ADDIS ABABA UNIVERSITY

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ROLE OF WOMEN AND CONTRIBUTION OF MANURE APPLICATION IN HORTICULTURAL CROP PRODUCTION: A CASE STUDY OF HULET EJU-ENESIE DISTRICT, NORTH WESTERN ETHIOPIA

Addis Walle Nigate

A Thesis Presented to the School of Graduate Studies of Addis Ababa University in Partial Fulfillment of the Requirements for the Degree of Masters of Science in Biology

September, 2017

Addis Ababa, Ethiopia

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APPROVAL SHEET I

This is to certify that the thesis prepared by Addis Wale entitled: ***Role of women and contribution of manure in Horticultural Crop Production: A case study of Hulet Eju-Enesie District, North Western Ethiopia*** and submitted in partial fulfillment of the requirements for the degree of Mater of Science (Biology) compiles with the regulation of the University and meets the accepted standards with respect to originality and quality.

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ABSTRACT

Role of Women and Contribution of Manure Application in Horticultural Crop Production: A Case Study of Hulet Eju-Enesie District, Northwest Ethiopia

Addis Walle

Addis Ababa University, 2017

This study examined the role of women and the contribution of manure application in horticultural crop production as well as soil fertility improvement in hulet eju-enesie District, North Western Ethiopia. Two villages named Muger and Buhawch were selected in Beza-Bzuhan Kebele. Horticulture plays a great role in food security and a very good source of income, especially for women. A total of 120 general informants have involved in this study who were selected by using stratified sampling method. Different wealth category and gender were considered in selecting informants. Key informants were selected based on their experience about the horticulture management practices. Both qualitative and quantitative data were collected from primary and secondary sources. The data were analyzed using simple descriptive statistical methods. 76.67% of the respondents illiterate, 47.5% of respondents are poor. Majority of the respondents are age group 26-45 years. Despite the various constraints like land, credit and information women play significant role in horticulture management practices. The result from this study also indicated that manure application before planting the fruits great contribution for a better growth performance and yield. This study will provide evidence to decision makers for further empowering women and ensure food security.

Key Words/phrases: Horticulture, Hulet eju-enesie, Manure, Vegetable, Women,

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LIST OF ACRONYMS

ADA	Amhara Development Association
ARDO	Agricultural and Rural Development Office
DAs	Development Agents
FHH	Female Headed Household
HHs	House Holds
IFAD	International Fund for Agricultural Development
IMPS	Improving Productivity and Market Success
KIs	Key Informants
MHH	Male Headed Hose hold
PA	Peasant Association

CHAPTER ONE

1. Introduction

1.1 Back ground and Justification

Ethiopian economy is predominantly agrarian and women are key players in this business of agriculture in the country, especially in rural communities. As the main base of Ethiopian economy, agriculture contributes 43% of the gross domestic product, provides 85% of export revenue and supports over 86% of the population (FAO/WHO, 2004). According to Mersha (2007), about 85% of the populations of the country live in rural areas; out of this 35% are women who generate around 50% of income in the agriculture sector by actively participating in production. Women have always played a crucial role in the horticulture industry, not only from a consumer point-of-view but also as prominent business leaders and owners, growers and breeders (Drotleff, 2015).

Horticulture is one of the fastest growing sectors of agriculture. The growth of this sector was about 5.5% during last two and half decades (anonymous, 2014). The horticulture crops have potential of providing more employment and income from unit area than field crops. Apart from employment generation and income enhancement, the horticulture sector has vast scope of value addition which not only provides employment to farm family but also smallholder farmers, particularly women. According to JBM and SSR (2015), women play significant and crucial role in horticultural development including production, postharvest operation and value addition.

In most parts of Africa, women take the lead activity in home-gardening as this practice is performed close to the homestead. The role of women in traditional management practices has

increasingly been appreciated globally as a strong incentive for biodiversity conservation. They play vital role in enhancing conservation and sustainable use of natural resources, including horticultures, and therefore as remedy for numerous forests conservation problems (Akhter et al., 2010).

In spite of the above-mentioned facts about their active contributions in horticulture systems, women are given little recognition partly due to cultural and traditional bias against them. This crucial social force might be underutilized due to low engagement of women in professional supports such as extension advice, training and credit, etc. (Marc and Mamusha,2011). The promotion of inorganic fertilizer is a dominant strategy among governments and international development organizations to tackle low soil fertility. However, for the large majority of farmers in sub-Saharan Africa such initiatives have had limited effects due high costs and limited access (World Bank, 2013). Among women, who are likely to be more asset-poor and subsistence oriented compared to men, fertilizer use is even lower (Peterman et al., 2010). This scenario together with the social division of labor that has associated women to home yard activities, led women to use organic fertilizers more frequently.

Women in Hulet eju-enesie district, highly engage in fruit production (personal observation). However, no scientific study (at least to the knowledge of the researcher) regarding the contribution of women to fruit production has been conducted before. Therefore, this study was initiated to investigate the role of women and the contribution of manure to horticulture crop production in Hulet eju-enesie district, which is one of the areas having strong traditional horticultural practice.

1.2 Statement of the problem

Women account more than half of the total community and their contribution in managing agriculture, including horticulture practices, has great importance. Despite their vital contributions, they are given less recognition for their efforts. Therefore, this research was contributed in revealing the role of women in horticulture practices and the importance of manure application for horticulture production. The research will also address the lack of concrete and statistical information on their roles and decision making in the horticulture, which can be used as an entry point to build an economical viable and ecologically sustainable horticulture practice system. The study will help different practitioners to understand women's role and hence formulate gender-sensitive development interventions. It will also play a great role in creating awareness about manure application for growth performance of plants and yield increment in horticultural crop production.

1.3 Objectives

1.3.1 General objectives

The general objective of the study is to assess the role of women in horticulture practices and contribution of manure application for horticultural crop production in Hulet eju-enesie district, North Western Ethiopia.

1.3.2 Specific objectives

- To identify the activities in which women are involved in the horticulture practices
- To compare the level of participation of women in different wealth category

- To examine the opportunity and constraints of women participation in horticulture crop production
- To assess the contribution of manure application for horticultural crop production

1.4 Research questions

To achieve the stated objectives, the study was focus on the following research questions.

- What are the roles of women in horticulture practices in the study area and what type of practices are performed by women in their horticulture?
- Is their women use manure in horticultural crops?
- Is wealth category depending directly on who heads the household?
- What are the opportunity and constraints those affects women in horticulture practices?

CHAPTER TWO

2. Literature Review

2.1 Horticulture practices in Ethiopia

Growing fruits and vegetables is a common practice that is run by small holder farmers as mainly to supplement the daily food requirement and also for as a means of income generation. Horticultural crops play a significant role in developing countries like Ethiopia, both income and nutrition status (Girma, 2003). It helps in maintaining ecological balance since horticultural crop species are so diverse. Further, it provides employment opportunities as their management being labor abundant and capital scarce countries like Ethiopia. Historically, the backbone of Ethiopia's economy like many other developing countries is the agricultural sector, which absorbs significant labor force out of which women make almost half. It is documented in many literatures that, Ethiopian rural women play a significant role in crop and livestock production in addition to their reproductive and community roles. However, their relative access to and control over resources is limited vis-à-vis men. This is believed to contribute its part to the sector's low performance (Yaekob, 1999).

Ethiopia is one of the countries in Africa which have huge potential for the development of the different varieties of horticultural crops. The country is endowed with natural resources in deferent agro-ecological zones which are suitable for the cultivation of horticultural products. Accordingly, large varieties of flowers, vegetables, fruit and herbs are being grown currently in various areas of the country (Kassa, 2015).According to the recent population census, the total area coverage for fruits and vegetables production is about 12,576 hectares in 2011 (CSA, 2012).

However, production of fruit and vegetable cover less than one percent of the total land area under cultivation (Kassa, 2015).

Fruit and vegetable production have been carried out in Ethiopia for decades. This sector comprises large state farms supplying fruits and vegetables to the local market and for exports (Ethiopia-Netherlands Horticulture Partnership, 2007). Ethiopia is a country with great variety of climate and soil types that can grow diversity of horticultural crops for home consumption and foreign markets (Grima, 2003).

2.2 Women's Role in agricultural and horticultural management

Women play a great role in agriculture in all parts of the world. They are committed to sustain food supply as well as bringing extra income to their family; this is particularly true with rural dwelling women (IFAD, 2010 cited in FAO, 1990). In Africa, 75% of the food grown and eaten is produced predominantly by women (Garrity, 2006). Majority of women in developing countries fall within the small scale subsistence sector farming and produce more than 80% of the food for the sub-Saharan Africa (Irvine, 1996). In addition, they grow half of the world's food requirements (FAO, 1993). This also holds truth with the Ethiopian rural women who make significant contribution to agriculture as the mainstay of the farm labor, which in turn contributes to ensure food security.

Generally women play an important role in food production. As a major chunk, women labor force in production system is invested in weeding, harvesting, marketing, post-harvest handling etc. (Ranjan and Hedija, 2004).This indicates that women participate actively in all phases of agricultural production. In addition to taking care of their families, women in the developing countries spend considerable proportions of their time and energy in farming activities, which

includes crop production, growing fruits and vegetables, rising small livestock, nurturing trees, processing products for food and markets, gathering fuel wood and maintaining their homes (IFAD, 2010, SOFA and Doss, 2011). In Ethiopia, rural women are actively involved in various farm activities such as seed cleaning, land preparation, sowing/planting, weeding, preparing and applying manure, hoeing, bird watching, harvesting, collecting fodder, watering fruit plants, transporting and storage of products (Anteneh, 2008 cited Alemayehu, 2003). As it is stated in Zenebe, (2005), about 87% of women in Ethiopia are engaged in agriculture, contributing about 50% of income based on subsistence agriculture. Moreover, women are responsible for about 40% of all agricultural labor in Ethiopia (MOA, 1992).

On the other hand women generally have shown more attachment to home gardening although it varies across cultures. They involve in land preparation, planting, weeding, harvesting as well as marketing of home garden products. Thus, female-headed households appear to spend more on production of fruits and vegetables (which are mostly homegarden products) than male-headed households (Ruel et al., 2005).Women are heavily involved in all aspects of homestead production, from the selection of land to decisions regarding which crops to grow and to harvest (Akhter et al., 2010). According to Mohammed (2014) women have dual responsibility for farm and house hold production. This led to an increased engagement of women in horticultural sector, playing major role in cultivation of fruits, vegetable and flowers (Baba et al.,2010). The intimacy of women to fruit and vegetable production in home gardens is also a common practice in most parts of Ethiopia.

Horticultural crop production creates jobs and it provides twice the amount of employment per hectare of production compared to cereal crop production (Ali et al., 2002). The move from cereal production towards high value horticulture crops is an important contribution to

employment opportunities in developing countries (Joshi et al., 2003cited in Habtamu and Adugnaw, 2016). Women in general, playa much more significant role in horticultural crop production compared to starchy staple crops. Throughout the developing countries of Africa, women play a dominant role in the production of horticultural crops and cultivate more than half of the total smallholdings. Besides creating jobs on the farm, the horticultural sector also generates off-farm employment, especially for women by (Wenberges and Genova, 2005 cited in Habtamu and Adugnaw, 2016).

2.3 Constraints and Opportunities of women participation in horticulture

2.3.1 Opportunities

Horticulture is viewed as a great opportunity for women as they can gain economic benefits from the sector in several ways. In addition to the actual farm field for fruits and vegetables, women farmers usually use their farm knowledge and practice to grow horticultural crops around their homes. This help them to establish a small kitchen gardens, where they can grow crops used in their private household for cooking, and/or for selling to their neighbors. In contrast to other agro forestry products, women receive substantial benefits from indigenous fruits and vegetables (Kiptot and Franyel, 2011).

Horticulture is also an opportunity to women's empowerment effort since it may be an alternative way to increase women's access to and control over assets. Creating an opportunity to women participation in market-oriented agricultural production, strengthens women's decision-making role and thus to the overall economy of a country (Lemlem et al., 2010).

Smallholder farmers tend to find horticulture positive because the harvest period for the horticultural crops is shorter compared to the non-horticultural crops, which mean that the crops mature earlier. The reason why most farmers start with horticulture is due to the fact that they expect a greater income since the market prices of horticultural crops are higher than for non-horticultural crops (Darfeldt and Fredriksson, 2011).

2.3.2 Constraints

Women are competent in many activities. However, the different cultural and social attitude hinders them to equal opportunities for resource access and caught up the productivity of women. This might be one of the key reasons that the agriculture sector is underperforming in many developing countries (FAO, 2011). Despite the significant attention given to the agricultural sector and the immense contribution of women to this sector, they have more difficulties than men in gaining access to resources such as land, credit and productivity enhancing inputs and services. In addition, the traditional division of labor and the lower value attached to the contribution of women disadvantage them by limiting their land size, the number and types of agricultural services provided, and other necessary resources and inputs (Almaz, 2001). Odoemelam et al. (2014) shows that there are differences in yield between male and female farmers, not because the female farmers are less skilled than their male counterpart but lack access to agricultural inputs and resources. The limited visibility linked to a number of social, cultural and economic factors, women tend to be marginalized in many development interventions. Women have also less education and less access to extension services, which make it more difficult to gain access to and use some of the other resources, such as land, credit and fertilizer. These factors also prevent women from adopting new technologies as readily as men

do. Policy, program design and information systems are trying to resolve these impairment but still a lot is remaining to go.

2.4 Importance of Horticulture

Horticulture is an important system of cropping in which smallholder farmers can benefit. It is a system useful in maintaining family health in addition to its importance in production of food supplements. Fruits and vegetables, which are primary products of horticulture, play vital role in maintain the health of human population in addition to their importance in income generation (FAO/WHO, 2004). In many cases, horticulture generates a sound income in smallholdings that would not be gained from harvest of cereal crop. Since women use their earnings to take care of their family and invest on their children education, women engagement in horticulture multiplies the benefits by increasing social capital (Habtamu and Adugnaw, 2016).

It is a widely accepted that fruit and vegetables are important of healthy diet and that the consumption can help prevent a wide range of diseases (Habtamu and Adugnaw, 2016) if consumed daily in sufficient amounts, could help prevent serious health problems. According to WHO (2002), low fruit and vegetable intake is estimated to cause about 31% of ischemic heart disease and 11% of stroke worldwide. Over all it is estimated that up to 2.7% million lives could potentially be saved each year if fruit and vegetable consumption was sufficiently increased (FAO/WHO, 2004).

From human nutrition point of view horticulture is most important to our daily living. Many of the horticulture crops and their products find place in our meals and diet. Human body requires vitamins, proteins, energy etc., for healthiest functionality. All these are supplied by horticultural crops. Fruit and vegetables are the chief sources of vitamins, minerals, carbohydrates, fats;

proteins etc. Fruits and vegetables are generally low energy density and often are good sources of fiber and potassium, but the nutritional contribution of standard servings of fruits and vegetables varies widely (Joanne and Beate, 2012).

2.5 Importance of manure application in Horticultural crop production

Manure is a valuable fertilizer for any farming operation and has been used for centuries to supply needed nutrients for crop growth. The use of manure has generally declined on many farms over the past 50 years due to: 1) farm specialization with increasing separation of crop and livestock production, 2) cost of transporting manure, 3) relatively low analysis nutrient source and increased availability of high analysis synthetic fertilizers that usually provide a cheaper source per unit of nutrient than manure. Despite these limitations, manure produced on or near a vegetable farm provides many benefits and should be beneficially utilized whenever possible (Carl and peter, 2005). Row manure is an excellent resource for organic crop production. It supplies nutrients and organic matters, stimulating the biological processes in the soil that help build fertility (George, 2003).

The most common sources of manure are cows, horses, sheep, pigs, goats, and poultry. By using manure, important micro and macronutrients can be added to soil. Manure improves soil aeration and water retention there by building good soil structure and texture. Having good soil also offers supportive system for beneficial soil organisms and earthworms. Furthermore, using manure means recycling of nutrients which removes dependency on chemical fertilizers.

In organic production, manure is commonly applied to the field in either a row (fresh or dried) or composted state (George, 2003). Manure and compost not only supply many nutrients for crop production, including micronutrients, but they are also valuable sources of organic matter.

Increasing soil organic matter improves soil structure or tilth, increasing the water-holding capacity of coarse-texture sand soils, improves drainage in fine-textured clay soils, provides a source of slow release nutrients, reduces wind and water erosion, and promotes growth of earth worms and other beneficial soil organisms. Most vegetable crops return small amounts of crop residue to the soil, so manure, manure compost and other organic amendments help maintain soil organic matter levels (Carl and Peter, 2005).

Nutrients contained in organic manures are released more slowly and are stored for a longer time in the soil, thereby ensuring a long residual effect (Sharma and Mittra, 1991). Improvement of environmental conditions and public health concerns as well as the need to reduce cost of fertilizing crops are also important reasons for advocating increased use of organic materials (Seifrite, 1982). Application of organic manures also improves the soil physical and microbial properties (Belay et al., 2001).Livestock manure can be a valuable source of nutrients, but it also can be a source of human pathogens if not managed correctly.

CHAPTER THREE

3. METHODLOGY

3.1 Description of Study Area

3.1.1 Location and Topography

This study was conducted in Hulet eju-enesie District, East Gojam zone, Amhara regional state, North-western Ethiopia, which is situated at about 365Km away from the capital city, Addis Ababa on the main road that links Dejen to Bahir Dar(Figure 1).The study area is geographically located at $10^0 40' 30'' - 11^0 15' 00'' N$ latitude and $37^0 45' 00'' - 38^0 06' 00'' E$ longitude with an altitudinal ranges between 1200-3300m a.s.l. It has an area of 147,990ha and populations of 280,997, of which 140,825 are male and 140,172 are female and the average family member in a household is estimated to be six (ARDO, 2016). The specific study site in the district was Beza-Bizuhan Kebele.

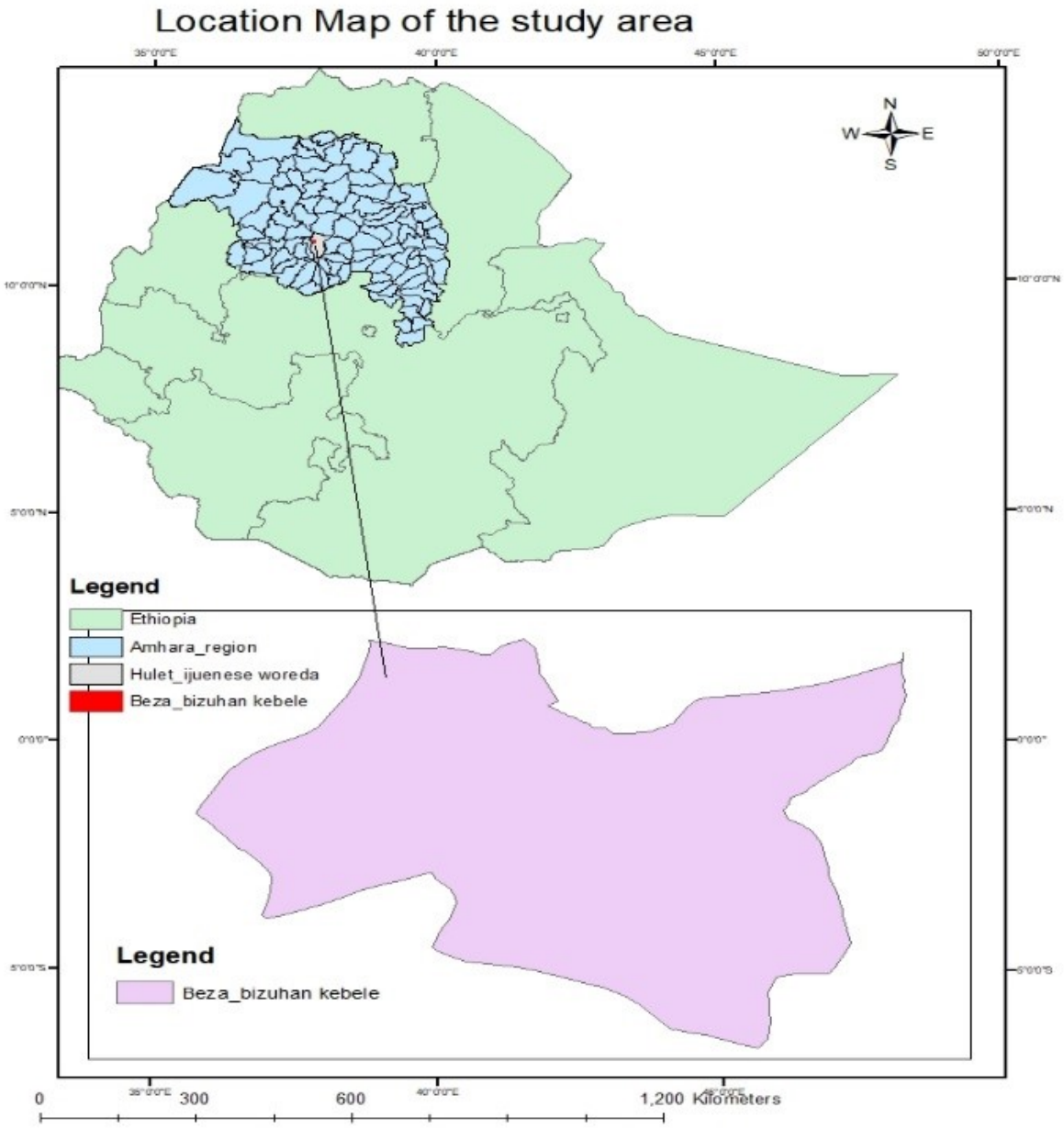

Figure 1 Map of Ethiopia showing the study area

3.1.2 Climate

Climatically, the district falls within the three agro-ecological zones Dega (13%), Weyena-Dega, (57%) and Kola(30%). The mean annual temperature is about 16.5^0c with maximum temperature exceeding 25^0c and a minimum of 8^0c (Mota meteorological station). The annual rainfall ranges between 1100-1189 mm varied with long period of summer rain (ARDO, 2016).

3.1.3 Land use and Vegetation

From the total land area of the district, 62,952 ha are cultivated, 14,506 ha is covered by forest, 18,736 ha is shrub land, 33,549 ha is grazing land and 18,247 ha is resident and other constructions. According to the annual report of ARDO (2016), agricultural crops constitute 42.54% of the total land area and agriculture is the principal source of livelihood for the population. It is characterized by subsistence rain-fed crops, livestock, vegetable and fruit production and management systems. Among fruits plants papaya, mango, and avocado; as vegetables tomato, onion, and cabbage are the main productions in the district. As main food crops teff (*Eragrostis tef* L.), maize (*Zea mays* L.), wheat (*Triticum aestivum* L.), millet **(***Eleusinecoracana* Gaertn.), bean (*Phaseolus vulgaris* L.), pea (*Pisum sativum* L.) are produced while few oil crops and coffee are produced as side products in the study area. Maize is the most widely cultivated crop for household consumption. From the total area of the district, 9.24% is covered by tree species such as *Sesbania sesban* (L.) Merr.*, Eucalyptus globules* Labill.*, Cordia africana* L.*, Vernonia amygdalina* Delile*, Croton macrostachyus* Hochst. Ex Delile*, Albizia gummifera* C.A.Sm.*, Rhamnus prinoides* L 'Hér.*, Cupressus lusitanica* Mill.*, Acacia abyssinica* Hochst. Ex Benth.*, Grevillea robusta* A.Cunn. ex R.Br.*, Coffea Arabica* Benth. and fruits like *Mangifera indica* Thwaites*, Carica papaya* L.*, Psidium guajava* L.*, Citrus sinensis* Pers.*, Persea americana* Mill.*, Citrus limon*(L.) Osbeck*, Musa paradisiacal* L., and other scattered indigenous tree and shrub species planted or grown naturally on farmlands (ARDO, 2016).

3.2 Research site selection

The study was conducted in Hulet eju-enesie district from September 1/2016-June 30/2017. The district was selected based on the presence of good horticultural practices. A preliminary survey was held in order to have an overview of the cultural and socio-economic aspects of the

communities in the study area. Development agents (DAs) of the district and elders were also consulted during the pilot survey before the selection of the specific study sites. Information was collected from ARDO about the socio-economic, demographic, cultural aspects and the presence of horticultural practices. Then Beza-Bizuhan kebele was identified and selected purposefully among the 48 kebeles found in the district. Beza-Bizuhan kebele is found almost 7km far from Mota town towards Bahir Dar. Field assessment was made with the kebele development agents, and then the appropriate village was identified on the basis of similar selection criteria. Those are Muger and Buhawch.

3.3 Informant Selection

3.3.1 Key Informant and Focus Group Selection

Key informants (KIs) were selected based on their experience about the horticulture management practices, the socio-economic and culture of individuals in the study area and who have been lived for a long period of time in the villages. These key informants were selected following the snowball method used by Den Biggelaar (1996). In order to identify individual farmers, who well identify the key informants, village guided tour, with the selected PA members and development agents were carried out. During guided tours, individual farmers were selected by snowball method and they were asked to give the names of about seventeen key informants. At least five individual farmers were asked in each village. Lastly, 15 key informants with higher score per village were identified. Therefore, a total of 30 KIs were involved in the study for the two villages and to do participatory approach was followed to do the field experiment in applying manure in horticultural crops. Moreover, the information obtained from the interviews of KIs were also be used in the development and modification of questionnaires for the survey.

Focus group discussions were conducted with a group of individuals who are believed to be equally interested or affected by the topic being discussed. Therefore, about nine to ten women with two age groups (15-40 and >40) for each village were invited.

3.3.2 General informant Selection

Stratified random sampling method was employed to select the general respondents. Stratified sampling technique was applied to characterize households in each village into different wealth category poor, medium and rich as well as the household heads on the basis of gender/sex. It was assumed that women participation in managing horticulture practices depends on the socioeconomic status of the households. The total households of the villages were stratified into three wealth categories as poor, medium, and rich household. The purpose of wealth stratification was to inspect how wealth may affect the horticultural management practices. Each stratum was again stratified in to MHHs (Male Headed Households) and FHHs (Female Headed Households). Key informants were used to categorize all individual households in each selected village in to three main categories according to the criteria of wealth classification used in their locality. Thus, yardsticks for wealth such as landholding greater than 2 ha, existence of fruit, vegetable and coffee fields, number of cattle more than 10, number of houses two and more grouped in to rich etc., was elicited and defined with KIs.

Samples of MHHs and FHHs were taken from each wealth category using random sampling technique, and a total sample size of 120 (9%) with purposive inclusion of 20% FHHs (see Table 1).

Table 1Total House hold, sample House hold size and % in the Kebele and each village by gender of house hold head

Sample kebele	Total House Hold/Kebele			Sample villages	Total House Hold/village			Sample House Hold/village		
	Male Headed House Hold	Female Headed House Hold	Total		Male Headed House Hold	Female Headed House Hold	Total	Male Headed House Hold	Female Headed House Hold	Total
Beza Bizuhan	2385	269	2654	Mugger	628	94	722	52	13	65
				Buhawch	542	69	611	44	11	55
Total	2385	269	2654		1170	163	1333	96	24	120

3.4 Method of Data Collection

The information and data required for the study was collected by employing various data collecting tools and methods.

3.4.1 Survey questionnaire

With the objectives of the study in mind, a questionnaire (open ended and close ended) survey, containing a variety of demographic and socio-economic indicators: marital status, household composition, age, family size, education, women's role in management practices and contribution of manure for horticulture crop production, women's role to apply manure and so forth were intended to collect information with the sample households in each selected villages. The questionnaire was prepared in English language and interpreted in to *Amharic* when presented to respondents.

3.4.2 Key informant Interviews and Focus Group Discussions

In order to cross-check the information obtained through the survey questionnaires and to gather an in-depth information about the major issues pertaining to the role of women in management of horticulture practices, semi-structuring interviews were conducted with selected KIs. Similarly, focus group discussions were held where the female members of the households actively participated. At the start of each interview and discussion it is important to mention and clearly explain the aim of the interview and discussion to the participants in order to invoke clear and objective responses. Information were gathered on the cultural division of labour, change in gender roles in horticultural management activities and the role of women in property control, particularly value property, such as land in the study area.

3.4.3 Review of Secondary Sources

Review of secondary sources was conducted from the kebele administrations, Agricultural and Rural Development Offices of the district and the region to gather information about the socio-economic, demographic, location, climatic, and vegetation characteristics of the study area.

3.4.4 Field observation of horticultural practices

Field observation was carried out using transect walk across farms of sampling households to obtain an impression about the type of species and management regimes mentioned during interviews.

The fruit and vegetable species and their vernacular names were identified and recorded in the field with the help of household members, KIs and DAs and their scientific names were verified using available literatures and with the help of professionals from the District's Agricultural Office.

3.4.5 Field experiment

Participatory approach was followed to conduct the field experiment, which dealt on growth performance of the crop with manure applications. The experiment was done in home gardens on maize farm with volunteer farmers, and results was observed and recorded regularly. The size of maize stem, diameter and No. of leaves recorded starting from 20 days after germination every 7 days for 5 times and every 15 days (two weeks) for two times. Measuring the height and the diameter has been done directly by using measuring tape and the fruit was measured once during maturity of maize and some dried by using sensitive balance and number of leaves by direct counting.

The experiment was designed in the field (farmland) as follow:

Four plots with different experimental treatments were established **Plot 1** was subjected to a control plot and reflected the reality of most of the farmland in the study area. **Plot 2** was subjected to micro-dosing of inorganic fertilizer during planting. One bottle cap of urea was applied in each seed hole while planting the maize seed. **Plot 3** was subjected to manure application before planting. In this plot, 1kg of dried sheep manure applied on the soil before three months to the time of planting that is important for decompose manure and prevent pathogen spreading. **Plot 4** was subjected to manure application during planting. The same quantity and source of manure like that of plot 3 was applied in the fourth plot during planting.

All the participating women selected the experimental crop to be maize because it is common to plant maize in home gardens. The maize was planting January 20/2017. The participants suggested it would be easier to follow up their experiments while they are at home busy with family caring. Besides they all agree that maize is the major component of the daily family food. During lack of rain supplementary hand watering were applied in each plot. Hybrid maize was used and the space variety between plants was 50×70cm. The total area of each plot 2×2, contain 6 maize and planting by six volunteer women.

3.5 Data Analysis

A descriptive statistical method was employed to analyze and summarize the collected data. The quantitative data were analyzed using SPSS v 20. The analyzed data were summarized and presented using tables, percentages and graphs.

CHAPTER FOUR

4. RESULT

4.1 Socio-economic characteristics of respondents

The survey result indicated that among the total sampled households, 80% of respondents were MHHs, and while the remaining 20% were FHHs (Table 1). The marital status of the sampled households showed that 80%, 18.33%, and 1.67% of them were married, widowed and divorced, respectively. The composition of the respondents was from one ethnic group, Amhara (Table 2).

Information from household survey also indicated that the family size of the sample households ranges from 2 to 12 persons, with a mean of 6.2 persons per household. Family size of the households is 2-4 members 21.67%, 5-9 members 60% and large above 9 members was 18.33%. With regard to educational level, 76.67% have not obtained formal education, 10% can read and write, 6.675% (grade 1-4), 4.16% (grade 5-8) and 2.5% have gone to secondary education (grade 9-10). The age range distribution of the respondents showed that, 16.67% of the respondents were in 20-25 age groups, 68.33 were in 26-45 age groups, 13.33% were in 46-64 age groups and 1.67% was > 64 age group. With regards to religious status of the households, 85% were Orthodox and 15%was Muslim. Occupation of respondents76.67% agriculture and 23.33% are agriculture and other. Economically, about 47.5% of the respondents were from poor categories, 30.83% were from medium economic category and 21.67% were also from the rich category (See Table 2).

Table 2 Household and socio-economic characteristics of the respondents (N=120)

Socio-economic characteristics		Frequency	Percent (100%)
Ethnic group			
	Amhara	120	100
Religion	Orthodox	102	85
	Muslim	18	15
Marital status	Married	96	80
	Widowed	22	18.33
	Divorce	2	1.67
Age			
	20-25	20	16.67
	26- 45	82	68.33
	46 – 64	16	13.33
	>64	2	1.67
Education			
	No education	92	76.67
	Only read and write	12	10
	Primary education(1^{st} cycle) (grade 1-4)	8	6.67
	Primary education(2^{nd}cycle) (grade 5-8)	5	4.16
	Secondary education (grade 9-10)	3	2.5
Family size			
	≤ 4	26	21.67
	5-6	42	35
	7-9	30	25
	>9	22	18.33
Occupation			
	Agriculture	92	76.67
	Agriculture and other	28	23.33
Wealth status	Poor	47	47.5
	Medium	44	30.83
	Rich	29	21.67

4.2 Horticultural Practices in the Study Area

Farmers in the study area cultivate food crops and cash crops as well as diverse fruits and vegetables which provide various benefits. The benefits mentioned include provision of cash crops (coffee, teff, fruits and vegetables); food crops (maize and wheat). Maize is the staple food supplemented by other crops such as millet and wheat. Fruit trees are the major components serving as sources of income, food, fodder, coffee shade, fuel wood and maintain the soil organic matter.

Farmers in the study grow fruits intercropping with vegetables and other food crops like maize in their home garden. About 90% of the respondents practice home garden while the remaining 10% respondents grow the above crops in their farm field away from their houses (Table 3).

Table 3 Participation of women in home garden

Practices	Frequency	Percent
Homegarden	108	90
Far from home	12	10

4.3 Women's role in home gardening and horticulture management practices

The major horticultural crop components are vegetables such as wild cabbage (*Brassica oleracea* L.), tomato (*Solanum lycopersicum* Blanco), onion (*Allium cepa* L.), chili pepper (*Capsicum annuum* L.), carrot (*Daucus carota* L.), beetroot (*Beta vulgaris* sub. Vulgaris L.) and cabbage (*B.oleracea* var.*capitata*), potato (*Solanum tuberosum* L.), fruits such as papaya(*Carica papaya* L.), mango(Mangiferaindica L.), avocado(*Persea americana* Mill.), lemon(*Citrus limon* L.Osbeck), orange(*Citrus sinensis* Osbeck) and coffee(*Coffea Arabica* Benth.), crops such as

maize (*zea mays*), teff (*Eragrostis tef*), wheat(*Triticum aestivum*), millet(*Eleusine coracana*), bean(*Phaseolus vulgaris*), pea(*Pisum sativum*) and oil crops like sunflower and Niger seeds.

Women generally play significant role in horticultural management, postharvest and processing practices. However, their roles and levels of participation can be dependent on the location of the farm, as well as types and purposes of the dominant crops produced in the practices. The majority (90%) of the households in the two village practice home garden management composed of crops, different types of fruit trees, vegetables and livestock. Almost all food crops are grown in the home garden and only 10% of the households participate in farms away from their houses. Home gardens were found to be the dominant practice in which women are significantly active. Women manage home gardens for different reasons large number of respondents (65%) prefer home garden for its proximity to their houses. Immediate source of food for the family, source of alternative income, good site to harmonized climate around the homestead and availability of irrigated water around their houses as reasons why they practice home gardening (Table 4).

Table 4 Women's reasons for interest in managing home gardens

Reason	Number	Percentage
Proximity of the practice to home	78	65
Source of food/food security	58	48.3
Land located around the home	25	20.8
Source of alternative income	34	28.3
Shade	10	8.3
Irrigated water available around the home	15	12.5

Note: Due to multiple response percentages do not add up to 100%.

Women in the study area includes all female in the age ≥15 (wives, daughters and any other women residing in that particular home); and men includes all males in the age ≥15 (husbands, sons and other man residing in that particular home).

a) Managing horticultural crops b)Vegetable harvesting

Figure 2. The role of woman in home garden

4.3.1 Women's Role in Vegetable Production

In the study area different types of vegetable crops cultivated for food security and for marketing. The most commonly produced vegetables in the study area are cabbage, carrot, lettuce, wild cabbage and beetroot. Others include chili pepper; tomato and onion are also grown by some farmers. Vegetables grown in two seasons, that is in the wet season (locally in meher seasons) using rain fall or under full irrigation during the dry season. The production of

vegetables by irrigation is the most common practice in the study area because of access of irrigated water and increase sale of vegetables during this season.

The practice of vegetable production is not solely managed by women whenever possible. The result from the analyses revealed that land preparation is mainly handled by men (54.2%) in most MHHs while women largely participate in manuring (80%) and processing the plants for food (100%) See Table 5.

Table 5 Division of labor for managing vegetables in household level (N=120)

Role	Tasks	Men(%)	Women(%)	Men&women(%)
	Site selection	51.7	15.8	32.5
Decision making	Seedling selection	42.5	17.5	40
	Sealing/income	18.3	52.5	29.2
	Land preparation	54.2	19.2	26.6
	Planting	45.8	29.2	25
Implementation	Manuring	_	80.8	19.2
	Hoeing	44.2	40	15.8
	Slashing	10.8	51.7	37.5
	Collecting	_	76.7	23.3
	Processing	_	100	_
	Marketing	10	50	40

4.3.2 Women's vegetable preferences for growing

The analyses from this study *Brassica spp.* (100%) are the highly preferred vegetable to grow survey result of women's vegetable preference. *Allium cepa* (3.3%) received the least mention for planting (Table 6).

Table 6 Women's preference of vegetable species at the study site (N=120)

No	Species	Frequency	Percent	Rank
1	*Brassica oleracea*	120	100	1st
2	*B. oleracea* var. *capitata*	72	60	2nd
3	*Daucus carota*	50	41.7	3rd
4	*Beta vulgaris*	28	23.3	4th
5	*Lactuca sativa* L	13	10.8	5th
6	*Capsicum annum*	8	6.7	6th
7	*Solanum lycopersicum*	7	5.8	7th
8	*Solanum tuberosum*	6	5	8th
9	*Allium cepa*	4	3.3	9th

Note: due to different preference rank of women percentage not add in 100

4.3.3 Women's role in fruit production

In the study area, the common fruits grown by women for food security and source of income are papaya (*Carica papaya*), mango (*Mangifera indica*), avocado (*Persea americana*), lemon (*Citrus*

limon) and orange (*Citrus sinensis*). Table 7 shows that percentage of women and men in house hold production and management of fruit.

Table 7 Division of labor for managing fruits (N=120)

Role	Tasks	Men (%)	Women (%)	Men&women (%)
Decision making	site selection	45.8	25	29.2
	Seedling selection	40.8	35	24.2
	Income/sealing	31.7	18.3	50
Implementation	Land preparation	50	40.8	9.2
	Weeding	8.3	81.7	10
	Watering	39.2	37.5	23.3
	Planting	49.2	18.3	32.5
	Manuring	8.3	80.8	10.8
	Pruning	55.8	27.5	16.7
	Harvesting	45.8	32.5	21.7
	Marketing	7.5	29.2	63.3

4.3.4 Women's role in livestock keeping

About 80% of the respondents in this study keep livestock and most of them have ox and cow as common livestock keeping practice (Table 8).

Table 8 Distribution of respondents based on having livestock and type of livestock (N=120)

Attributes	Response	Frequency	Percent
Do you have livestock?	Yes	96	80
	No	24	20
	Total	120	100
Type of livestock	Ox	62	64.5
	Cow	48	50
	Sheep	5	5.2
	Mule	10	10.4

Note: due to respondents have different livestock percent not add to 100

4.4 Contribution of manure in horticultural crop production

The survey result shows that 45%, 29.2%, 25.8% of the respondents use commercial fertilizer, manure and both respectively (Table 11). Table 9 indicates that only some women's in the study area use manure for horticultural crop production. From this 29.2% of respondents to apply manure 74.3% before planting, 17.1% during planting and 8.6% after planting.

Table 9 Distribution of sample respondents based on type of fertilizer and time of application for horticultural crop production (N=120)

Attributes	Respondents	Frequency	Percent
Type of fertilizer	Commercial fertilizer	54	45
	Manure	35	29.2
	Both	31	25.8
	Total	120	100
Time of application	before planting	26	74.3
	During planting	6	17.1
	After planting	3	8.6
	Total	35	100

4.4.1 The effect of manure and commercial fertilizer on the growth performance of maize

The result of this experiment shows that the growth performance of maize with the application of manure before planting was best of all followed by the application of manure while planting. Overall the maize growth with the application of manure outperforms the growth performance of maize with the application of inorganic fertilizer. Table 10 shows the average growth performance of maize from each plot recorded on every 7 days for five times and every 15 days for two times.

Table 10 Aggregated mean of maize growth and yield by treatment (N=6)

Treatment	height of Stem (cm)	diameter of stem (cm)	No. of Leaves/plant	Weight of Fruit (kg)
Manure before planting	75	4.1	11.5	0.337
Manure during planting	65	3.5	10.4	0.306
Inorganic fertilizer	61	3.1	9.2	0.279
Control/No manure or fertilizer	50	2.6	8.2	0.179

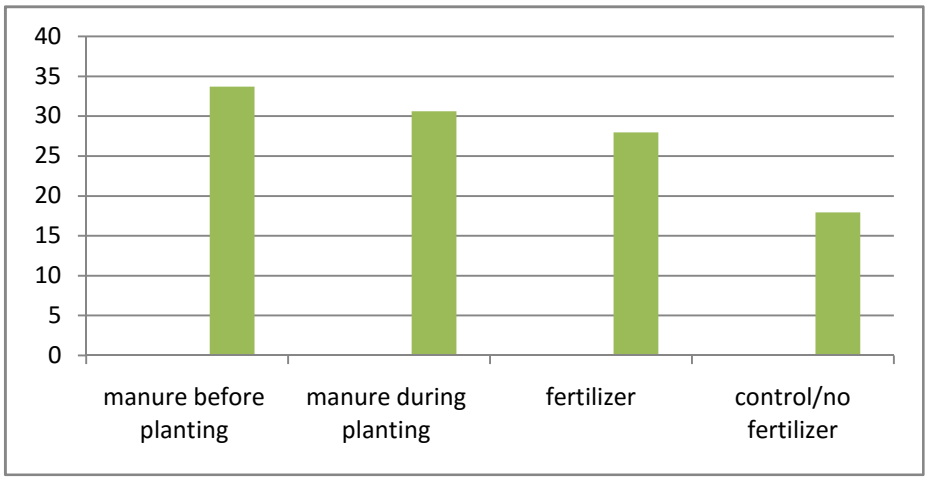

Figure 3 Aggregated mean yield of maize per gram by treatment

4.5 Women's differential participation in horticulture management practices: opportunities and challenges

The survey result shows that women involvement in horticulture management practices is highest in FHHs followed by women from poor households (Appendix 3).

4.5.1 Opportunities

All the key informants and participants of the focus group discussion agreed that the practice of horticulture is an opportunity to the community in the study area. Products of horticultural provide a job opportunity to youth and women in addition to easy access to family food. Women take some of the products to market and earn money. The fact that most production is carried out in home gardens and provide valuable yield within short period of time also is an opportunity for the producers.

Access to credit can address the financial constraints of farmers. The finding shows that about 37.5% of the respondents had no access to credit services, where as 62.5% had access to credit (Table 11). Thus, more than half of the sampled population get access to credit, which a good opportunity.

Table 11 Distribution of respondents by access to credit services (N=120)

Do you have access to credit?					
Yes		No		Total	
Frequency	%	Frequency	%	Frequency	%
75	62.5	45	37.5	120	100

4.5.2 Challenges

The results from key informants the production constraints are the perishable nature of fruit and vegetable, lack of appropriate postharvest handling practices and processing technologies and

lack of improved seed verities. The other constraints of fruit and vegetable production are lack of land, information, irrigated water and markets.

Extra workload in the house is also another challenge that may impair scaling up the horticulture productivity by women. The analyses from respondents' response indicated that women spent more than 12 hours working for the family (Table 12).

Table 12 Average time allocation for different activities within 24 hours for men and women in household

No	Activities	Women		Men	
		Hours	Minutes	Hours	Minutes
1	Cooking foods	3	_	_	_
2	Fetching water	2	_	_	_
3	Cleaning house	_	30	_	_
4	Caring children	2	30	_	_
5	Boiling coffee	1	_	_	_
6	Cleaning barn	1	_	_	_
7	Milking	1	_	_	_
8	Caring animals	1	_	3	_
9	Fuel wood collecting	1	_	_	_
10	Attend social meeting	_	_	2	30
11	Grinding	2	_	_	_
12	Others	_	_	4	_
	Total	15	_	9	30

The other challenge is size of land occupied by FHHs. Most FHHs own a plot size between 0.5 and one ha of land but never greater than two ha (Figure 4).

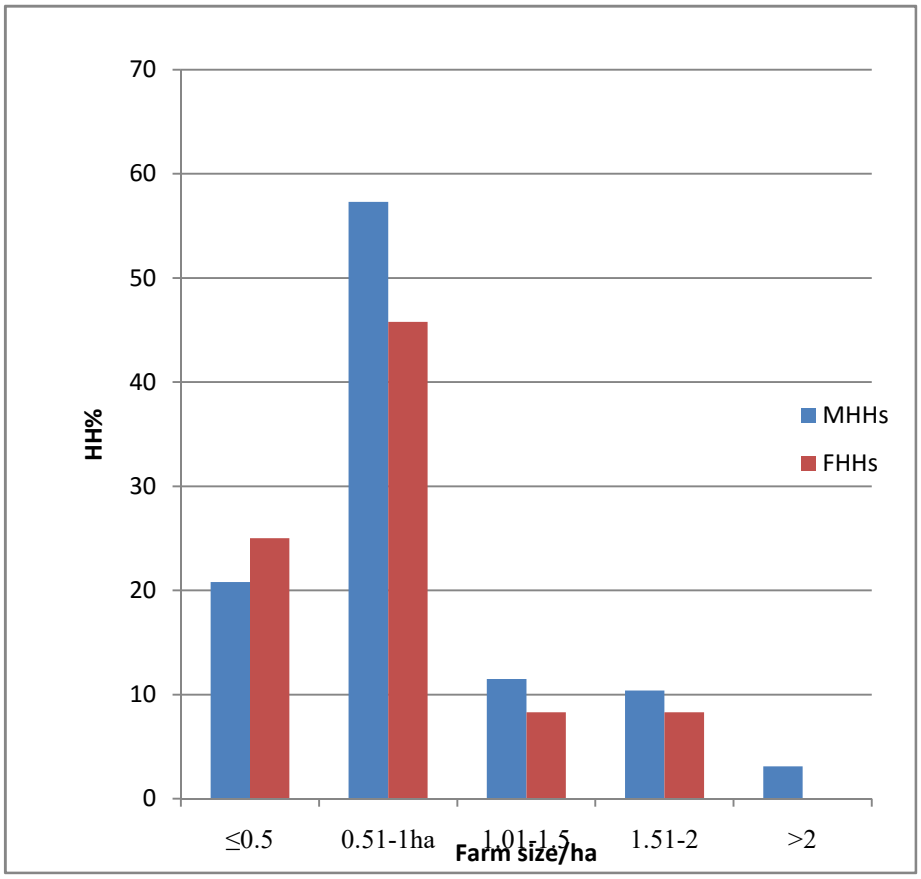

Figure 4 Farm size of MHHs and FHHs per ha

According to the analyses in this study, a good number of women farmers do not have access to information. About 55.8% of the respondents reported that they have no contact with Das due to various reasons (Table 13). This might also hinder the productivity of FHHs farmers.

Table 13 Distribution of sample respondents based on their access and frequency of contact with DA (N=120)

Attributes	Responses	Frequency	Percent
Access to information	Yes	53	44.2
	No	67	55.8
	Total	120	100
Frequency of contact with DA	Once in a week	3	5.7
	Once in two weeks	6	11.3
	Once in three weeks	10	18.9
	Once in four weeks	34	64.1
	Total	53	100

CHAPTER FIVE

5. DISCUSSION, CONCLUSION AND RECOMMENDATIONS

5.1 Discussion

5.1.1 Socio-economic characteristics of respondents

With regard to educational level, most of the respondents did not attend formal school. Education is vital to human development. In the study area women constitute nearly half of the rural population and play a vital role in the rural economy. They need to be considered equal partners' in the development process. Not only do education and training go a long way in achieving this goal, but also in raising the status of women, enable development of their potential and help them to live as independent and equal partners. It is obvious that educating women adds to the improved livelihood of a family and then to sustainable development. If women are supported by modern education, they definitely will have positive impact to biodiversity conservation and environmental protection (Isikli et al., 1998). The larger the number of healthy and clean family, the more will be its positive impact to the whole citizen.

The majority of the respondents are at the age of working group implying a better productivity. However, most of the sample respondents (47.5%) are in the wealth category of poor. This might be due to the different challenges faced by women in the study area.

5.1.2 Horticultural Practices and home gardening in the Study Area

The majority 90% of the households in the kebele practice home garden. They grow mostly vegetables as well as also fruits and crops. Since home garden is adjacent to the house, this facilities use of household waste and manure for the fertility of soil.

The high participation of women in home garden management could be due to proximity of the practice to home, easy to grow and managing, women can take care of it while under taking their domestic responsibilities, to provide an opportunity to a source of alternative income and also source of food security. Moreover, the dominant crop in home garden is food crop, vegetable, medicinal plants and fruit, in which women have more interest and responsibility managing it. The same result was found by Akhter et al. (2010) revealing that women play a key role in homegarden management and they are usually responsible for a large part of food production. On the other hand, women play a major role in homegardens because they have direct access to raise their incomes (Ametemariam, 2009; Watson and Eyzaguirre, 2002).Income from homegardens can thus improve the welfare and nutritional status of the family as well as contribute to the empowerment of women (Helen, 2003). Besides, the practice of horticulture in homegarden enables women to make use of their time and skills. The cultivation and management of homegardens by women is a wide spread phenomenon among settled groups world over (Borg, 1989). In developing countries, the role of women in the use/management of agricultural and forest resources is usually greater than that of men who are generally only directly involved in timber extraction and other hard work tasks.

Much less number of women practice horticulture far away from their house. According to the respondents in the study area, women still have a great input particularly during fruit harvesting. The lower involvement might also be associated with lack of land particularly FHHs. On the other hand, the activities taken place away from houses usually involve planting tree and is male dominated (According to Kiptot and Franzel, 2011). Planting of trees is attractive to men because of the commercial benefits they get from selling poles and timber while women go to the area often to collect fuel wood for domestic use. This is clearly because women's high engagement in

household activities. Thus, women play a central role in horticulture management nearby their houses (Yos, 1998).

5.1.3 Women's Role in Vegetable Production

Although the major role of women in vegetable production is in manuring application, collecting during harvesting and processing, they engage more in vegetable production than men do. Mansoor et al.(2007). Male and female community both were involved in agricultural practices and female were specifically involved in vegetable production. The high participation of women in vegetable production could be due to its location. Mostly, vegetables are produced in homegarden. Sandford and Helen (1996) have also stated that the contribution of labor and domination of the sale is often influenced by the location of crop. As women carry the lion share of the work in vegetable production, they also enjoy the income generated from the sale of vegetable. In fact the market of vegetable in the area is a good source of income for women in addition to household consumption. Women often use this income to buy different commodities such as oil and sugar for household consumption and also to buy clothes for your children. All these confirm that women play central role in vegetable production.

Women's vegetable preference

All women's in the study area grow *Brassica oleracea* in different amount mostly for house hold consumption and for some extent for sells. This might be due to the societal preference of this species of cabbage among all the available leafy vegetables, or might be due to lack of awareness about other leafy vegetables and also less supply of seed. Resulting from focus group discussions indicates that wild cabbage, cabbage, carrot and beetroot have high market value to offset high cost of production under irrigated farming systems and higher consumer demand and fewer pests

during this season. Emana et al. (2015) also stated that in Ethiopia vegetable consumption often increases during the Christian fasting period, when livestock products are not consumed and the demand for pulses and vegetables are high. Vegetable growers often align their planting time so that harvesting will coincide with the fasting period. Producing under irrigation also enables the farmers schedule production pattern to avoid periods of high pest and disease infestation.

Women in the study area to grow vegetables are for economic and nutritional importance and medicinal values. This might also be a good reason for the preference *Brassica oleracea* among others.

5.1.4 Women's Role in Fruit Production

Comparing the participation of men and women in fruit production as a whole, men's involvement is higher than that of women. The participation of women in fruit production is lower than their participation in vegetable production. Similar result (JBM&SSR, 2015) shows that the participation of women is less in fruit production related activities.

5.1.5 Women's Role in Livestock production

The study revealed that not all women in the study area to keeping livestock. The reason is that because of shortage of greasing land. In the study area women livestock production is done with horticultural crop production for various purposes such as, source of food (milk and meat), cash income and source of manure. The same result stated by Thornton et al.(2002) that livestock are important as source of manure to increase soil fertility. Within pastoralist and mixed farming systems, livestock play an important role in supporting women and in improving their financial situation and women are heavily engaged in the sector.

The house hold information from Table 5 reveled that women has important role in managing livestock as well as men are high decision maker for buying livestock and income from sall of livestock. The same result observed by Boserups (1970) states that rural women have played significant role in livestock production in developing countries and they are active participants in the livestock management such as supply of fodder, milking and protecting animals. Frank (1999) also states that in Ethiopia mixed farming system, crop production goes hand in hand with livestock production. Here also, women's contribution is significant. In Amhara region, for example women are often responsible for herding, watering, supplying fodder, barn cleaning, milking and milk processing.

5.1.6 Contribution of manure in horticultural crop production

According to the analyses in this study manure has a great contribution to soil fertility improvement and growth performance of maize on height, diameter and number of leaves especially when it is applied before planting. Lory et al.(2006) also states that manure differs from most commercial fertilizers in that it typically includes adverse mix of organic nitrogen compounds that require conversion to inorganic nitrogen by microorganisms (a process called mineralization) to make them available to plants. The window period before planting and applying the manure enables the efficient absorption of nutrients by the soil.

Increase in the productivity of the experimental plant (maize) with the application of manure indicates the better performance of organic fertilizer than the otherwise alternative fertilizer. Similarly, Asiegbu and Uzo (1984) indicated that the use of organic manure when properly applied, benefits fruiting in plants like maize and generally enhance size, height and number of leaves. Rassie (2015) states that by applying manure just before the planting date of crops, maximizes plant nutrient availability, especially in high rain fall areas and on porous soils having

rapid percolation. Manure is important nutrients for the growth of plant and soil fertility compare to fertilizer. The same result stated by Omisore (2010) the application of NPK fertilizer to the soil actually boosts the performance of maize. However, its persistence use destroys soil reaction and impedes the activities of soil microorganisms there by making the soil acidic and toxic to maize. Abama et al.(2006)stated that most importantly, the chemical fertilizer is not affordable to local farmers and so the use of organic manure is of great advantage, because it contains many nutrients required by plant for optimal performance and also helps in improving soil texture and structure. The application of organic manure has also been found to increase soil PH.

5.1.7 Women's fruit and vegetable production opportunities and challenges

Opportunities

The productivity of horticulture in small plots and with short time compensates the lack of land faced in the study area. production and marketing of vegetables creates opportunities for increasing rural and urban employment, the possibility of earning income, especially for those typically excluded from economic activities, such as women and other disadvantaged people, and provides quality and varied food for the poor(Nichols and Hilmi, 2009).

Challenges

Women are of course an integral part of the household. Yet, they usually have limited access to land, credit and relevant information. This is due to the burden that they are having in taking care of their family. In some cases, women even with access to land may not effectively and efficiently use the resource due to the sum up of different challenges. Due to lack of reliable market information and support system, women may be forced to sell the products by extremely

low prices. Ignoring the link between women's labor burden and household production capacity perpetuates household food security (Frank, 1999).

5.2 Conclusion and Recommendation

Conclusion

The findings of the data therefore lead to conclusion that women are the major working forces of household in the study area. They participate in horticultural and non-horticultural activities. Though men also found to do the same, the extent varies to different horticultural activities between the two sexes, women therefore need to be addressed and be given the proper attention. The result of the study shows that, in most households women had performed more in productive work but often earn as secondary income earners. The factors that affect women's role and decision making ability were socio-cultural, illiteracy, and men (husband) influence. The study revealed that the involvement of women in decision making process related to household income was limited. Most of the income was used for household consumption.

Women's have limited access to the right of land, credit, advice and other properties. Most women in the area had access to land only through marriage. Widowed women obtained the right to land holding due to the death of their husband. The study revealed that manure application in horticultural crop production have high contribution for growth and yield. So women's was the main actors to apply manure for horticultural crops.

Recommendation

Recognition of women's role and contribution of horticultural development by planner and decision makers would help to enhance the status of women and increase food security at house hold.

The government in the district should devise a mechanism to enhance the level of education of women.

The leadership in the study area has to put effort to create opportunity for women's for having access to productive resources such as land, credit individually, variety seed and other horticultural technology.

A mobilized work should be carried out in enhancing the existing knowledge of manure utilization before the knowledge is completely disappeared.

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Appendix 1 Questionnaires

1: Survey questionnaires

Name of respondent…… Interview date……..

Village…….. Interviewer……

Part I House hold information

Sex …… Male ☐ Female ☐ age…….

1.1 Marital Status: Single ☐ Married ☐ Widowed ☐ Divorced ☐

1.2 Household size…… male…… female……..

Number of persons living in your household by age/gender (use X)

Age									
Male					Female				
<5	5-15	16-30	31-45	>45	<5	5-15	16-30	31-45	>45

1.3 Level of Education

No	Education status	Remark
1	Illiterate	
2	Write and read only	
3	First cycle (grade 1-4)	
4	Second cycle(grad 5-8)	
5	High school (grade9-10)	
6	Preparatory (grade 11-12)	
7	Technical school	
8	College diploma	
9	University degree	

1.4 Religion Muslim ☐ Orthodox ☐ Protestant ☐

1.5 House hold income information

What is your main economic activity?

No	Activities	Rank of activities	rank of income generation
1	Fruit and vegetable production		
2	Coffee production		
3	Cereal crop production		
4	Livestock reaching		
5	Cereal crop production & animal rearing		
6	Selling fuel wood and charcoal		
7	Off farm activity		
8	Other		

1.6 In Horticulture Practices women's participating mainly in_

Homegarden ☐ r from home ☐

1.7 If the answer in question No 1.6 is homegarden why? .....

1.8 Who take crop production activities in household level?

No	Crop production activities	Men	Women
1	Ploughing		
2	Sowing		
3	Harvesting		
4	Storing		
5	Threshing		
6	Transporting		

1.9 Landholding

1.9.1 How many plot of land do you have?

0.25-0.5 ha ☐ 0.51-1ha ☐ 1.01-1.5ha1.51☐ ☐> 2 ha ☐

1.9.2 How did you acquire the land?

1. By inheritance
2. Through marriage
3. Through land distribution
4. By leasing from other holders
5. Other means_____

1.10 Livestock holding

No	Livestock type	Number	Main purpose		Remark
			sale	Consumption	
1					
2					
3					
4					

Part II;At farm level and particular management unit or horticulture practices record

2.1 Types of fruits

No	Type of activities	Name of species	Main purpose	Remark
1				
2				
3				
4				

2.2 Types of vegetables

No	Type of activities	Name of species	Main purpose	Remark
1				
2				
3				

2.3 Major crops

NO	Type of activities	Type of crops	Main purpose	Remark
1				
2				
3				

2.4 Average time allocation for different activities within 24 hours for men and women in house hold

No	Activities	Women		men	
		hours	Minutes	Hours	Minutes
1	Cooking foods				
2	Fetching water				
3	Cleaning house				
4	Caring children				
5	Boiling coffee				
6	Cleaning barn				
7	Milking				
8	Caring animals				
9	Fuel wood collecting				
10	Attend social meeting				
11	Grinding				
12	Others				
	Total				

2.5 What type of fertilizer is used by women in their horticultural crops?

A Commercial fertilizer

B Manure fertilizer

C Both

D Others

2.6 If the answer is manure fertilizer in the above question in what time to apply fertilizer in their horticultural crops?

1 Before planting

2 During planting

3 After planting

4 Others

2.7 Why to choose manure fertilizer is used for horticultural crops?

1 Easily gets from home

2 No money to buy commercial fertilizer

3 Based on importance of manure for horticulture development

4 Others

2.8 How is the work in food crop production divided between men and women?

1. Men do the major work

2. Women do the major work

3. Both participate equally

4. Each have specific task

5. Other specificity

2.9 How is the work in cash crops production divided between men and women's?

1. Men do the major work

2. Women do the major work

3. Both participate equally

4. Each have specific task 5. Other specify

2.10 How is the work in fruit production divided between men and women?

1. Men do the major work
2. Women do the major work
3. Both participate equally
4. Each have specific task
5. Other specify

2.11 How is the work in vegetable production divided between men and women?

1. Men do the major work
2. Women do the major work
3. Both participate equally
4. Each have specific task 5. Other specify

2.12 Who take vegetable management activities at house hold level?

No	Type of activities	Who manage/division of labour	Who make decision	When (period)	Remark
1	land preparation				
2	Planting				
3	Manuring				
4	Hoeing				
5	Slashing				
6	Harvesting				
7	Processing				
8	Marketing				

Code:- Who manages M1= Men , M2= Women M3= Both

Who makes decision D1= Man, D2= Women, D3= Both

2.13 Who decides on income from sale of fruits?

1. Men 2. Women 3. Both

2.14 Who decides on income from sale of vegetable?

1. Man 2. Women 3. Both

2.15 Who decides on income from sale of coffee?

1. Man 2. Women 3. Both

2.16 Who take livestock management practices at house hold level?

No	Type of activities	Who manage/division of labour	Who make decision	When/period	Remark
1	Collecting feed				
2	Cleaning animal sheds				
3	Marketing				
4	Milking				
5	Taking animal to the field				
6	Taking care of calves				

Code for livestock:- ls1=caw ls2=sheep,ls3=goat,lst4=mule,ls5=ox,ls6=donkey

Code for who manages: m1=men, m2=women, m3=both

2.17 Who decides on income from sale of livestock?

1=men 2=women 3=both

2.18 Who take fruit tree management practices at house hold level?

Fruit species	Management practice	Who manage/division of labour	Who makes decision	Reasons for managing
	Land preparation			
	Watering			
	Manuring			
	Pruning			
	Harvesting			
	Transporting and marketing			

Part III: Women's species preference (general farm information)

3.1 Species preference

3.1.1 Fruit tree preference

Species name	Reasons	Remark

3.1.2 Vegetable preference

Species name	Reasons	Remark

Part IV Institutional constraints

4.1 Access to information

4.1.1 Did you have any contact with DAs in your area?

1= yes 0= No

4.1.2 If the answer is yes in question No 4.1.1, frequency of contact

Once in a week (4)

Once in two weeks (3)

Once in three weeks (2)

Once in four weeks (1)

4.1.3 If No in the above questions, why?

1=No DA nearby 2=No need for service 3=Others (specify)

4.1.4 What type of service most of the time you are getting from DAs?

1= Technical support

2= Theoretical information

3= Input supply

4= Experience sharing

4.2 Access to credit

4.2.1 Do you have access to credit? 1= Yes 0= No

4.2.2 If the answer is yes in the above questions, from do you get the credit services? 1= Bank 2=NGO 3= Micro Finance Institute

4= Local money elder 5=Service cooperatives 6=other (specify)

4.2.3 If the answer is No, why?

1=Fear of inability to repay 2=High interest rate

3=No credit services 4=No need of credit

5= Lack of collateral 6= other (specify)

Appendix 2Check lists for key informants and focus group discussion

1. How do you understand the role of women in management of horticulture in your area?
2. Is there different between men and women in the management (labour division)?
3. What do you think about the reason for such difference?
4. What is your opinion about women addressing the food security problems?

For group discussion

1. Do women manage horticulture components in your village?
2. What type of management practices do you use to manage fruits and vegetables?
3. Why do you manage fruits and vegetables on your horticultural areas?
4. What species do you prefer more to plant or manage in your horticultural area? For what purposes?
5. What are the limitations that have been occurred for the management of fruits and vegetable species on your horticultural areas?
6. Does a woman in this area have access to land? If your answer is yes how? And if no to what is the possible reason?
7. Cultural related issues
   7.1 Motivating aspects to involve women in horticulture management

   a _____

   b_____

   c_____

   7.2 De-motivating aspects to involve women in horticulture management

   a_____

   B _____

C _____

8 Do women in our areas use manure fertilizer for horticultural plants? What is the reason?

Appendix 3 Women's differential participation in the horticulture component management

Component	Tasks	Women from MHHs						Women from FHHs					
		Poor n=45		Medium n=38		Rich n=23		Poor n=12		Medium n=6		Rich n=6	
		Freq	%	Freq	%	Freq	%	Freq	%	Freq	%	Freq	%
Crop	ploughing	-		-		-		-		-		-	
	Sowing	21		19		3		12		5		3	
	Weeding	23		19		4		12		6		4	
	Harvesting	25		15		2		12		6		6	
	Storing	13		8		5		12		6		4	
	Threshing	15		13		8		11		6		2	
	Transporting	46		20		9		12		6		5	
Vegetable	Landpreparation	22		11		8		12		6		5	
	Planting	11		8		4		6		4		2	
	Manuring	35		20		18		12		6		6	
	Hoeing	19		12		8		11		5		3	
	Slashing	19		15		6		12		6		4	
	Collecting	35		20		14		12		6		5	
	Processing	45		38		23		12		6		6	
	Marketing	20		10		6		12		6		6	
Fruit	Land preparation	18		8		5		9		5		4	
	Weeding	35		26		14		12		6		5	
	watering	10		8		3		12		6		6	
	Planting	5		4		2		5		3		2	
	Manuring	40		24		9		12		6		5	
	Pruning	10		7		3		6		4		3	
	Harvesting	12		8		5		6		5		3	
	Marketing	12		6		3		7		4		3	

Appendix 4 Different growth stage of maize

A

B

C

D

APPROVAL SHEET II

I, the undersigned, supervisor of Addis Walle have read and evaluated her thesis entitled "***Role of Women and Contribution of Manure for Horticultural Crop Production: A case study of Hulet-Eju Enesie District, North Western Ethiopia***" and approved for submission in partial fulfillment of the requirements for the degree of Masters of Science in Biology.

_____	_____	_____
Name of candidates	Signature	Date
_____	_____	_____
Name of Advisor	Signature	Date