: Household wealth and food crop commercialization (n=594)

Variable	Commercialization Level	Ecological Zones															
		Sub-humid Kilosa (n=299)								Semi-arid Chamwino (n=295)							
		0-25%		26-50%		51-74%		75% and above		0-25%		26-50%		51-74%		75% and above	
Characteristics	MHH	FHH	MHH	FHH	MHH	FHH	MHH	FHH	MHH	FHH	MHH	FHH	MHH	FHH	MHH	FHH	
Wealth Status	Poor	26.5	55.6	39.2	55.6	41.0	46.2	44.4	44.4	52.0	87.5	81.2	58.8	68.0	50.0	66.7	50.0
	Progressive	73.5	44.4	58.8	44.4	59.0	46.2	55.6	55.6	48.0	12.5	18.8	41.2	28.0	50.0	33.3	50.0
	Rich	0.0	0.0	2.0	0.0	0.0	7.7	0.0	0.0	0.0	0.0	0.0	0.0	4.0	0.0	0.0	0.0

4.9 Asset Ownership and Commercialization

Generally, the study results presented in Table 3.6 show that MHH in the study area own more assets relative to their female counterparts. Furthermore, having money savings (financial asset) reduces commercialization of food crops for MHH and FHH in the study districts this might be because they sometimes commercialize to get the household necessities which do not include food (staples) (i.e. soap, salt, sugar). Normally, there is a high commercialization (75% and above) when the respondents do not have any saving. In Kilosa MHHs with savings were found to commercialize food crops more than FHHs, this means that, savings might be instrumental in raising their ability to commercialize. In line with this study, literature (Agwu *et al.*, 2012) reports that savings enables the household to commercialize by being able to purchase agricultural inputs, fertilizer and hire or buy means of transport. Observations from the FGDs revealed that, having savings enables households not to sell food crops but rather use the money they have to buy what they need. One participant said;

“we sell food crops sometimes not because we like it, but because we have no way out, no savings and in return sometimes we end up being food insecure” (Female FGD participant Chamwino, Sept, 2015).

Results in Table 3.6 suggest a strong relationship on livestock ownership and food crop commercialization. In general, households without livestock do not engage much in food crop commercialization compared to those owning livestock. Results also show that in the semi-arid Chamwino, FHH without livestock were commercializing food crop between 26-50% and 75% and above while MHH commercialized at 75% and above. During the FGD's it was revealed that FHH keeping livestock mainly kept Chicken which they sold during what they called desperate times and therefore owning livestock meant having something quick to sell instead of selling food crops which they considered to be a

vulnerability action towards hunger. The results show that MHH commercialize food crops more than FHH. Comparing the two ecological zones, households in the semi-arid Chamwino commercialize food crops less than those in Sub-humid Kilosa.

Results in Table 4.6 further show that food crop commercialization at 75% and above is the same for both FHH and MHH owning livestock in both study areas. Table 4.6 also shows that land ownership can increase food crop commercialization, in the sense that the owner may have more options on the land. For example, the owner may decide how much land to utilize in production depending on the crop to market and how much of the land to rent. In the sub-humid area, respondents who do not own land do not take part in high commercialization of food crops compared to those who do. During the FGD it was revealed that much of the land in the villages in the Sub-humid Kilosa does not belong to the village or the households but Miombo Estates and therefore create the uncertainty on having the land for a long period of time. As a consequence of the above they become more risk averse as they cannot participate in food crop commercialization for long. Similar results were reported by Sebatta *et al.* (2014), who noted that land access for smallholder farmers plays a great role for households' food crop commercialization.

Result on bicycle ownership and commercialization of food crops results (Table 4.6) in the sub-humid Kilosa, show that FHH who do not own bicycles commercialize food crops more than those owning the same. However, MHH who own bicycles commercialize food crops more than those who do not. It was expected that with a bicycle as a means of transport, FHH would get more involved in food crop commercialization due to simplified mobility. However, observation from the FGDs, show that FHHs with bicycles are better-off financially, and therefore they do not commercialize much. Moreover, those

without bicycles sell their food crops at farm gate prices because according to them they sell the same in small quantities hence no need not to go far from the village.

In the semi-arid Chamwino, a very small percentage of FHH own bicycles compared to MHH, however results show that FHH commercialize food crops more than MHH. This might be because of the explanation given during the Kilosa FGD that in semi-arid Chamwino, MHH are more interested in selling crops in bulk and those which bring in cash such as sunflower, more than food crops. Similar results have been reported in literature (Jayne *et al.*, 2010; Haug and Hella, 2013) whereby MHH were observed to be more interested with cash crop because of their high returns.

Results show that, in both districts high number of MHH possess radio compared to FHH. The FHH in sub-humid Kilosa are somehow better-off in ownership of radio compared to FHH in semi-arid Chamwino District. However, FHH in both areas commercialize more food crops than MHH. It was anticipated that those owning a radio will be well informed on availability of markets compared to those not. However, results show that food crop commercialization has no association with radio ownership because those without radios commercialize more. According to the FGDs, households in the study areas (especially in semi-arid Chamwino) do not need radios for information but rather the general village socialization allows easy sharing of information. In addition, they reported that they only care about their own households and well-being and not about the outer world.

Table 4.6 further shows that mobile phone ownership, for example, FHH with mobile phones were more associated with commercialization of food crops (51-74% to 75% and above) compared to those without. Table 4.6 also shows that in both areas FHHs and MHHs without remittance from relatives and friends and those who are not involved in

any micro-credit group membership commercialized their food crop production more than those with the same. According to the FGD's, those getting financial help from money lending groups or family have no reason to sell their food crops.

Study results presented in Table 4.6 further show that in both districts, households with fewer people (1-5) commercialize more than those with many (6-13). This was explained in the FGD's to be caused by the fact when the household has a big number of people they may depend on the produce to feed the household but the household with fewer people is assumed to have more excess crops and therefore commercialize more. In line with the study's observation, Bwalya *et al.* (2013) reported that a household's likelihood to sell crops and participate in the market increases with the number of working persons it have.

Results in Table 4.6 also show that female heads in sub-humid Kilosa in the age group 15-25 are not very much involved with commercialization (up to 25%) compared to MHH. However, in semi-arid Chamwino, 25% of female heads in the same age group were found to commercialize at 75% and above of their food crop production. The above observation may be due to one's location and involvement in off-farm activities, whereas in the sub-humid Kilosa the villages are located near a town with access to different off-farm activities other than agriculture. In the semi-arid Chamwino the villages are remotely located. Female heads aged 59-69 in Kilosa commercialize at 0-25% more than their male counterparts. In Kilosa District, while there are less MHH participating in commercialization, female heads in the same category commercialize more food crops. In Chamwino District, female heads (46-58 years) commercialize at 51-74% compared to their male counterparts. However, for male heads aged 26-35 there was more commercialization compared to their female counterparts. Commercialization for the

male heads was above 75%. This might mean that with age, women commercialize less may be due to increased responsibilities, dependence in the household for example grandchildren while in the mid ages (youth), male commercialize more due to mobility and enthusiasm.

4.10 Socio-economic Factors Influencing Surveyed Households Participation in Food Crop Commercialization

The logistic regression model (Table 4.7) was used to estimate selected attributes of commercialization. The overall model was significant at the ($p=0.000$) level, indicating that the independent variables had satisfactory explanatory power in determining food crop commercialization.

Results in Table (4.7) show that farm size is positively and significantly ($p=0.05$) associated with commercialization. The above suggests that large farm size is associated with increased probability of commercialization. A household with large farm size seems to produce more crops and hence surplus to market. The above finding conforms to the observations made by Ousman and Hossain (2015) in Durgapur Bangladesh and Okozie *et al.* (2012) in rural Kenya who have reported that households with large farms could allocate their land partly for food crop production and partly for cash crop production thus enabling them to commercialization. Result in Table 4.7 further show that age was significantly ($p=0.048$) associated with a household's commercialization of food crops suggesting that with an increase in the household head's age the household's likelihood of commercialization increased. The above may probably be due to the fact that aged household heads may have accumulated enough experience in crop marketing and farming techniques, as a result they are able to profitably engage in food crop commercialization. Wealth was observed to be negatively associated with commercialization. However, this was not significant. The above suggests that being poor can hinder food crop commercialization.

Table 4.7 further shows a positive and significant ($p= 0.05$) influence of farm income with indicating that increased farm income is associated with an increased probability of

commercialization. This positive influence of farm income may plausibly be a result of more entrepreneurial orientation for households, making them better placed to engage in more crop marketing and hence commercialization. It may also be an indication that rural households are moving away from subsistence based farming as noted elsewhere in rural Africa (Altieri and Nicholis, 2017). Furthermore, Table (4.7) shows livestock to be negatively and significantly ($p=0.05$) associated with household's commercialization of food crops. Thus households with livestock ownership have lower probability of commercializing compared to those households without livestock ownership. Generally, households with livestock probably invest more on livestock keeping and less in crop production. As a result of less farm investment households find themselves with little crop to market. It may also be an indication that they trade and earn more from livestock compared to crops. Similar to the results on negative influence of livestock ownership on commercialization was reported in Amsalu (2014) and Kebebe *et al.* (2015) whereby crop commercialization decreased with household's ownership of livestock. Table 4.7 further shows that market information is positive and significant at ($p=0.02$). The above implies that market information increases the probability of selling crops. Literature (Martey, 2014) shows that access to market information influences market participation by smallholder farmers because they get informed on the prices and the availability of market.

Table 4.6: Socio-economic factors influencing household's participation in food crop commercialization

Characteristic	B	S.E	WALD	df	Sig	Exp (B)
Farm size	.135	.058	5.379	1	.020*	1.145
Household labour	.051	.083	.375	1	.540	1.052
Age	-.017	.009	3.897	1	.048*	.983
Education	-.036	.040	.786	1	.375	.965
Sex	-.255	.266	.918	1	.338	.775
Non-farm income	.000	.000	1.005	1	.316	1.000
Farm income	.000	.000	5.123	1	.024*	1.000
Use of credit	.075	.418	.032	1	.857	1.078
Market information	1.182	.540	4.782	1	.029*	3.260
Livestock	-.623	.260	5.751	1	.016**	.536
Wealth	-.451	.260	3.002	1	.083	.637
Constant	-1.458	.764	3.643	1	.056	.233

4.11 Conclusions and Recommendations

The present study aimed at analyzing the relationship between asset ownership and commercialization. Specifically, it aimed to analyze gendered social-economic dynamics associated with food crop commercialization; assess male and female asset ownership in relation to food crop commercialization and analyse if different wealth categories differ in commercialization of food crops. Based on the study's findings it is concluded that socio-economic characteristics can have both a positive and negative influence on food crop commercialization and that whereas some characteristics can be regarded to have a negative influence they may turn out to have a positive influence and vice versa. It is also concluded that MHHs and FHHs asset ownership has a relation to food crop commercialization. However, though it is true that asset ownership is crucial, but not all assets serve the same purpose. It is further concluded that having assets such as mobile phones, radio and bicycles does not mean high food commercialization. It is also concluded that both male and female headed households are forced into food

commercialization due to wealth situation because in the results it was observed that when the smallholder farmers are in the rich wealth category, they do not commercialize food crops. Lastly, it can be concluded that, the neo-classical theory concurs with the current study because it reflects the household socio-economic characteristics to be linked with the household farm marketing which was also the case in the current study. The neo-classical theory further assumes the household who own land to commercialize different with those without and it was also similar in the current study. On basis of the above, it is recommended that men and women should be investigated/ analyzed as different entities because their situations are context specific and the socio-economic factors such as age, education and wealth status makes them to be different. The study further recommends more research on how women use the productive assets that belong solely to them based on their wealth situation and particularly what assets are more important to them and how the same affect their food crop commercialization levels.

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CHAPTER FIVE

5.0 Pathways for Addressing Gender Based Constraints for Effective Participation in Profitable Crop Value Chains

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5.1 Abstract

Gender-specific constraints in crop value chains are important to be looked upon for an equitable and sustainable participation of men, women and youth in agriculture. Women and youth make vital contributions to the agricultural sector and rural enterprises, despite the many gender-specific constraints (GBC) they face in accessing resources and opportunities but have often been left-out as important players in the value chain discussion. The present study aimed at analyzing constraints that men, women and youth face which hinders their participation in profitable crop value chains. Specifically, it aimed to analyze intra-household decision making, assets associated with gender based constraints, socio-economic factors influencing participation in profitable crop value chains and pathways of addressing gender based constraints. A sample size of 150

households was selected from each of the 4 villages to make a total of 600 households from the two study areas. However, data was only collected from 594 households as 6 of the households were not present during the actual data collection. Study results show that women use more time (6 and above hours) in performing agricultural activities such as planting, harvesting and post harvesting activities, except for post harvesting in Chamwino. Results further show that lacking wage labour, gender norms and household responsibilities negatively and significantly ($p=0.05$) influence ones participation in the food value chain this is because increase in income is associated with participation in profitable nodes of the value chain. The pathways for addressing GBC are divided into gender continuum of three categories of gender strategies namely gender exploitative, gender accommodating and gender transformative. The study concludes that women and youth are faced by the 'exploitative status quo' whereby there are intentional existing gender inequalities and stereo types with regard to pursuit of economic activities/income generation.

Key words: Gender, Gender-based Constraints, Crop Value Chain, Participation, Pathways

5.2 Introduction

Value chains have become a key concept in international discussions on development, in particular when one considers the effects of globalization on employment and poverty reduction (Carayannis *et al.*, 2017). In the context of gendered economies, women and men participate at multiple levels in food crop value chains, often in different tasks, and with different opportunities for upgrading (Barrientos *et al.*, 2003). In Africa, the participation of both women and men in agriculture is critical to production and growth,

however, there is a limited understanding of the gender dynamics related to crop value chains (Shackleton *et al.*, 2011). While men and women may face similar constraints to upgrading in crop value chains, their capability and incentives to overcome them often differ (Barrientos *et al.*, 2010). Therefore, understanding these gender dynamics can help to get the right incentives to the right actors to promote better positions of men, women and youth in crop value chain (Njuki *et al.*, 2011). In Tanzania, women in rural areas have one thing in common across regions; they have less access than men to productive resources and opportunities in agriculture (Mnimbo *et al.*, 2017). These gender gaps and constraints are found in different dimensions; assets, inputs, education, extension and financial services. Furthermore, they impose costs on the agricultural sector, the broader economy and society, as well as on women themselves (Maertens, 2012; Mnimbo *et al.*, 2017).

Over the past few years, the question of how to promote more gender-equitable agricultural development has emerged as an explicit component of value chain development efforts (Rubin *et al.*, 2009; Chan, 2010; Bullock *et al.*, 2017). Socio-economic researchers are increasingly analysing interventions to be able to achieve the dual objectives of economic efficiency and increasing gender equality which is goal number five of the Sustainable Development Goals (SDG), some of the SDG include no poverty, no hunger, good health and quality education (Mnimbo *et al.*, 2017).

Ensuring gender issues are taken on board in value chain-related interventions is vital for facilitating the development of inclusive value chains that benefit both women and men (Norell *et al.*, 2016). The value chain as a concept describes the full range of activities that firms, farms and workers do to bring a product from its conception to its end use and

beyond (Kaplinsky and Morris, 2001). This includes activities such as production, processing, marketing, distribution and support to the final consumer. Value chain activities can produce goods or services, and can be contained within a single geographical location or spread over wider areas (Coles and Mitchell, 2010).

Gender is conceptualized as the socially constructed roles associated with being male or female (Morgan *et al.*, 2017). Thus, understanding men's and women's position in a value chain, how changes in a value chain might affect gender inequality, and the main constraints in terms of gaining from value chain participation, requires one to place gender in the context of intra-household bargaining power (Dolan, 2001). Generally, women and men enter value chains for commercial purposes (Chogomoka *et al.*, 2014). Their opportunities in value chain are shaped by their physical, financial and human assets of which access to land and other productive assets (e.g., land, credit, extension, inputs) are key enabling factors (Mnimbo *et al.*, 2017). Moreover, social assets and norms can also expand or limit the character and extent of men's and women's involvement (David, 2015). Men and women stand to benefit in a number of ways from their participation in value chains through employment, wages or other income, and empowerment, all of which can accrue to an individual or a household (Quisumbing, 2014).

Generally, accessing value chain benefits is determined by the type of participation (e.g. as a wage worker or unpaid family worker), and the gender dynamics and power relations at multiple levels of the value chain. The above determine who gains, and how these benefits are accessed and distributed (Meaton *et al.*, 2015). According to Coles and Mitchell (2011), gendered patterns of benefit distribution are such that participation in the

value chain does not always translate into gains, for example in Kenya despite women providing 72 percent of the labour they only got 38 percent of the food crop value chain total income (Dolan, 2001). At the same time, non-participation does not equate to a lack of benefit (Norell *et al.*, 2016). What matters is not simply the level of income derived from value chain activities, but a combination of factors related to the perception of ownership or management of a particular commodity, the scheduling of payment, and the point of entry into the chain (Maertens, 2012).

Agricultural value chains are equally important to women as a source of employment, however, gender inequalities run through agricultural systems, hence action is required at all levels from the household and community up to the national level (MAFAP, 2013). In this study the pathways to remove Gender Based Constraints (GBC's) take into account the daunting constraints that prevent women and men from more productive and equitable engagement in agriculture for more equitable agriculture systems. The main objective of the study is to identify key gender-based constraints towards the achievement of an equitable participation in profitable value chains. Specifically, the study looked at sources of gender-based constraints, socio-economic constraints for participation and the sustainable pathways of reducing gender based-constraints in the study villages. While acknowledging that men and youth are sometimes disadvantaged in, or excluded from value chains (Bullock *et al.*, 2017), this study focused on issues related to the impact of value chain interventions on women. This is because women are more disadvantaged than men in the context of value chain operations (Quisumbing *et al.*, 2014).

5.3 Conceptual Framework

This study adopted the Community Capital's Framework (CCF) to provide a holistic perspective of the interaction between the capitals required by men and women farmers for effective engagement in agriculture (Gutierrez-Montes *et al.*, 2009). In this study, the gendered constraints and opportunities are grouped into seven capitals of the community capitals framework (CCF) i.e. natural, human, financial, cultural, social, physical and political capitals as reported in literature (Bhandari, 2013). The above was adopted to give a holistic perspective of the resources required by men and women farmers for adoption of sustainable agricultural practices required for intensification and equitable management of the benefits. Community capitals are assets or resources that can be utilized to produce additional resources (Flora and Flora, 2013). A holistic perspective helps to determine the actions to improve women's access to and control over resources to effectively engage in agriculture (Bullock *et al.*, 2017). Human capital describes the skills, knowledge and abilities of people which they can deploy to mobilize other resources. Human capital enables individuals to strengthen their understanding, identify promising technologies and practices, and obtain information to enhance their mobilization of other resources. At the household level, human capital includes the amount and quality of labour available and the ability to command labour (Flora and Flora, 2013). Financial capital refers to the monetary resources available for investment. For monetary resources to become capital, they must be invested to create new resource.

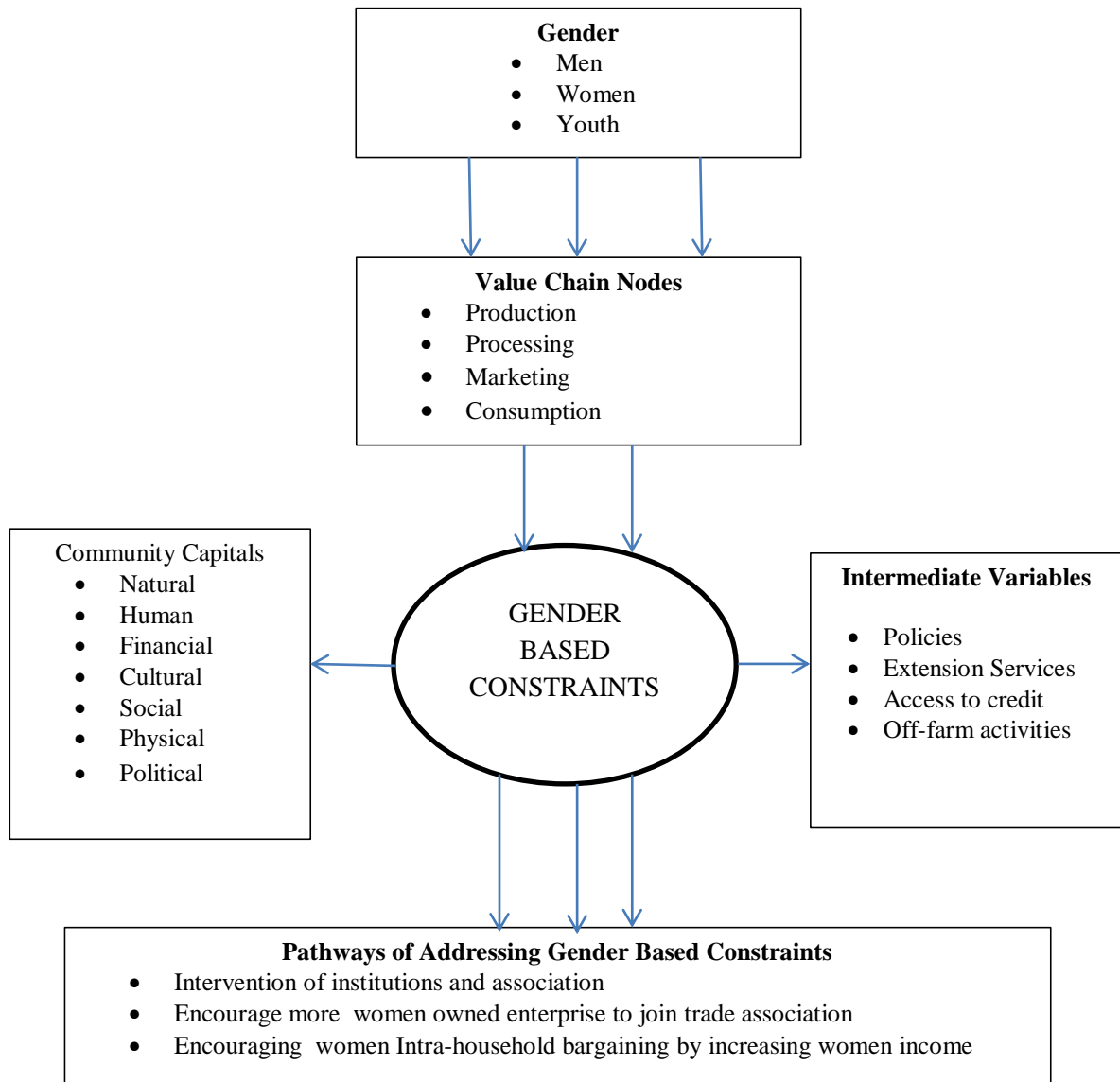


Figure 5.1: Conceptual framework pathways of addressing gender based constraints.

5.4 Study's Theoretical Framework

This study adopted the social cognitive theory of gender development. This theory looks at people and the conceptions they hold of themselves and others, the socio-structural opportunities and constraints they encounter (Bussey and Bandura, 1999). The theory focuses at the social life and occupational paths people pursue and how they are prescribed by their society (Giddens, 1984). The social cognitive theory explains that people are producers as well as products of social systems furthermore; social structures are created by human activity (Giddens, 1984; Bandura, 1996; 1999). The structural practices, in turn, impose constraints and provide resources and opportunity structures for personal development and functioning (Bandura, 1999). Viewed from this sociological perspective, the pattern of opportunity structures and formal and informal constraints shape gendered styles of behaviour and channel men and women into different life paths (Epstein, 1997). Not all people of the same socio-economic status, and who live under the same opportunity structures, social controls, family, educational and community resources and normative climate, benefit in the same way.

According to the theory, gender constraints and the difference between men and women takes on added importance because many of the attributes and roles selectively promoted in males and females tend to be differentially valued with those ascribed to males generally being regarded as more desirable, effectual and of higher status (Berscheid, 1993). Although some gender differences are biologically founded, most of the stereotypic attributes and roles linked to gender arise more from cultural design than from biological endowment (Bandura, 1973; Beall and Sternberg, 1993; Epstein, 1997).

The Social cognitive theory of gender development and functioning integrates psychological and socio-structural determinants within a unified conceptual framework (Bandura, 1973; 1996). In this perspective, gender conceptions and role behaviour are the products of a broad network of social influences operating both at the family level and in the many societal systems encountered in everyday life (Bandura, 1996). Many gender differences in social behaviour are viewed as products of division of labour between the sexes that get replicated through socio-structural practices governed by gender status and power (Eagly, 1987; Geis, 1993).

5.5 Research Methodology

5.5.1 Description of the study area

The study was conducted in two districts i.e Chamwino District, Dodoma (which in this study is regarded as a semi-arid area) and Kilosa District, Morogoro (which is regarded as sub-humid). The study sites were selected due to their diversity. While Chamwino is considered to be generally a patriarchal community, Kilosa which includes a diversity of tribes, is mostly populated by the *Luguru* who are considered matrilineal.

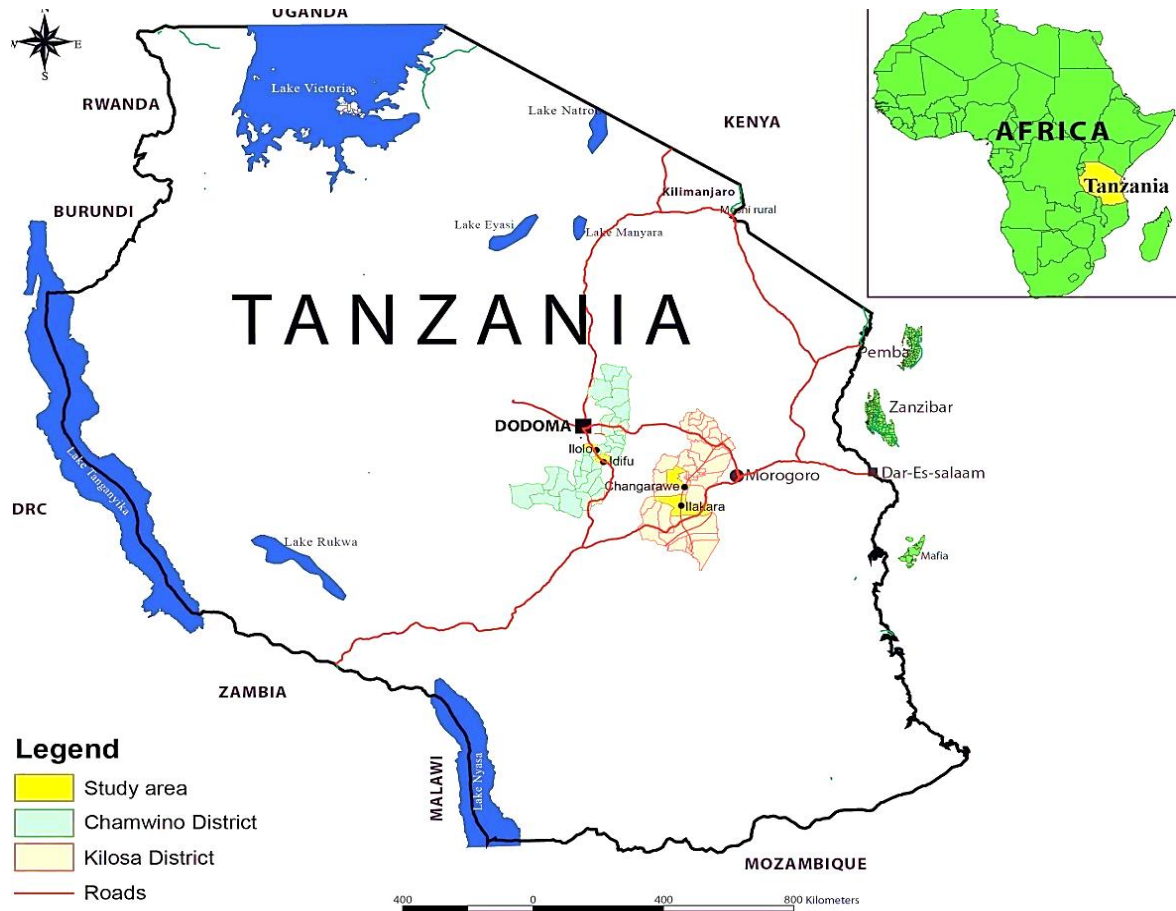


Figure 5.2: Map showing the study areas

5.5.2 Sampling techniques and sample size

The study areas were purposively selected while the households were randomly sampled from village registers. These lists contained information of the names of household heads in their corresponding sub-villages. In each village, a proportionate sample of 150 households was selected from each of the 4 villages to make a total of 600 households from the two study areas. However, data was only collected from 594 households as 6 of the household heads were not available during actual data collection. In this study the youth are defined based on the Tanzanian youth policy (2009), as individuals aged between 15-35 years.

Table 5.1: Sex and age of the respondent in (%)

Age(yrs)	Chamwino (n=295)		Kilosa (299)	
	Male	Female	Male	Female
19-35	20.5	18.6	23.2	15.9
36-55	40.5	40.7	48.8	38.1
56-75	27.0	27.9	19.0	31.7
76 and above	12.1	12.8	9.0	14.3

5.5.3 Data Collection

The study adopted a cross-sectional research design whereby data were collected using a mixed methods approach whereby both quantitative and qualitative data were collected. This design was adopted because it helps to estimate the prevalence of the outcome of interest for a given population and allows data to be collected on individual characteristics, including the gender based constraints alongside information about the outcome (Harvey *et al.*, 2016). Hence, cross-sectional studies provide a 'snapshot' of the outcome and the characteristics associated with it, at a specific point in time (Beck and Katz, 1995).

Qualitative data were collected through focus group discussions (FGDs). A total of twelve FGDs were conducted, 6 per each of the two study districts. Generally, the FGD's involved separate group of men, women and boys and girls (youth) with each group having 12 participants. In this study youth is defined according to the Tanzanian policy of youth (2007) which considers youth are people aged between 15 and 35 years. Data on gender-based constraints (GBC) at different nodes of the food crop value chain, consequences of the GBCs for value chain participation and benefits derived from value chain participation were collected using the Gender Dimensions Framework (GDF) (Rubin *et al.*, 2009).

5.6 Data Analysis

5.6.1 Intra-household decision making

Cross-tabulation using Statistical Package for Social Sciences (SPSS) was done to compute the intra-household decision making. Weights were assigned to '1' meaning joint decision, '2' meaning women made the decision and '3' meaning men made the decision in the household. The household decisions were analyzed based on the three aspects (decision on what to produce, where to sell and how much to spend).

5.6.2 Model of the gender based constraints

The GBC were modeled using the multinomial logistic regression obtained from the data

The model was represented by:

$$\log \left(\frac{p}{1-p} \right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + \varepsilon$$

Where, $\log [p / (1-p)]$ = Natural logarithm of the odds of probability of participation.

$\beta_1, \beta_2, \beta_3, \beta_4, \beta_5, \beta_6, \beta_7, \beta_8, \beta_9, \beta_{10}$ are parameters to be estimated and ε is the error term. The explanatory variables $X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, X_{11}, X_{12}$, were as follows.

X_1 = Land ownership

X_2 = Household labour

X_3 = Age

X_4 = Education

X_5 = Sex

X_6 = Wage labour

X_7 = Household size

X_8 = Access to market information

X_9 = Household responsibilities

X_{10} = Society gender norms

X_{11} = Water scarcity

X_{12} = Gender based violence

ε =an error term

These explanatory variables are specified in Table 5.2 with their expected sign of influence.

Table 5.2: Definition of Hypothesized effects of Explanatory Variables on sex

Variable Name	Variable Definition	Variable Type	Hypothesized effect on Sex
Lack of education	Cannot read and write	Dummy	-
Lack of Productive assets	Ownership of agricultural asset	Dummy	-
Access to fertilizer	Yes=1,No=0	Dummy	+
Wage labour/employer	Respondent being hired as a wage labour Yes=1,No=0	Dummy	+
Lack of Market Information	Availability of market info Yes=1,No=0	Dummy	-
Women household responsibilities	Number of hours used to work in the HH	Continuous	-
Society Gender norms	If society rules and regulation hinders participation in decision making Yes=1,No=0	Dummy	-
Water scarcity	Yes=1,No=0	Dummy	-
Gender based violence	Physical harm Yes=1,No=0	Dummy	-

5.6.3 Analysis of the socio-economic factors in relation to GBC

Cross-tabulation using Statistical Package for Social Sciences (SPSS) was done to compute the relationship between social-economic factors and gender based constraint.

5.7 Results and Discussion

5.7.1 Intra-household decision making on agriculture

Study results as presented in Table 4.3 show the decision making status in the study area. Generally, results show that men make most decisions on what crop to produce, what and how much to sell and how much to spend. In the FGDs, women in Kilosa argued that, women's decision making power increases when they earn more than men or just as much as men do. Literature (Bullock *et al.*, 2017) confers with the study's finding that decision-making within households has to do with bargaining, and this bargaining depends on the endowments of the parties and that a woman's ability to bargain in the household is usually augmented by the increase in her income, which leads to greater equity in the dispensation of household resources. Furthermore, a study by Ngome (2003) found that lack of income affects men's decision-making power, in the direction that, if the man cannot afford to cater for family needs and the woman takes charge of that responsibility, then the man tends to involve the woman more in the decisions which he could have made alone. Moreover, literature (Dolan, 2001) shows that cultural and religious beliefs and practices influences participation in value chain by showing results of the case in the Kenyan French bean value chain, where women were escorted to the market place in order for the husbands to verify the prices paid.

Table 5.3: Decision Making Status on Matters Related to Agriculture (n=594)

Decision on		Chamwino (%)		Kilosa (%)	
		Male	Female	Male	Female
what to produce	Joint	31.1	26.4	38.7	31.3
	Women	2.7	40.2	1.9	35.8
	Men	66.2	33.3	59.4	32.8
what to sell	Joint	28.1	25.3	39.0	29.9
	Women	5.4	41.4	0.9	37.3
	Men	66.5	33.3	60.1	32.8
what to spend	Joint	30.8	27.6	42.7	32.8
	Women	2.7	40.2	0.9	38.8
	Men	66.5	32.2	56.3	28.4

5.7.2 Time-use in agriculture activities

Table 4.4 shows female and male farmers time use in performing agriculture activities in the study area, In general results show that in Chamwino district female farmers use more time 50.9%, (more than 6 hours) in planting, spend 52.1% of the time in harvesting and post harvesting activities compared to males. On the other hand in Kilosa male farmers use more hours 51.0%, in planting and in harvesting than females 50.4%. This implies that, since post harvesting activities includes crop product processing and marketing, and since Chamwino is mostly patriarchy, then men could be more attracted to the activity because it involves getting cash. In Kilosa, more females 50.3%, spent more time in post harvesting activities than males. In the FGDs, male farmers in Kilosa reported that female farmers have many household activities in the household causing them to leave the farm early than male farmers that is why males spend more time. Female farmers in Kilosa reported in the FGDs that time use in the farm between male and female varies by crop, activity and age (if it's a cash crop male's tend to use more time compared to females). Male farmers in Kilosa pointed out in the FGD's that, activities such as weeding or planting is a females work moreover, weeding involves a lot of bending which they don't like therefore leaving women to perform this activity.

The above results are similar to what has been reported in literature (Seymour *et al.*, 2016) which shows female farmers use more time in undertaking agricultural activities compared to male farmers. Contrary to the study's observation, FAO (2011) suggests that women's contribution in agriculture is slightly less than half because of household activities. In addition, Doss (2014) and Palacios-Lopez *et al.* (2017) have reported that female share of agriculture labour as opposed to time use is 40% on average in Tanzania and Uganda respectively which is substantially less than the 60-80% cited by most literature on gender, for example, Dolan (2001) and Barrientos *et al.* (2003). So generally, this study's take is that females use more time than males in undertaking the mentioned agricultural activities, because females participate in performing activities in all the important nodes in the value chain For example, in the production node were they plant, prepare the seeds and do the weeding and the processing node were they process the crop produce by doing the winnowing, drying and storing.

Table 5.4: Distribution of respondents by hours spent in agriculture activity

Activity	Working hours	Chamwino (n=295)		Kilosa (n=299)	
		Male%	Female%	Male%	Female%
Planting	1-5	44.4	55.6	46.4	53.6
	More than 6 hours	49.1	50.9	51.0	49.0
Harvesting	1-5	45.0	55.0	39.5	60.5
	More than 6	47.9	52.1	50.4	49.6
Post harvesting	1-5	39.7	60.3	46.8	53.2
	More than 6	50.2	49.8	49.7	50.3

5.7.3 Gender based constraints in asset ownership

The multinomial logistic regression model was used to estimate the selected constraints attributing to participation in value chain and the results are presented in Table 5.5. In this study value chain is defined based on the definition by Kaplinsky and Morris (2002) which is the full range of activities which are required to bring a product or

service from conception through the different phases of production, transformation and delivery to final consumers, and eventual disposal after use. In the Kaplinsky and Morris' approach, a value chain should have economic viability and sustainability as one of its core values and should aim at enhancing win-win outcomes for all participants (Coles and Michell, 2011).

The overall model in determining the GBC was significant at ($p=0.05$), indicating that the independent variables had satisfactory explanatory power in determining men and women's participation. Table 5.5 shows gender-based constraints faced by male and female respondents in the study area for participation in the food value chains. Generally, the study results show that education is negatively associated with the probability of participation in the food value chain. This implies that the less the education one has the less the chances of taking part in the profitable nodes of the food value chain. Furthermore, results show that wage labour is associated negatively and significantly ($p=0.05$), with ones participation in the food value chain. Generally, wage labour involves doing work for pay which increases income. According to literature (Palacios-Lopez *et al.*, 2017), there is an association of increased income and participation in the profitable node in agricultural value chain, this means that with paid work one can be able to participate in the profitable nodes of the value chain.

Gender norms negatively and significantly influence participation in value chain. This might be because women are deprived mobility (e.g. moving outside the village to commercialize crops). Therefore, this sometimes excludes them from participating in the marketing node which is considered one of the profitable parts of the agricultural value chain. In line with these results observations from the FGDs show that in Chamwino,

female respondents explained that it is normal in these societies for males to be in charge and in control of assets, contrary to this, the society sees them as 'out of the ordinary' i.e. how men should be as shown in the quote below:

‘When a household is comprised of a wife and a husband, and then somehow the wife controls the important assets such as land, money and makes all the important decisions, then that husband(man) is considered to be weak and to be under a spell’(Female FGD participant, Chamwino District, March, 2014).

According to literature De Mel *et al.* (2009), the more assets people have, the less vulnerable they are. Palacios-Lopez *et al.* (2017) also argue that women and youth are more vulnerable because tradition gives them less control over assets than men, while at the same time their opportunities to engage in remunerative activities to acquire their own assets, are limited. Results in Table 5.5 show that land ownership is negatively and significantly ($p=0.05$) associated with participation in the food value chain. These results are in line with views of the female FGDs participants that being deprived of land ownership bring in difficulty in making important decisions such as which crops to grow, or using the land to obtain credit because ownership of land is synonymous to managing resources. According to Grabe (2010), land remains an important livelihood resource in many societies and is likely to increase in time of economic crisis; it is emblematic of social belonging and is a highly gendered phenomenon. Grabe, further reports that women are often excluded or marginalized from access to land relative to men in similar social positioning. This study suggests women to have access and control over land in order to participate in the important and beneficial part of the value chain, this is because they will be able to choose types of crops to produce and the quantity due to the available land.

Similar to this study, literature Palacios-Lopez *et al.* (2017) reports that women face disadvantages compared to men in accessing the basic assets and resources needed to participate fully in realizing their growth potential and that gender-based differences affect supply response, resource allocation within households, and labour productivity.

Table 5.5: Gender based constraints and their influence in participation in the food value chain

Gender Based Constraint	B	S.E	Wald	df	Sig	Exp (B)
Education	-4.899	5.031	0.948	1	0.330	0.007
Land ownership	-1.485	0.177	70.824	1	0.000***	0.006
Lack of Productive Assets	4.643	5.029	0.852	1	0.356	103.878
Access to fertilizer	1.649	0.357	21.359	1	0.000***	5.200
Wage labour	-1.972	0.260	57.530	1	0.000***	0.139
Lack of Market info	-0.279	0.417	0.447	1	0.504	0.757
Household responsibilities	-1.072	0.316	11.535	1	0.001***	0.342
Gender norms	-1.869	0.421	19.739	1	0.000***	0.154
Water scarcity	0.066	0.052	1.622	1	0.203	1.068
Gender based Violence	-0.005	0.015	0.120	1	0.729	0.995

NB: *** significant at the p=0.001 level

5.7.4 Pathways in addressing gender based constraints

Generally, there is no single way of mitigating or removing GBC due to community diversity. Therefore, it is useful to adopt a continuum of different strategies. In this study ‘Continuum’ is defined based on the gender manual of 2009 (FAO,2016), that is using gender elements in a continuous sequence which are adjacent but not clearly different from each other but where the extremes are quite distinct on the intended issue to be resolved. Therefore, this study uses the continuum of three categories for identifying pathways to remove gender based constraints and assuring an equitable participation in value chain, namely gender exploitative, gender accommodating and gender

transformative. The study opts to use the gender continuum of strategies after observing the GBC and how they influence participation in the food value chain (Table 5.5). Generally, the aim is to move from exploitative to transformative strategies focusing mainly on policy, intra-household and community pathways.

Based on Table 4.5 which also reports on the gender norms which negatively affects participation, the community and the household are faced by the '*exploitative status quo*' whereby there are intentional existing gender inequalities and stereo types with regard to pursuit of economic activities/income generation. For example, when it comes to decision making women are left to use most of their time on tedious and time consuming less profitable agricultural related activities compared to men who are mostly found in the profitable nodes of the value chain (Mnimbo *et al.*, 2017). In addition, women are involved more in household labour as 'free labour'. Literature (Barrientos *et al.*, 2010; Milberg and Winkler, 2011) shows the exploitative status quo exists in value chain and women are the ones being exploited relative to men.

The gender accommodating strategy is the pathway which focuses on addressing specific gender inequalities such as decision making (Table 5.5) by addressing the isolated issues that may create more dynamic change in a broad range of activities (Gereffi, 2014). For example, enabling women's access to income generating activities, innovations or upgrading strategies that will enable them combine this with their domestic responsibilities. Therefore, it is suggested that there is a need for a review of some policies which might be pathways of addressing the GBC in value chain for example, the current national gender and agricultural policies.

Literature (Pretty, 2014) shows the importance of looking at policy as a driver of change. The above-mentioned policies for example, the 1990 community development gender and children and the women and gender development policy of 2000 were observed to have many challenges in implementation of the policy due to the customary laws particular those linked to the patriarchal systems, customs and tradition which still discriminate against women (Bullock *et al.*, 2017). This should be taken into serious consideration in the policy review because the majority of Tanzanian society are patriarchal hence a general perpetuation of gender imbalances and institutional aspects (Gneezy *et al.*, 2009; Lecoutere and Campenhout, 2015) and because equitable and sustainable participation of men and women in the value chain will contribute to achievement of the SDGs such as reduction of poverty and equitable participation (Allen and Sachs, 2012; Maestre and Henson, 2017; Oduol *et al.*, 2017).

Lastly, the gender transformative strategy focuses on achieving mutual supportive goals in achieving the ‘win-win’ situation by finding synergies between gender relations and equitable participation in value chain (Mnimbo *et al.*, 2017). In addition, due to the results on time use in agriculture activities (Table 5.5), there is a need of introducing labour saving technologies that reduce women’s load while at the same time increasing men’s involvement (Johnson *et al.*, 2016). For example, the introduction of winnowing and maize processing has changed the roles from the activity formally performed by women to an activity done by men (change of gender role) (Mnimbo *et al.*, 2017).

5.8 Conclusions and Recommendations

The manuscript aimed at analyzing constraints that men, women and youth face which hinder their participation in profitable crop value chains. Specifically, it aimed at

analyzing intra-household decision making, community capitals associated with gender based constraints and household decision making influencing participation in profitable food crop value chain and pathways of addressing gender based constraints.

Based on the study results it is concluded that GBC are negatively associated with women's participation in food crop value chains. In addition, it is concluded that assets such as land ownership and access to fertilizer, which were observed are vital for participation in the food value chain. It is further concluded that of all the gender groups, women are more constrained when it comes to participation in the food value chains. The study concludes that household responsibilities, gender norms and not getting employed as a wage labourer have a strong negative association with participation in food crop value chain. Furthermore, it can be concluded that men make the important decisions in the household and that women are only involved in decisions already made.

Based on the study's findings and conclusions, the study recommends, reduction of household duties for women by men being more involved in the household activities, due to the societal gender norms this can only be achieved by introducing new innovations/technologies which will simplify work and also attract men to be involved. In the policy arena, it is important to understand that without changing the "business as usual" mindset of considering women as the 'weaker farmer' in all activities surrounding agricultural production, sustainable participation will continue to fail. Furthermore, there is a need to be careful in the adoption of a package of sustainable agricultural practices to avoid the possibility of increasing women's workload by increasing time-spent, which may affect their decisions to adopt and take part in the food crop value chain.

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CHAPTER SIX

6.0 Conclusions and Recommendations

6.1 The Influence of Gender Roles in the Choices of Crop Types and Value Chain

Upgrading Strategies

The first specific objective of this study was to analyse the influence of gender roles in upgrading strategies on crop value chains. The results of the analysis in relation to this objective are presented in the first paper of the thesis. In the study sites, many challenges observed concerning the value chain upgrading strategies are associated with natural resources and production (95%) and processing node (53%). For example; Male farmers showed more concern to natural resources than female farmers ($p=0.05$). This implies that farmers activities are closely linked to natural resources. Female farmers in Chamwino are concerned with upgrading strategies that are linked with processing and storage (Maize shellers and millet threshers) than men ($p=0.05$). This implies that women are traditionally involved with the processing activities. Problems associated with availability of markets are more observed in Chamwino 33.5% than in Kilosa 29.4%. This implies that most of the crops produced in Chamwino are sold (50%). Furthermore, it was observed that women and youth prefer crops that consume less time especially when it comes to weeding. In Chamwino, women opted to grow Roselle which is locally known as *choya* which according to the key informants requires little care and has multiple functions (making local brew and traditional medicine).

6.2 The Gendered Impact on Food Securing Upgrading Strategies Using Different Gender Tools

The second specific objective of the study was to analyse the gendered impact on food securing upgrading strategies using different methodologies. The findings in relation to this objective show that female and male participants scored the criteria differently and the ratings between sexes differed significantly ($p=0.05$). The study also observed that working conditions concerning rain water harvesting technology (RWH) was very challenging to the farmers with regard to demand for labour, especially in constructing tied ridges ($p=0.05$). From the Gender Analysis Matrix (GAM), the RWH has been reported to be constraining the farmers ($p=0.05$) due to time used to perform the activity. As regards to economic criteria for food security, activities that involved the threshing/shelling machine seem to be more advantageous to men relative to women in Kilosa ($p=0.05$) especially when it comes to income accrued from the machine. On the social criteria, female farmers in the study area are more involved in issues related to food preparations than male farmers ($p=0.05$) whilst male farmers in Kilosa are more involved with social relations ($p=0.01$) relative to female farmers. This implies that when the processing of maize or millet is done traditionally, women seem to be more socially related compared to men, the vice versa is true when the technology is modernized. Therefore, the change of technology or new innovation changes the traditional roles in the society and can be used to relieve women from their work burden.

6.3 Gender Roles in Asset Ownership and Participation in Market Oriented Crop Value Chains

The third specific objective of this study was to analyse the relationship between asset ownership and commercialization of food crops. The findings in Chamwino district, indicate that Male Headed Households (MHH) commercialize food crops more than

Female Headed Household (FHH), while in Kilosa FHHs commercialize food crop more than MHH. This implies that in areas with high proximity to towns for example Kilosa it is easier for female farmers to be involved or to participate in commercialization. The findings further show that wealth status relates to participation in commercialization because when both FHHs and the MHHs are rich, they do not participate in food crop commercialization. Furthermore, MHHs commercialize food crops more than FHHs when they are poor. This implies that MHHs tend to commercialize food crops when they have fewer assets to sell traditionally, men are the bread winners of their households. FHHs only commercialize food crops when they are assured of their households' food security.

In Kilosa MHHs with financial assets (savings) commercialized food crops more than FHHs. Implying that having financial assets triggers food crop commercialization. The study observed that ownership of physical assets such as livestock enables farmers to engage in food crop commercialization, livestock owners commercialization of food crops was 75% and above, compared to those without (26 -50%). The study has also observed that socio-economic factors such as age, farm size and farm income, do influence participation in food crop commercialization ($p=0.05$). The above implies that these factors are directly connected with the activities involved in food crop commercialization.

6.4 Pathways for Addressing Gender Based Constraints for Effective Participation in Profitable Crop Value Chains

The study's fourth objective was to analyse the pathways of removing gender based constraints for effective participation in profitable crop value chains. Generally, findings show females use more time in production activities (i.e more than 6 hours) compared to

men (1-5 hours). The study further shows that land ownership can influence affective participation for example having less land is negatively associated with participation in crop value chain activities ($p=0.05$). This implies that having less land for production, means less yield, less number of crops produced and less involvement in value chain. Findings show access to fertilizer to have a positive and significant ($p= 0.001$) influence on participation in value chain node such as marketing. This implies application of fertilizers increases yields hence more excess crops for selling.

Factors such as lack of access to land, farmer being deprived of wage labour opportunities, household responsibilities and society gender norms were found to have a negative and significant ($p=0.001$) influence in value chain participation. This implies that failing to access enough land and having too much household responsibilities hinders participation in crop value chain activity for example the marketing node. Generally, gender norms such as those limiting women to land ownership and mobility have a negative influence on participation.

The present study acknowledges that (GBC) inhibit men's or women's access to resources or opportunities based on their gender. Therefore, the study came up with pathways to remove gender based constraints for equitable participation in the food value chains. The study acknowledges that in addressing GBC one needs to look for specific issues such as division of labour, decision-making and access to and control over resources and this can be elaborated as follows;

1. Reducing workload for women through the reduction of multiple-responsibilities in the household. This can be a pathway towards better engagement of women in the

activities related to crop value chains and thus putting them in a better position to benefit from their participation.

2. Introducing user friendly technologies which are household centered to benefit both men and women. This is because although productive tools, fertilizer and farm input supply and education to mention a few are known to help farmers develop however; if these are not properly disseminated then they become a GBC. For example, currently, use of mechanical productive machines are not very user friendly for women when it comes to operationization.
3. Re-assessment of target groups for extension training and education. This is because many brought-in educations are messages which are usually targeted for male household heads which leave out women who in some occasion take part as their husbands' representatives.
4. Assessment of policy is important for intentions to remove GBC, this is because some constraintraining issues are not taken into account. For example; the above may involve a review of the current national gender and the agriculture policies. The policies for example the community development gender and children 1990 and the women and gender development policy of 2000 still face a lot of challenges including patriarchal systems and customs/ tradition that discriminate women hence a continued perpetuation of gender aspects and institutional aspects that constrain women to participate in value chain.
5. Empowering women through introduction of income generating activities, innovations or upgrading strategies which involve the crops they produce. Doing the above will enable a good combination between the domestic responsibilities and functionality in food value chains.

6. Community engagement in gender-related education so as to create better society aware of the traditional norms that constrain women and men's participation in food value chains. However, the present study realizes that this takes a long time to achieve but is a process worth taking if men and women are to be equitably involved in food value chains.

6.5 Conclusions

6.5.1 The influence of gender roles in the choices of crop types and value chain upgrading strategies

Based on the study findings differential gender perspectives associated with participation in value chain are observed. The study leads to the conclusion that there exists gender difference in the choice of crops to be produced by gender i.e cash crops or food crops. With regard to upgrading strategies, it is also concluded from the study that the preferred upgrading strategies are gender based with regards to the different roles and responsibilities performed by men, women and the youth in the respective communities. The study further concludes that with the introduction of new innovations and technologies, men's involvement in agriculture increases in agriculture suggesting less work burden for women.

6.5.2 The gendered impact on food securing upgrading strategies using different gender tools

The study further concludes that the GAM, Scala-FS and the FoPIA tools used in this study complement each other and bring out the ways in which different representations of the community (farmers) and scientist (expert) are organized. The above also show how the two groups are socially influenced hence a better understanding of the food security

criterion (economic, social and environmental) in areas with the same characteristics as the study area.

The study concludes that there are no fixed activities for males or females when it comes to food securing upgrading strategies as these evolve based on the economic aspect (income), social aspect (social relations) and environmental (working conditions). This is because males were found to be more involved in activities that are traditionally known to be more feminine such as social involvements (taking part in social gathering).

In addition, the study concludes that sex-wise farmers adapt to the upgrading strategies that are perceived to have causal-effect connections to them as individuals. Therefore, the intentions to reduce food insecurity which may or may not coincide with these predicted outcomes may create a positive or negative feedback, which would either support the adoption of successful upgrading strategies or none adaptation respectively.

6.5.3 Gender in asset ownership and participation in market oriented crop value chains

The present study concludes that socio-economic factors influence participation in food crop commercialization, such as age which was found to be a determinant, whereby younger household heads participate in commercialization more than older household heads. The study further concludes that, asset ownership is crucial, but not all assets have the same level of importance. For example; assets involved in transportation such as the bicycle was found not to contribute to household food crop commercialization.

6.5.4 Pathways for addressing gender based constraints for effective participation in profitable crop value chains

The present study concludes that factors such as lack of land ownership hinders effective participation in crop value chains. The present study further concludes that the pathways for addressing gender based constraints should be based on three major aspects; the division of labour, household decision-making and access to and control of productive resources. This will enable not only a better positioning of women in the crop value chains and but also active participation of men hence, increased yields and achievement of food security.

6.6 Theoretical Implications of the Study Findings

The findings have wider theoretical implication which will be particularly relevant in explaining the gender dynamics in crop value chains in the areas with same socio-cultural and agro-climatic conditions to those of the study area. At a broader analytical perspective, this study illuminates an analytical gap in rural development economics between the Gender-Sensitive Value Chain Framework (GSVC). The above are built on the assumption of improved skills and capacities of value chain actors (farmers, processors) and effective participation in value chains as a risk reducing factor on the other. The conceptual framework that incorporates the pathways of reducing GBC closed this gap. In Chamwino and Kilosa district the ineffective participation in value chains especially for women is a critical aspects in rural development. Evidence has shown that households overcome financial constraint related to crop commercialization when they participate equitably in the crop value chains. Hence, production assets and labour endowments determine household's farm production and involvement in the value chains.

According to the Marxist Political Economy (MPE) theory ownership of productive assets such as land and decision making do play a major role in effective participation in value chains. Thus the theory shows effective participation is shaped by socio-economic factors, resource ownership and intra-household decision making. On the other hand effective participation in crop value chains is said to help increase the drive of ownership of bigger sizes of land and hence increased productivity hence contributing to poverty reduction through economic growth, wealth, and employment creation.

6.7 Policy Implication

Sustainable rural development generally needs involvement of both individual household's processes and state based interventions. For individual households, the processes which relate to assets endowments and strategies are adopted to achieve a desirable outcome of sustaining flow of income and avoid deprivation. The state interventions involve policies and other measures which are implemented by the government at different levels of administration and also by the non-governmental organisations (NGO's). These interventions assist households and individuals to pursue sustained livelihoods hence attainment of economic development.

Based on the above two sets of specific policy implications are discussed focusing on the state interventions with regard to what transpired from the households' which is an effective participation in crop value chains. The first policy implies there is a need to promote equitable ownership of productive assets which was found to reduce the barrier to effective participation in crop value chains. The above can be enhanced by promoting and supporting household bargaining power and empowering women at the village level. At village level, this falls under the village council and the Local Government Authorities

(LGA) which have a role to supervise at village level. District officers may provide education on resource management, access and ownership and how households can distribute the resources equitably.

The second specific policy intervention relates to the finding that women are constrained with ownership of resources (e.g land) and society norms in Chamwino and Kilosa district. Therefore, policies should ensure the equitable ownership and participation of women in crop value chains is attained through a review of the relevant policies and strategies. At a broader perspective, a cross-sectoral approach to women empowerment and rural development is recommended.

Rural development makers at all ministerial levels should not assume women have equal access to men with regard to resources and opportunities, hence these should not go for "one size fits all" economic growth strategies. It is therefore critical that sectoral constraints are addressed to allow a clear focus on all the necessary assets for economic growth or poverty reduction for example; human capita (skills and literacy levels), Social capital (Ideas exchange, group membership, markets for crops which are considered to be women-based) and financial capital/asset (Income, micro-credits/loans). Policies that focus on the above attributes if properly implemented will generally ensure increase women's participation in the crop value chains.

6.8 Recommendations

Based on the study's findings and conclusions it is recommended that:

- (i) At the household level, men need to recognize how women are burdened by the household activities hence, there is a need to create a conducive environment for women to participate in value chains and in addition, women need to actively contribute in the household's decision making on the choices of crops to be

produced. At the community level, the local leaders (The village government /LGA) should encourage the farmers on uptake of new technologies and innovations introduced by projects and extension staff. For example, the threshing and shelling machines on order to allow more involvement of men in activities that were traditionally performed by women. Doing this will relieve women from their current heavy work burden.

- (ii) There is a need for projects, NGO's and the government to assess the innovations and technology brought to farmers for better achievement of intended outcomes in food securing approaches, this is because some technologies are gender-biased (do not work for other sex) for example; some production technologies (RainWater Harvesting) and the shelling/threshing machines, are too mechanical for women, this in turn decreases their participation.
- (iii) It is imperative for economic experts, project development planners and the Local Government Authority to work-upon and understands the drivers for better economic expansion through commercialization. doing the above might benefit youth immensely as they are the ones mostly involved in selling crops.
- (iv) The Local Government Authorities (LGA) and communities (particularly the male household heads) need to re-consider the gender aspect when it comes to access and ownership of assets/resources as these affect participation in crop value chains especially for women. Based on the study findings there is a need for policy interventions at different administrative levels from the central to the local government to ensure men, women and the youth have access to and own resources to enable them participate and benefit equitably from crop value chains. Doing the above will enable households and individuals to sustainably improve their well-

being. The present study recommends policy interventions on land ownership and the need to review the relevant policies in particular the land policy to ensure women and the youth have adequate access to land which is of paramount importance in crop value chains.

6.9 Areas for Further Research

Based on the study findings some further investigations are being proposed as consequence of the study's coverage and the methodological approach adopted.

- i. On the basis of the current study's coverage, there is need for a further in-depth analysis of one aspect of gender participation in crop value chain to focus on gendered physical attributes which may affect how women and men participate in crop value chains. Generally, men often engage in activities that include what is perceived to be heavy labour.
- ii. There is a need also to conduct a study on the roles of value chain actors and their contributions in household participation in crop value chains. For example, operators as actors both handle and process the product at several stages in the chain. In addition, producers organizations, processors, brokers, wholesalers, retailers and supermarkets are supporters who not do necessarily handle or possess the product, yet they have a direct impact on the chain through service facilitation such as financial or advisory services. Further to the above influencers (government officials, politicians, researchers and organizations) who have an indirect impact on crop value the chain performances and functions through agricultural and trade policies and research and development focus. Doing the above will enrich the crop value chain participation studies.

APPENDICES

Appendix 1: Questionnaire

Questionnaire to Analyse Differential Gender Perspectives of Crop Value Chains in Semi-Arid Chamwino and Sub-Humid Kilosa

Household survey 2014

My name is TATU SAID MNIMBO a researcher working to study the food security, value chain and agriculture in rural Tanzania. To achieve the objective of my research I kindly ask for your cooperation. I really appreciate you taking the time to complete this interview. There is no “right” or “wrong” answer. Accurate and thoughtful responses will allow us to pinpoint general situation in your household. I assure you that all information you give during the interview is kept strictly confidential. Data will be used for scientific purposes only and will not be given to any outside person

Section 1: Survey Information

- 1 Name of household head
- 2 Name of respondent
- 3 Name of interviewer:
- 4 Relation to the Household head
- 5 Tribe
- 6 Sex
- 4 I.D. Code
- 5 I.D. Code
- 6 I.D. Code

No.	Code A	Code B	Code C
1.	Head	Female	1 Kaguru
2.	Wife/Husband	Male	2 Luguru
3.	Son/Daughter		3 Sagara
4.	Son/daughter in law		4 Vidunda
5.	Father/ Mother		5 Mbunga
6.	Father/ Mother in law		6 Ndamba
7.	Sister/ brother		7 Ngindo
8.	Grandchild		8 Bena
9.	Nephew/Nice		9 Kutu
10.	Cousin		10 Zigua
11.	Other relatives		11 Bena
12.	None-relatives		12 Kwere
13.	Brother/sister in law		13 Gogo
14.	Son/daughter adopted		14 Rangi
15.	Others		15 Sandawe
			16 Iraqi
			17 Chagga
			18 Bogoro
			Other, specify

Appendix 2: Gender Impact Assessment tools on Upgrading strategies

The Gender Analysis Matrix Tool (GAM)

Economic criteria

UPS	Issues	Questions	Gender Analysis Matrix (GAM)
Rain water harvesting: may have positive impact on yield. This may affect sharing of produce and income in the hh. The individual responsible with marketing may have an upper hand on income obtained.	Production/yield	Labor provider(s) (male/female)	Labor
		The share of time input by male and female.	Time
	Income	How is produce being distributed	Resources
		How is income distributed	
	Market participation	Who participate in marketing	Labor
		How much time is spent by male and female?	Time
Micro-dosing: may have positive impact on yield. This may affect sharing our produce and income in the hh. The individual responsible with marketing may have an upper hand on income obtained.	Production/yield	Labor provider(s) (male/female)	Labor
		The share of time input by male and female.	Time
	Income	How is produce being distributed	Resources
		How is income distributed	Resources
	Market participation	Who participate in marketing	Labor
		How much time is spent by male and female?	Time
Processing m/c: new income to a group, group participation determines income distribution.	Production/yield	Labor provider(s) (male/female)	Labor
		The share of time input by male and female.	Time
	Income	How is income distributed	Resources
	Market participation	Who participate in marketing	Labor
		How much time is spent by male and female?	Time
	Nutrition education and kitchen garden: new production and possibly income to the group. Group participation and distribution.	Production/yield	Labor provider(s) (male/female)
The share of time input by male and female.			Time
Income		How is produce being distributed	Resources
		How is income distributed	Resources
Market participation		Who participate in marketing	Labor
		How much time is spent by male and female?	Time

Social criteria (Culture dimension of GAM)

UPS	Issues	Questions
Rain water harvesting: has it increased food diversity and participation is favoring a certain gender group? Has it increased social interactions between different gender groups? Has it improved working conditions or favored one gender group vs. the other?	Food diversity	Is the increase or decrease in food diversity gendered? If so, toward which group (men/women)?
	Social interactions	Has the social interaction between different gender groups increased due to the introduction of RWH?
	Working conditions	Which gender its working condition has been affected? (Fail to participate/forced to participate because of its gender?)
Micro-dosing: has it increased food diversity and participation is favoring a certain gender group? Has it increased social interactions between different gender groups? Has it improved working conditions or favored one gender group vs. the other?	Food diversity	Is the increase or decrease in food diversity gendered? If so, toward which group (men/women)?
	Social interactions	Has the social interaction between different gender groups increased due to the introduction of RWH?
	Working conditions	Which gender its working condition has been affected? (Fail to participate/forced to participate because of its gender?)
Processing m/c: Has the introduction of processing machines increased food diversity in the farms? Which gender was responsible for increasing food diversity? Have the interactions between different gender groups increased? Which group its working condition has been affected and how?	Food diversity	Which gender was responsible for increasing food diversity because of the introduction of the processing machine? (Is the question relevant?)
	Social interactions	Have the interactions between different gender groups increased? OR, which gender group interactions have increased?
	Working conditions	Which group its working condition has been affected and how?
Nutrition education and kitchen garden: It may be assumed that the introduction of kitchen gardens has increased food diversity, increased social interactions as other members of the community go to those with kitchen gardens to purchase vegetables, also likely changes in the roles	Food diversity	Has the increased food diversity change the relationship in the hh (between men and women)?
	Social interactions	Are men interacting more with women and vice versa or are the same gender groups interacting more frequently?
	Working conditions	Which group is more involved with Nutrition education and kitchen garden? To what extent?

Environmental criteria (Community dimension of GAM)

UPS	Issues	Questions
Rain water harvesting: water harvesting will increase soil-water, improve nutrient uptake by plant, and likely increase agro-diversity as more water-sensitive crops can be grown.	Soil fertility	How will the relationship between men and women be affected if soil fertility will improve as a result of RWH?
	Soil water	How will the relationship between men and women be affected if soil water will improve as a result of RWH?
	Agro-diversity	How will the relationship between men and women be affected if agro-diversity will improve as a result of RWH?
Micro-dosing: micro-dosing will likely improve soil fertility and possibly increase agro-diversity but possibly decrease soil water.	Soil fertility	How will the relationship between men and women be affected if soil fertility will improve as a result of micro-dosing?
	Soil water	How will the relationship between men and women be affected if soil water will improve as a result of micro-dosing?
	Agro-diversity	How will the relationship between men and women be affected if agro-diversity will improve as a result of micro-dosing?
Processing m/c:	Soil fertility	How will the relationship between men and women be affected if soil fertility will improve as a result of processing machines?
	Soil water	How will the relationship between men and women be affected if soil water will improve as a result of processing machines?
	Agro-diversity	How will the relationship between men and women be affected if agro-diversity will improve as a result of processing machines?
Nutrition education and kitchen garden:	Soil fertility	How will the relationship between men and women be affected if soil fertility will improve as a result of nutrition education?
	Soil water	How will the relationship between men and women be affected if soil water will improve as a result of nutrition education?
	Agro-diversity	How will the relationship between men and women be affected if agro-diversity will improve as a result of nutrition education?

Appendix 3: Scala-FS tool for expert based assessment

ScaIA FS (Food Security)

MANUAL

Introduction

We aim at assessing the requirements and to explore the possible, anticipated impacts of the Upgrading strategies (UPS) on an expert basis. A similar assessment procedure has just been done with stakeholders in a participatory process on local village level (FoPIA). With both assessments we will be more aware of the points that we have to consider from both views (expert – stakeholder) during the implementation of the UPS in the four villages: Ilakala, Changarawe in Morogoro region and Iloilo and Idifu in Dodoma region. Each Task team assesses only those UPS they have been specifying together during the last weeks and/or that they are expert. We estimate approx. 50-60 minutes to fill in the ScaIA tool for 3-4 UPS.

Getting started

You receive 2 Excel tables: one for Dodoma region and one for Morogoro region and (in case of need) the information from the UPS sheets of facts and figures. In the following we explain you step by step how to fill in the table. Please open the excel file. The file includes 6 sheets:

- (i) General UPS suitability
- (ii) Institutional requirements
- (iii) Social Impacts
- (iv) Economic Impacts
- (v) Environmental Impacts
- (vi) Impact Results



14	Assets (mcs)	UPS 3: Integrated rural poultry-crop system for enhanced rural income and food security	0	0	0	0	0
		UPS 4: Mobile phone based integrated					
		General UPS requirements	Institutional requirements	Social impacts	Economic impacts	Environmental impacts	

On the sheets 1 and 2 (“General UPS suitability” and “institutional requirements”) we ask you to assess on a scale 0-4 the project requirements needed for the implementation of the UPS from the project perspective.

On the sheets 3, 4 and 5 we ask you to assess the impacts of the UPS on particular social, economic and environmental criteria. Scores are used in this procedure as means for estimating the anticipated UPS impacts. Each score is based on a specific expert-based idea or argument.

Assess the UPS that you are knowledgeable about. Please do all assessments of one UPS throughout all sheets. If you are not able to do one specific assessment you may choose “don’t know” by leaving the field blank. You may encounter difficulties while assessing and/or also like to give reasons for specific assessments. In any case it is beneficial for this joint ScalA assessment if we receive your assessment feedback on the last page of this manual. It will be gathered, compared and analyzed for a holistic UPS assessment.

Assessing requirements for implementation

Open the first sheet “General UPS suitability and answer the question for each UPS in your field of expertise: **"To which degree does the UPS (x) meet the following general requirements?"** For instance, to which degree does the UPS “Fertilizer Micro-dosing” require “local knowledge on UPS”: 0 none, 1 low, 2 medium, 3 high, 4 very high. To get a clearer understanding of the requirements in the headline please open the commentary function.

1 Question yourself before you score (0 to 4): "How does the given UPS (x) meet the following general suitability criteria"										
	no	0								Sui
	low	1								app
	medium	2								acr
	high	3								loc
	very high	4								reg
	don't know	"blank"								sys
2										
4	Natu									
	resou									
	manage									
5										
6										
7										
8										

Once you have finished, click on the second sheet: “Institutional requirements”. The logic here is similar to sheet 1. The focus is on the institutional local requirements needed to realize the UPS. The guiding question is: **"What is the importance of each institutional requirement for successful implementation of UPS (x)?"** Please insert your scores (0-4) again. The results of both sheets of this more general UPS implementation assessment are summarised in the last column.

Impact assessment

On the sheet 3, 4, and 5 we ask you for the assessment of the impacts on social, economic and environmental criteria. Please click on the page: Social Impacts. You are asked to assess the UPS in regards of their impacts on 3 given criteria that you see in the headline. The scale for the assessment is -3 to +3 (-3 very high negative impact, -2 medium negative impact, -1 small negative impact, 0 no impact, +1 small positive impact, +2 medium positive impact, +3 high positive impact) Ask yourself before you score (-3 to +3): **"How will UPS (x) affect the criteria and its related indicator (y) in Dodoma/Morogoro towards the year 2020?"** Insert the rating in each column. In order to get a clearer description on the criteria and its indicator please just open the commentary function on the criteria in the headline.

A		B		C		D	E	F	G	H
Question yourself before you score (-3 to +3): "How will UPS (x) affect criteria (y) in Morogoro towards the year 2020?"										
Scoring -3 to 3										
						Food diversity (sufficient, safe, nutritious food)	social relations socio-cultural acceptance)	Working conditions (working hours and quality)	high negative impact -3 moderate negative impact -2 medium negative impact -1 no impact 0 low positive impact 1 moderate positive impact 2 high positive impact 3 don't know "blank"	
Natural resource management	Crop Production	UPS 1: Rainwater harvesting (tied ridges)		1	1	-2				
		UPS 2: Fertilizer Micro-dosing		1	1	-1				
		UPS 3: Optimised weeding		1	-1	1				
Processing/w aste management		UPS 1: Crop byproducts for bioenergy		0	0	1				
		UPS 2: Training on improved processing (incl. pot. investment Maize sheller)		1	0	2				
		UPS 6: Improved cooking stoves		1	3	3				

Fill in the following sheets: “economic”- and “environmental impacts” and assess here also the impacts on a scale -3 to +3. On the last sheet: “Impact results” you will see an overview of your impact ratings in the table and in a graph. If necessary you may also adjust your ratings by going back into the preceding pages. Thank you very much for your input. At the Trans-SEC 1.annual conference in September you will get a feedback on the results!

Feedback sheet for specific assessments (give short reasons if you would like to, and in particular if you have a strong argument which you would like you to share with us)

General UPS requirements

	Simplicity	Local knowledge	etc	etc
UPS 1				
UPS 2				
UPS 3				
UPS 4				

Institutional requirements

	Human capital	Social capital	Property rights	Investment
UPS 1				
UPS 2				
UPS 3				
UPS 4				

Social Impacts

	Food diversity	Social relations	Working conditions
UPS 1			
UPS 2			
UPS 3			
UPS 4			

Economic Impacts

	Production	Income	Commercialization
UPS 1			
UPS 2			
UPS 3			
UPS 4			

Environmental Impacts

	Soil fertility	Available soil water	Agro- Biodiversity
UPS 1			
UPS 2			
UPS 3			
UPS 4			

Question yourself before you score (-3 to +3): "How will UPS (x) affect criteria (y) in Morogoro towards the year 2020?"

			Scoring -3 to 3		
			Soil fertility (chemical soil properties)	Available soil water (available water for plants over the growing season)	Agro- Biodiversity (Nr. of crops and wild species)
Natural resource management	Crop Production	UPS 1: Rainwater harvesting (tied ridges)			
		UPS 2: Fertilizer Micro-dosing			
		UPS 3: Optimised weeding programme			
Processing/waste management		UPS 1: Crop byproducts for bioenergy			
		UPS 2: Training on improved processing (incl. pot. investment Maize Sheller)			
		UPS 6: Improved cooking stoves			
		UPS 2: Optimised market oriented storage			
		UPS 3: Poultry-crop integration			
		UPS 4: Market access system (m-IMAS)			
Consumption/food quality		UPS 1: Household nutrition education			
		UPS 2: Kitchen gardens			

High negative impact -3, moderate negative impact -2, medium negative impact -1, no impact 0, low positive impact 1, moderate positive impact 2, high positive impact, 3 don't know "blank"

Question yourself before you score (-3 to +3): "How will UPS (x) affect criteria (y) in Morogoro towards the year 20

			Scoring -3 to 3		
			Production (agr. Yield [kg])	Income (household income)	Market participation (surplus sold at markets or inputs purchase)
Natural resource management	Crop Production	UPS 1: Rainwater harvesting (tied ridges)			
		UPS 2: Fertilizer Micro-dosing			
		UPS 3: Optimised weeding programme			
Processing/waste management		UPS 1: Crop byproducts for bioenergy			
		UPS 2: Training on improved processing (incl. pot. investment Maize Sheller)			
		UPS 6: Improved cooking stoves			
Markets (income generation)		UPS 2: Optimised market oriented storage			
		UPS 3: Poultry-crop integration			
		UPS 4: Market access system (m-IMAS)			
Consumption/food quality		UPS 1: Household nutrition education			
		UPS 2: Kitchen gardens			

High negative impact -3, moderate negative impact -2, medium negative impact -1, no impact 0, low positive impact 1, moderate positive impact 2, high positive impact 3, don't know

Question yourself before you score (-3 to +3): "How will UPS (x) affect criteria (y) in Morogoro towards the year 2020?"

			Scoring -3 to 3		
			Soil fertility (chemical soil properties)	Available soil water (available water for plants over the growing season)	Agro- Biodiversity (Nr. of crops and wild species)
Natural resource management	Crop Production	UPS 1: Rainwater harvesting (tied ridges)			
		UPS 2: Fertilizer Micro-dosing			
		UPS 3: Optimised weeding programme			
Processing/waste management		UPS 1: Crop byproducts for bioenergy			
		UPS 2: Training on improved processing (incl. pot. investment Maize Sheller)			
		UPS 6: Improved cooking stoves			
		UPS 2: Optimised market oriented storage			
		UPS 3: Poultry-crop integration			
		UPS 4: Market access system (m-IMAS)			
Consumption/food quality		UPS 1: Household nutrition education			
		UPS 2: Kitchen gardens			

High negative impact -3, moderate negative impact -2, medium negative impact -1, no impact 0, low positive impact 1, moderate positive impact 2, high positive impact, 3 don't know "blank"

Appendix 4: FoPIA tool for farmer participation assessment

Manual and process for undertaking FoPIA

Farmer-based participatory Impact assessment Tool (FoPIA)

Upgrading Strategies (UPS) on the local Food Security situation, a cross-cutting indicator framework (along the different tasks) will be elaborated. The specific aim of this framework is to provide a generic structure to identify and select a common set of food security assessment indicators. Cross-cutting key indicators will enable linking between different impacts across the Food Value Chain. Therefore, the indicator framework (Figure 1) aims

1. to structure the selection process along selected Food Security criteria (Table 1),
2. while ensuring a balanced selection of economic, social, and environmental assessment indicators
3. that should cover the different food-value-chain (FVC) components

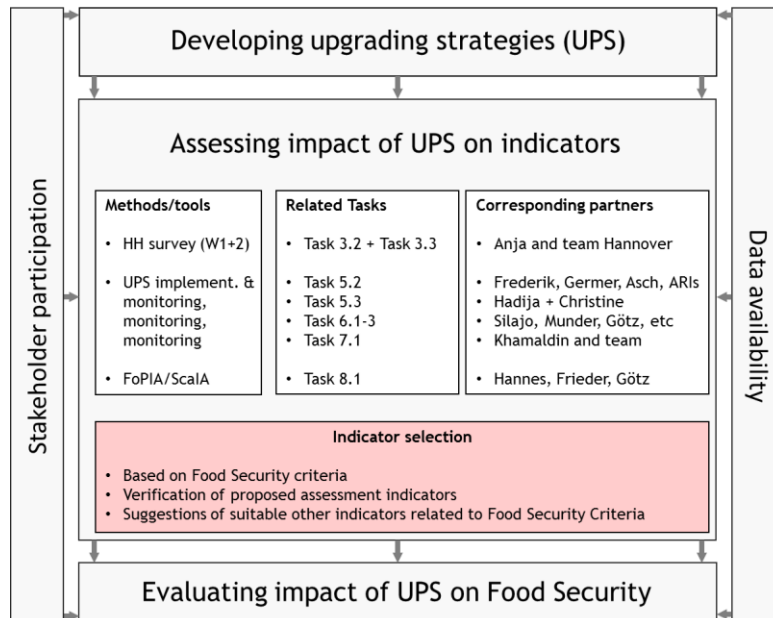


Figure 1: Indicator selection scheme within the general UPS assessment framework

Indicator selection process

We considered the following **indicator selection criteria** to develop an indicator set for the assessment of UPS impacts on food security. The following three selection criteria are required:

1. the indicator should be relevant to the corresponding Food Security criteria
2. the indicator should be covered by the HH Survey and the obtained indicator data should be available in a good quality (the baseline survey responses should be of sufficient and useful quality)
3. the indicators should not be redundant

In addition to this we aim to consider the following criteria where possible:

- should be able to measure short (1 year) to medium (> 1-10 year) term effects
should be able to serve as ex-ante AND ex-post IA indicator
 - should be “neutral”=> either positive and/ negative impact direction possible
 - the indicator should be simple and measurable (avoidance of composite indicators)
4. the indicator should be understandable to different stakeholder groups (e.g. farmers and decision makers at policy level).

Table 1: Food Value Chain Component and corresponding UPS

FVCC	UPS Nr	UPS name
Natural Resources/agricultural production	1	Rainwater harvesting
	2	Fertilizer micro-dosing
	3	Optimized weeding
Processing	1	Byproducts for bioenergy
	2	Improved processing
Marketing	1	New product development
	2	Optimized storage
	3	commercialization
Consumption	1	Kitchen garden and nutrition education

	family- and village leve, See also new MDGs expected: 4 th dimension 'cultural impacts')	Nr of HH/village participating in village institutions and/or collective actions (SHG, village group activities...)	Sec 2.1, page 7, Q.15; page 41, 42083; page 23,, 35006, 35014	Allocation of labor/ distribution of work among genders; poss. Changes	x	x	x	x	x	x	x	x	x	x	x	x	x	
		Spare time per week to be spent for social issues (family, friends, village-groups) Note: not covered in the HH survey round	May be next round of the survey?	Assuming UPS will really reduce time availability?!! Worth to consider time issues	x	x	x	x	x	x	x	x	x	x	x	x	x	x
	Working conditions (working hours, quality, load)	Nr of hours per day spent for food production (share of food being produced for consumption)	Sec. 6, Q. 14,15, and agriculture section (family labour for harvesting etc.)	Hours spent before / after UPS XY	x	x	x	x	x	x	x	x	x	x	x	x	x	x
		Expenditure in Tsh. per year for hired labour (specification needed, e.g. on wayer level and opportunity costs)	Sec. 4.2, Q. 43 Sec. 4.2, Q.44	Anja, please check Maybe not comparable; leaves out the targeted poor	x	x	x	x	x									
			Sec. 4.2, Q. 42						x									
E c o n o m i c	Production (agr. yield)	Yield in kg/ land-unit / capita or produce for particular crop (pearl millet, maize, sunflower, sesame, groundnuts)	Sec. 4.2, Q. 11, 12	Obvious/ clear ("neutral", either positive or negative)	x	x	x					x	x			x		
		Quantity of stored food in kg per capita per season / year (<i>repetition food diversity</i>) better here	Sec. 4.2, Q. 32, 33, shocj section; 42014a/b , 42015, 42037	See above (for selling/ consumption)	x	x	x		x			x	x	x	x	x	x	x
		Nr. of chicken / HH and season		Not covered in the HH survey														
		Quantity of agricultural losses per hh per season?	Sec. 4.2, Q. 14	Production / storage losses	x	x	x	x	x			x	x	x	x	x	x	x
	Income (household income)	Net Income in Tsh. per capita per year from farming and off farm activities (consider food expenses for different regions)	Volume of sales (average per month) Sec. 6, Q.10 Average monthly Cash (Sec. 6, Q.13)		x	x	x	x	x	x	x	x	x	x	x	x	x	x
		s Input costs for food production per year per crop (e.g. machine, fertilizer)	Sec. 4.2, pp. 33-41 Q.31-82		x	x	x	x	x	x	x	x	x	x	x			x
	Market participation	Nr of HH/village/year growing cash crops sold at the market	42027, 42022		x	x	x		x			x	x	x	x	x	x	x

Appendix 5: Checklist for Gender Based Constraints Disparities in Asset Ownership

4. Are you constrained in any way to obtain land? Y/N, if Y: how?
5. Do you get any difficulties in the choices of which crop to cultivate? Y/N, if Y: how? (wether cash or food crop)
4. Do your male and female household members have the same access to education? Y/N, if N: how?
5. Do female have same access with male on productive assets (Like tractors, transport facilities of harvest). Y/N, if N: how?
6. Do female and male have same access to fertilizer as male? Y/N, if N: how?
7. Does female headed HH have same access as male farmers for improved seeds? Y/N, if N: why?

Labour /Market Imbalances

4. Are you hindered to take part as a wage labour because you are male/female? Y/N, if Y: why
5. Are you paid differently in wage labour because you are male/female? Y/N, if Y: how
6. If you are told to rank from a scale of 1-5 on what constraints you the most to take part in marketing what would that be?
5. Culture/Taboos/Religion
6. Husband/wife
 - (iii) Household responsibilities
 - (iv) Security (Theft, Violence, Rape e.t.c)
 - (vii) Marital status (e.g. If having a partner causes you not to participate, or being single hinders)
 - (vii) Others

Access to Financial Services

1. Is it possible for you as a woman or man to move /go to town to sell your produce? (freedom of mobility) if not why?
2. Do you get market information Y/N, (If it is female HH-Do you think men get more information on market than women)? Y/N, if Y: why

Cultural

3. Do you think there are differences in property laws between men/women in your community? Y/N, if Y: which ones?
4. Who makes the important decisions in the HH (Female/Male)?a) what to produce (Female/Male), b) how much to sell (Female/Male), c) how much to spend (Female/Male).
5. Do the household responsibilities hinder you to take part in markets? Y/N, if Y: why
4. Are there any existing gender norms, attitudes and practices hindering you to take part in production or marketing? Y/N, if Y: why
5. Does your tradition or belief hinder you to mix with other sex in marketing? Y/N, if Y: why

Other Challenges

1. Are you sometimes constrained to do your household activities because of water scarcity? Y/N, if Y: why
3. Are you constrained to take part in any activities due to gender based violence? (e.g violence from husband, wife, relative). Y/N, if Y: how?.

Appendix 6: Required samples size at the 5% confidence interval, given a finite population

N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	246
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	351
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	181	1200	291	6000	361
45	40	180	118	400	196	1300	297	7000	364
50	44	190	123	420	201	1400	302	8000	367
55	48	200	127	440	205	1500	306	9000	368
60	52	210	132	460	210	1600	310	10000	373
65	56	220	136	480	214	1700	313	15000	375
70	59	230	140	500	217	1800	317	20000	377
75	63	240	144	550	225	1900	320	30000	379
80	66	250	148	600	234	2000	322	40000	380
85	70	260	152	650	242	2200	327	50000	381
90	73	270	155	700	248	2400	331	75000	382
95	76	270	159	750	256	2600	335	100000	384

(N=population size and n= sample size)