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GENDER DISAGGREGATED CHICKPEA YIELD GAP ANALYSIS: THE CASE OF ADA'A WOREDA, OROMIA REGIONAL STATE, ETHIOPIA

BY

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DECLARATION

I, the undersigned, declare that thesis is my own work and has not been presented or submitted partially or in full by any other person for a degree in any other university, and that all sources of materials used for the purpose of this thesis have been duly acknowledged.

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This is to clarify that the thesis prepared by Wubishet Chiche, titled; "Gender Disaggregated Chickpea Yield Gap Analysis; The Case of Ada'a Woreda, Oromia Regional State, Ethiopia" is submitted in partial fulfillment of the requirements for degree of masters of art in development studies (Gender studies) complies with the regulations of university and meets the accepted standard with respect to originality and quality.

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Lists of Acronyms and Abbreviations

AFDB **African Development Bank**

ANOVA **Analysis of Variance**

Coop **Cooperative**

DzARC **Debrezeit Agricultural Research Center**

EAEB **European Agricultural Economic Brief**

EIAR **Ethiopian Institute of Agricultural Research**

FAO **Food and Agricultural Organization**

FGD **Focus Group Discussion**

FHH **Female Headed Household**

GDP **Gross Domestic Product**

IRP **International Resource Panel**

KII **Key Informant Interview**

MHH **Male Headed Household**

SPSS **Statistical Package for Social Science**

TA **Thematic Analysis**

UNCTAD **United Nations Conference on Trade and Development**

UNESCO **United Nations Educational, Scientific and Cultural Organization**

USAID **United States Agency for International Development**

Abstract

The yield gap between FHHs and MHHs remain the major barrier for the efforts to reduce poverty in Africa. So as Ethiopia is from the country trapped by poverty, studying the magnitude of yield gap between FHHs and MHHs is important to provide solutions. Thus this research aimed to examine gender disaggregated Chickpea yield gap analysis in Ada Woreda, Oromia Regional State, Ethiopia. The potential chickpea producing kebeles selected are; Akaako, Denkaka, and Tullu-Dimtu from Ada'a Woreda. This study attempted to: assess whether there is chickpea yield gap between the potential and average farmers yield, assess whether there is chickpea yield gap between FHH and MHH farmers, and describe the underlying factors for the chickpea yield increment of both FHH and MHH farmers. The research used mixed research method which based on explanatory sequential design for supporting the quantitative data collected through survey method by qualitative data collected through FGD and KII. Multistage sampling method is used to select chickpea potential kebeles in Ada'a woreda and three kebeles were selected purposively from those potential kebeles. Finally, research participants were selected using simple random sampling. For the quantitative research 325 participants were involved and for the quantitative research 28 participants (24 for FGD and 4 KII) were involved. The major findings of this study are: the average farmers' yield (157.185 kg ha-1) is statistically significantly lower by 157.185 kg ha-1 than potential yield (1700 kg ha-1) of chickpea in the study area. So depending on the traditional means of farming is the main factor that the identified. Additionally, average chickpea productivity of FHHs (1286.47 kg ha-1), is statistically significantly lower by 511.120 kg ha-1 (28.5%) than the average productivity of MHHs (1797.59 kg ha-1) in the study area. Thus, both Gender based constraints and technical abilities are factors identified for lower productivity of FHHs in the study area. Thus, the research recommends to bride the yield gap identified equal and equitable use of agricultural development activities without any discrimination for being FHHs and MHHs.

Key Words: Gender disaggregated, Chickpea, yield gap, and Female and male headed households

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Chapter one: Introduction

1.1 Background of the study

Female Headed Households (FHHs) farmers are women who are unmarried, divorced or widowed, women whose husbands are most of the time away from home due to several factors such as work and not actively engaged in agricultural activities (Girma et al. 2019), and single woman without the mediation of a husband, father, or male relative in the routine day-today activities of that household (Starkey et al. 1994). Male headed households (MHHs), on the other hand, are husbands who to give a final decision of important household issues and expected to lead the family (Starkey et al. 1994). Between FHHs' and MHHs' the extent of agricultural productivity significantly varies or differ across and within countries in Sub-Saharan Africa. According to Girma et al. (2019), across Sub-Saharan African countries there is about 20 to 30%, with an average of 25% agricultural productivity difference between them. However, FHHs farmers in Ethiopia have 35 percent lower value of output per hectare than their male counterparts (Addis et al. 2001).

The Gender's agricultural productivity gaps are as a result of several constraints; women's lower access to agricultural inputs, lower returns on the inputs they use and comparatively less secure land rights as well as gender-based distortions in product markets (UN Women, 2019). Unequal access of women farmers compered to male farmers to improved seed, fertilizer, labor, education, and extension service are some of the key reasons which are influencing their agricultural productivity (Girma et al. 2019). Underlying these disadvantages are gendered norms and practices, reflecting unequal power relations and fairly rigid gender divisions of labour at the household level (UN Women, 2019). For instance in Ethiopia, due to multicultural differences women's roles in agriculture vary across regions. Gender-specific constraints as those caused by socio-cultural forces reduce their agricultural productivity and limit their ability to ensure production. Women in southern Ethiopia, for instance, face a serious gender gap in access to productive resources and farming is culturally considered a man's task (Aguilar et al. 2014).

To manage the external life patterns, women's lower status, social power, and the incapability to be responsible for the remuneration of assets imposes external constraints. Among the majority

of the world's population, women receive only a small proportion of opportunities and benefits for their work than their male colleagues. For instance, in many developing countries only 5% of women receive extension services (Smith et al. 2003), and in European countries 12% of them receive some agricultural trainings (EAEB, 2012).

Gender responsive and inclusive research should go beyond the quantity of production as its only objective and include taste, food quality, nutrition, processing, resilience, and other characteristics that are particularly important to women farmers. So that it can contribute for the effectiveness of agricultural research by producing crops that included the needs not only of women and men farmers but also of processors and others along the value chain (World Bank, 2009). According to Catherine et al. (2012) indicated that, plots of both female and male headed households are as equally productive if they faced the same level of agricultural inputs and, access to improved technologies and services.

Thus, this research aim to assess the gender disaggregated chickpea yield gap between female and male headed households in Ada'a Woreda, Oromia regional states, Ethiopia. Chickpea is selected crop for yield gap analysis because of; its area coverage is increasing, it is cost effective crop by reducing the cost of fertilizer by 60%, it has higher returns than cereal crops like Tef and it needs lower labour than cereal crops (Girma, 2010). Ada'a Woreda is also one of chickpea potential areas in East shewa zone, Oromia region, selected as study area because of its accessibility for conducting field survey and chickpea is becoming popular crop in the area.

Gender yield gap analysis is important to assess the effect of the technical factors and the social structural effects for chickpea productivity of both FHH and MHH farmers. Additionally, it helps to provide in depth data for identifying the most important factors limiting and enhancing current chickpea farm yields of farmers, and for generalizing the information generated.

1.2 Statement of the problem

One of the major development challenges which remain the major barriers to the efforts to reduce poverty in Africa is the yield gap between female and male headed holds (AFDB, 2015). For instance Peterman et al. (2011) found female managed plots lower productivity compared to their male counterparts even when household-level unobservable factors were controlled. Additionally, Pender and Gebremedhin (2006), stated that with similar use of labor, ox power,

and other inputs, female headed households achieved 42 % lower crop yields than their male counterparts thereby indicating a further gender-based disadvantage in productive use of inputs (FAO, 2014). Furthermore, Mugisha et al. (2019) indicated, because of women's gender positioning in society that limits their production and marketing opportunities they have a comparative disadvantage in growing the more improved varieties compared to the less productive varieties.

The research conducted by Peterman (2011) and, Pender and Gebremedhin (2006) indicated that, as there is another gender related factors in addition to the technical ability and inputs. Mugisha, et al. (2019) stated in addition to technical ability to produce gender yield gaps are to a large degree as a result of unexplained gender inequalities in the communities' structural arrangement that could be attributed to social norms, practices and beliefs.

However, the research conducted in Ethiopia by Addis et al. (2001) found that, the productivity of FHH and MHH farmers depends on the agricultural inputs they used. Additionally, some of the reasons for low productivity of chickpea at farmers' level are poor agronomic practices, low yield potential of local varieties and farmers limited access to improved chickpea varieties (Eshete and Fikre, 2006). These researches conducted in Ethiopia did not take into consideration the contribution of gender relations for the yield gap between FHHs and MHHs. Additionally, both research mainly focused on the technical factors like the use of inputs contribution for yield gap between FHHs and MHHs and did not collect the in-depth data through qualitative method. As indicated in the earlier paragraph in addition to the technical factors for yield gap between FHHs and MHHs, the gender related factors also important to be assessed. Thus, this indicates that there is data gap related the gender contribute for the yield gap between FHHs and MHHs in Ethiopia.

So to fill the data gap identified which is lack of gender disaggregated chickpea yield gap data, this research aimed to examine both the technical and gender related factors that contribute for yield gap between FHHs and MHHs in the study area.

1.3 Objectives of the study

1.3.1 General Objective;

The general objective of the study is to examine gender disaggregated Chickpea yield gap analysis in Ada'a woreda, Oromia Regional State, Ethiopia.

1.3.2 Specific Objectives;

- To assess whether there is chickpea yield gap between the potential yield and average farmers yield,
- To assess whether there is chickpea yield gap between FHH and MHH farmers.
- To identify the underlying factors for the chickpea yield per hectare of both FHH and MHH farmers.

1.4. Research questions

To achieve the indicated objectives, the following research questions are outlined

- Is there chickpea yield gap between potential yield and average farmers yield?
- Is there chickpea yield gap between FHH and MHH farmers?
- What are the contributing factors for the chickpea yield gap between FHH and MHH farmers?

1.5. Scope and limitation of the Study

The proposed study assessed the gender disaggregated chickpea yield gap between FHH and MHH farmers'. The study kebeles are; Akako, Denkaka, and Tullu-Dimtu in Ada Woreda, Oromia regional states, Ethiopia and Chickpea is the selected crop for analysis. The study participants were both female and male headed household farmers producing chickpea in the study area and key informants knowledgeable about the objectives of the study interviewed.

The study identified respondents based on purposive sampling however problem and experience farmers who did not produce chickpea in 2011/12 E.C not considered. Additionally, this research limited only on assessing the yield gap of chickpea disaggregating by gender in the study area

however the yield gap of other crop needed to be studied to know the magnitude and find solutions to bridge the gap.

Additionally, this research limited only in Ada'a Woreda, of Oromia regional state of Ethiopia however in Ethiopia there are diverse culture and social structures. So to figure out how gender relation's varies and other factors' effect on FHHs and MHHs and to know the general picture of gender yield gap research need to be conducted in different parts of Ethiopia.

1.6. Significance of the Study

This research aim to examine the gender disaggregated yield gap analysis between FHH and MHH farmers, and the findings of this research has the following importance in;

- Providing gender disaggregated yield gap information for policy makers and further researches
- Providing the yield gap information between potential and average farmers yield of chickpea
- Portraying in-depth factors for yield gap between potential yield and average farmers' yield of chickpea, and between FHHs and MHHs farmers.
- Giving illustrations on the effect culture/religion and communities structural arrangement in addition to technical factors effect on FHH and MHH farmers productivity
- Forwarding corresponding means of empowering FHH and MHH farmers socially, culturally, and economically.

1.7. Operational Definitions

Crop yield: is a measurement of the amount of yield of a crop harvested per unit of land area (Chen, 2019).

Dependent variable: it refers to the types of variables that are completely dependent on the independent variables (Lauren, 2020).

FHH: are women who are unmarried, divorced or widowed, women whose husbands are most of the time away from home due to several factors such as work and not actively engaged in agricultural activities (Girma et al. 2019).

Feminization of agriculture: refers to the increased concentration of agricultural tasks in the hands of rural women in developing countries (FAO, 2016).

Gender analysis: is the study of the different roles of women and men in order to understand what they do, what resources they have, and what their needs and priorities are in a crop product (FAO, 2016).

Gender disaggregated: data that show the yield differences between women and men, girls and boys (Rhonda and Susanne, 2007).

Independent/ explanatory variables: are variables that are manipulated or are changed by researchers and whose effects are measured and compared. It predicts or forecast the values of dependent variable in the model (Lauren, 2020).

MHHs: are those in which a husband was present and was the final decision-maker in their important issues pertaining to the household (Starkey et al .1994).

Potential yield: is the theoretical yield that can be assessed for a well-adapted cultivar, grown from the best possible seed under optimal conditions (Havert, 2015).

Variables: the properties or kinds of characteristics of certain events or objects (Lauren, 2020).

Yield gaps: are defined as the differences between potential yield and average farmers' yield over a given spatial or temporal scale of selected crops (Lobell et al. 2009).

Chapter Two

2. Literature Review

For enhancing gender roles in sustainable rural development, gender empowerment is essential and important (UNDP, 2012). However, empowering gender in Ethiopia is facing a number of major restraints; Societies' low level of consciousness about women's roles in development, the deep-rooted cultural beliefs and traditional practices, lack or shortages of appropriate technology in reducing women's workload, and shortage of qualified female development agents in assisting, motivating and empowering rural women (Alemi &Dereje, 2014). Hence women are economically and socially disadvantaged households (Tiruneh et al. 2001).

2.1 Gender and Agricultural Productive Resources

Gender refers to the widely shared expectations and norms within a society about appropriate male and female behavior, characteristics, and roles. As well, it is a social and cultural construct that differentiates women from men and defines the ways in which women and men interact and behave. Women have less access over and control of productive resources than men - resources such as income, land, credit, and education. While the extent of this difference varies considerably from one culture to the next, it almost always persists (Sivard et al.1995).

The principal income source of rural households is farming and women can be important agents of rural economic diversification, and key players in vibrant micro-entrepreneurial activities (FAO 2011), but according to UNCTAD (2015) report they face multiple constraints on their access to land, credit, agricultural inputs, extension services, labor, markets and education.

Thus, while the root causes of gender inequality must by their nature be addressed by gender-specific approaches targeting women explicitly, these indirect disadvantages are more appropriately addressed through more inclusive but gender-sensitive approaches and are essential in resolving gender inequality issues and avoiding further marginalization of women (UNCTAD, 2015). FAO (2011) global estimates suggest that providing women with an equivalent access to productive resources as men could increase yields on their farms by 20–30 per cent, raising total agricultural output by 2.5–4 per cent.

2.1.1 Land

Access to, control over, and ownership of assets are fundamental elements of well-being (Carter and Barrett, 2006). Productive assets play a vital role in generating outputs or services which are utilized or sold to generate income (Deere and Doss, 2006). Thus, in developing effective development policies, gendered nature of asset distribution and how it affects individual and household livelihoods is essential (FAO, 2014).

In agricultural society land is a basic asset and requirement for farming and grazing which is even the indication of wealth, status and power (FAO, 2010). According to UN (2015) Report in developing countries there is a consistent pattern of gender inequality in control over land; men are controlling much more land than women. FAO (2014) data on agricultural holdings in Ethiopia indicates that a lower proportion of female agricultural holders, 19.2 percent, have agricultural resources, including land, as compared to 80.8 percent of male agricultural holders.

As land is the main reason and determinant factor of gender disparity (USAID, 2010), To change women's life style and their contribution in their family and society strengthening their use of, and decision making on land is the very essential (FAO, 2010). So, in order to enhance far-reaching women farm productivity and household welfare, changing women's use of land and freedom of production has important influence for yield increment (Allendorf, 2007).

2.1.2 Financial services

Adequate access to financial services such as savings, credit and insurance has invaluable opportunities in improving agricultural output, economic development, and it is a key factor for rural development strategies' success (FAO, 2010).

Some developing country's governments, for instance, Ethiopia, have supported rural investment guarantee funds to ease women's access to credit, but they have not always been effective in reaching the intended beneficiaries (UNCTAD, 2015). Despite slight increase in the number of rural financial service provider institutions such as microfinance and financial cooperatives, the use of credit generally remains low. At the national level, only 15 percent of female landholders and 21 percent of male landholders reported taking out loans, even though this segment of

population who own land has better access to loans as compared to the overall population (FAO, 2019).

However women are reputed as efficient in paying loans, ironically they have the hardest time in securing loans (Fortmann, 2001). For instance, according to the Ethiopian Ministry of Women, women's access to agricultural sector credit stood at 12 percent of total credit allocated. The main constraints for rural women in accessing credit from financial institutions and government agencies are limited incomes, lack of collateral, higher levels of illiteracy and lack of information (Ojulu, 2015). Consequently, it hampers their capacity to purchase the necessary inputs and services for agricultural pursuits (USAID, 2010). Furthermore, without adequate access to loans or insurance, farmers during droughts, illness, or a significant drop in the prices they receive, can also lose some of the few assets they do have (Diagne and Zeller, 2001).

2.1.3 Education

Education and training exposures, as a measure of human capital, increases human understands of innovations and influences the process of decision making (Tigist, 2011). Various studies have indicated that rural women's level of education affects their efficiency and productive involvement in agricultural activities. According to Hiwot (2011), the significant and positive relationship between women's level of education and their extent of participation in agricultural empowerment signify that women empowerment can increase with their increased participation in agricultural activities as a function of education. Consequently, it correlates with agricultural productivity, household income and determine household welfare and economic growth at the national level (World Bank, 2007a).

With the assistance of different declarations, providing women an education has been the main focus of women's organizations, government agencies and international donor agencies (UNESCO, 2011). However, the gender gap regarding education both in levels of enrolment and attainment remains widest in sub-Saharan Africa (World Bank, 2007a).

In Ethiopia the rural literacy rate differences are significant between gender: 52 percent of rural men, but only 36 per cent of rural women, are able to read and write without difficulty however, primary school enrolment is slightly higher for girls (59 per cent) than for boys (57 per cent) (CSA, 2013). So, these lower literacy rates of female household heads than their male

counterparts have imposed competitive disadvantages in accessing and using market information and extension services; applying for credit; and complying with importing countries' product standards (UNCTAD, 2014). Consequently, many of the women that have been embraced in development programs are illiterate which requires making the issue of literacy as a women's development concern and likewise a priority (UNESCO, 2011).

2.2 Information and Extension Services

Public extension services as the key source of information on new technologies for farmers employed in most developing countries (World Bank, 2007a). As they are designed to improve productivity and the overall wellbeing of rural populations, as it involves service providing experts in the areas of agriculture, agribusiness, health and others. (Meinzen-Dick et al.2010). Hence it facilitates the access of farmers to knowledge, information and technologies and additionally it assists their interaction with partners in research, education, agribusiness, and other relevant institutions (Christoplos, 2010). Moreover, it leads to significant yield increases (Meinzen-Dick et al. 2010).

However, extension provision in developing economies remains low for both women and men, and women tend to make less use than men of extension services (Meinzen-Dick et al. 2010). According to a 1988–89 FAO survey of extension organizations covering 97 countries with sex-disaggregated, only 5 percent of all extension resources were directed at women. Moreover, only 15 percent of the extension personnel were female (FAO, 1993).

According to (Meinzen-Dick et al. 2010), one of contributing reasons for extension services gap are often directed towards farmers who are more likely to adopt modern innovations, for example farmers with sufficient resources in well-established areas while women are less likely to access resources and may therefore be bypassed by extension service providers. Moreover, the way in which extension services are delivered can constrain women farmers in receiving information on innovations (World Bank, 2007a). Women tend to have lower levels of education than men, which may limit their active participation in training that uses a lot of written material. Additionally, time constraints and cultural reservations may hinder women from participating in extension activities, such as field days, outside their village or within mixed groups (Meinzen-Dick et al. 2010).

2.3 Farmers' Cooperative Membership

Framers' cooperative is an autonomous association of farmers united voluntarily to meet their common economic, social and cultural needs and aspirations through a jointly-owned and controlled enterprise. It occupies a key position in agricultural development with support in resource and input use, harvesting of water resources, marketing channels, storage facilities, distribution channels, value addition, market information and a regular monitoring network system. Cooperatives are also engaged in economic activities like disbursement of credit, distribution of agricultural inputs (seeds, fertilizers, and agrochemicals), etc (Virendra et al 2015).

In recent years, cooperatives are increasingly being viewed as a means to promote improved agricultural technologies and alleviate food insecurity and poverty. Cooperative membership tends to increase crop yields, household income, and household assets; and reduce transaction costs in accessing inputs and output markets (Abebaw and Haile. 2013). This is so because in most cases cooperatives are associated with collective action and social capital, hence are thought to be better placed in reducing poverty than other types of institutional innovations (Verhofstadt and Maertens, 2015).

Agricultural cooperative membership is a major force of knowledge and technological transfer, due to not only the spillover effects of the collective use of a technology, but also since collective action facilitates innovation and learning by members of the group (Chagwiza et al., 2016). Previous studies on cooperatives have identified several factors that affect the participation of households in cooperatives. These can be grouped into household and farm factors (e.g. age of the household, sex, education, household size, land and livestock ownership, access to off-farm income, contacts with extension agents); social capital and networking (e.g. number of years in the village, relatives in leadership positions, and kinship); and locational factors (distance to cooperative office). Several studies have shown that age and education of the household head can affect cooperative membership. Older and more educated farmers are more likely to be members of cooperatives (Fischer and Qaim, 2012.

Women in Africa usually have limited opportunities to participate in collective action such as cooperatives; hence male-headed households are more likely to be members of cooperatives than

their female counterparts (Abebaw and Haile, 2013). The size of the household usually has a positive effect on the likelihood of cooperative membership and this is partly because of increased household labor endowment (Verhofstadt and Maertens, 2015).

One of the main bottlenecks of Ethiopian agricultural cooperatives is lack of finance, which they need to modernize their practices and purchase machinery. Lending institutions to the agriculture sector was still from the state-owned Commercial Bank of Ethiopian (CBE) and Development Bank of Ethiopian (DBE), which provided 99 percent of the agriculture loan (USAID, 2010). According to Tarekegn (2012), the capitalization of agricultural cooperatives in general is weak. In the past, only a few cooperatives dare to ask credit to banks and a large part was rejected because of a lack of internal capital (Biniam fikre. 2016). Furthermore, more inclusive cooperatives play a strong social role in improving gender relations and helping women create safe spaces to build their social solidarity and problem-solving capacity, particularly in all-female cooperatives (Baden and Pionetti 2011).

2.4 Soil Fertility

Soil fertility is the capacity of the soil to support the growth of plants on a sustained basis, yielding quantities of expected products that are close to the known potential. Soil fertility is only one aspect of soil productivity but it is a very important one. For example, a soil may be very fertile, but produce only little vegetation because of a lack of water or un-favorable temperature. Even under suitable climate conditions, soils vary in their capacity to create a suitable environment for plant roots. Soil productivity is the ability of a soil to support crop production determined by the entire spectrum of its physical, chemical and biological attributes (Gachene CKK. and Kimaru G).

To achieve high quality crop production and soil productivity without degrading the soil properties under long term use, appropriate management practices should be adopted. Fertilizer is required at the low levels of soil nutrients to reverse declining soil fertility (Olawale et al. 2009). Crop production is based largely on soils. For large-scale and low-cost crop production, there is no substitute for natural soils as a substrate for crops in the foreseeable future (Gachene and Kimaru, 2003).

Soil fertility is declining in many parts of sub-Saharan Africa (SSA) (Stoorvogel et al. 1993). One of the major constraints to crop production faced by smallholder subsistence farmers is the inadequate supply of nutrients (Quinones et al., 1998; Shapiro and Sanders, 1998). Sustaining soil fertility has become a major issue for agricultural research and development in SSA (Smaling and Oenema, 1997). In the past, most research consisted of trials to determine the appropriate amount and type of fertilizer needed to obtain the best yields for particular soil types and specific agro-ecological locations (Marc C et al, 2000).

The most common fertilizers used in Ethiopia are Di-Ammonium Phosphate (DAP) and urea. Such unbalanced and continuous application of limited fertilizers both in amount and type may aggravate the depletion of other important nutrients such as K, Mg, Ca, S and micro-nutrients not supplied by the chemical fertilizers and may also lead to chemical soil degradation. Chemical fertilizers are also costly for farmers to apply the recommended rates. On the other hand, sole application of organic matter is constrained by access to sufficient organic inputs, low nutrient content, high labor demand for preparation and transporting. Thus, the continuous depletion of important soil nutrients contributed for less productivity of soil (Eyasu, 2017).

2.4 Gender and Agricultural Technology Adoption

Productivity growth in agriculture requires the supply of timey technological innovations for agriculture and adoption of those innovations by the farm community (Ferdi, 2016). Advancements in technological resources have positively had an impression on farmers in developing countries by introducing a means to improve soil fertility and increase productivity of land and generally crop productivity (World Bank, 2009). Moreover, adoption of new technology is vital in sustaining and enhancing agricultural productivity (FAO, 2011).

Assets like land, credit, education and labor which are constraints of FHHs influence and have impact on the use of bought technology input for agricultural productivities as it is compared to their male counterparts (Blackden et al. 2006). The use of new agricultural technologies and inputs may also be inhabited by lack of confidence to take responsibility (FAO, 2011), and it is also hooked in to time constraints (Blackden et al. 2006).

2.5 Gender and Agricultural Production

Agriculture is the pillar of Ethiopian economy in which it is contributing 41.4% of the GDP, 83.9% of the total exports, and 80% of all the total employment in the country (Motouse et al. 2013). According to the Ethiopian government policy, rapid economic growth, maximum benefits to the people from this growth, and the elimination of the countries' dependence on foreign food aid are the overall economic development objectives (Atsbaha and Tessema, 2011). For initiating transformation of the Ethiopian national economy several set of policies and strategies for agricultural and rural development has been developed (FAO, 2019). But, agriculture has been suffering from various external and internal problems. One of the problems is deficiency in adequately addressing women in agriculture that constitute of 50% of agricultural labor in developing countries (UNCTAD, 2015).

In the development of agricultural and rural economies of the world women make significant contributions (FAO, 2011). In addition to their domestic role, at significant level, women participate in different crop production activities or farms works, and have significant contributions to offer. Despite their contributions to food security, their contribution is poorly understood and often underestimated. Because all too often their work is not appropriately recorded in statistics or deservedly recognized by society or mentioned in reports (Yohannes & Gebrerufael, 2015). So, it is vital to assess the benefits of empowering women who is accounting the greatest number of agricultural labor.

2.6 Feminization of Agriculture

Food and Agricultural Organization (FAO, 1999) report shows that, while the proportion of the labor force working in agricultural declined over the 1990s, the proportion of women working in agriculture increased, particularly in developing countries. In some regions like Africa and Asia, almost half of the labor pool is women. This trend has been called the feminization of agriculture (Lastarria, 2006). In broad terms, the feminization of agriculture refers to women's increasing participation in the agricultural labor pool, whether as independent producers, as unremunerated family workers, or as agricultural wage workers. Women work not only in the fields and pastures, but also in agricultural processing and packing plants (Deere, 2005).

Causes underlying feminization of agriculture are reported to be male labor out-migration, the growing number of female-headed households, and the development of labor-intensive agriculture (Kelkar, 2010). Recently, women's participation in agriculture has been recognized and put on the policy agenda, assuming a positive change for women's empowerment. However, whether feminization of agriculture leads to women's empowerment is contested (Gartaula et al. 2011).

Chapter Three

3. Research Methodology

This section describes the methods used, the planning and approach; subjects included within the study; the instruments and procedures used for data collection and therefore the techniques employed for data analysis.

3.1 Research Design

Explanatory research design was used to indicate the sequence of data collection for this research. An explanatory sequential design consisted of first collecting quantitative data and then collecting qualitative data to help explain or elaborate on the quantitative results was used.

The rationale for this approach is that the quantitative data and results provide a general picture of the research problem; more analysis, specifically through qualitative data collection is required to refine, extend or explain the general picture (Dhanapati, 2016). Therefore, explanatory research design is suitable to gather data about gender disaggregated chickpea yield gap of MHHs and FHHs within the study area.

3.2 Theoretical Framework

Feminist's struggle emerged to get rid of inequalities and to bring change in women's lives. The definition of feminism which is chosen for this research purpose is: -

> *"Feminism is a belief that ladies universally face some form of oppression or exploitation; a commitment to uncover and understand what causes and sustains oppression altogether it forms and a commitment figure individually and collectively in lifestyle to finish all sorts of oppression" (Patricia, 1987.pp 5).*

Feminist economic theory was used for analysis with respect to women's participation in agricultural development projects. Feminist economist's intention in the sector of economics is to support its reference to social relation and denunciation of marginalizing regarding gender relations in traditional economic theories. They developed an economics which could be applied to serve the interests of huge and groups of individuals (Diana, 1999). The contribution of

feminist economists to economic thought were new understanding and were innovative in involving economics which enable or brought a positive difference in people's life styles and standard especially for women.

Feminist economics can be distinguished especially from mainstream economics by its concern for the influence of the contextual environment on the preferences, possible actions, payoffs and outcomes for men and women in market and family situations. The 'situated' nature of economic behavior is a fundamental concept in feminist economics. Informed by feminist philosophy of science, feminist economics considers how individuals' (participants') economic power, obligations, goals, interests and, ultimately, their economic outcomes are affected by their social roles and relationships, and how these, in turn, are affected by their ascribed social identities, including their gender, race, and ethnicity (Siobhan, 2015).

Feminist economic theory discussed above used as a frame work and method for qualitative data analysis in this study. It indicates feminists' standpoints are important for the research. Considering Feminist economics theory in the agricultural sector helps to understand the real aspects of social relations and in guiding ways to conduct practical activities of the farming system. So their method of analysis of family farm and emphasis on socio-economic factors affecting the farming system were considered to analyze situations in the study area.

3.3 Study Area

Ada'a Woreda is selected as study area because of its accessibility for organizing and monitoring of the field study and potential in producing chickpea. Ada'a Woreda is about 40 km to southeast of Addis Ababa, between 08°44' N latitude and 38°58' E longitude with an altitude of 1900 m a.s.l and covers 1,750 km². The site is situated in the Central high land area of the country having Tepid to cool sub-moist highlands type climate.

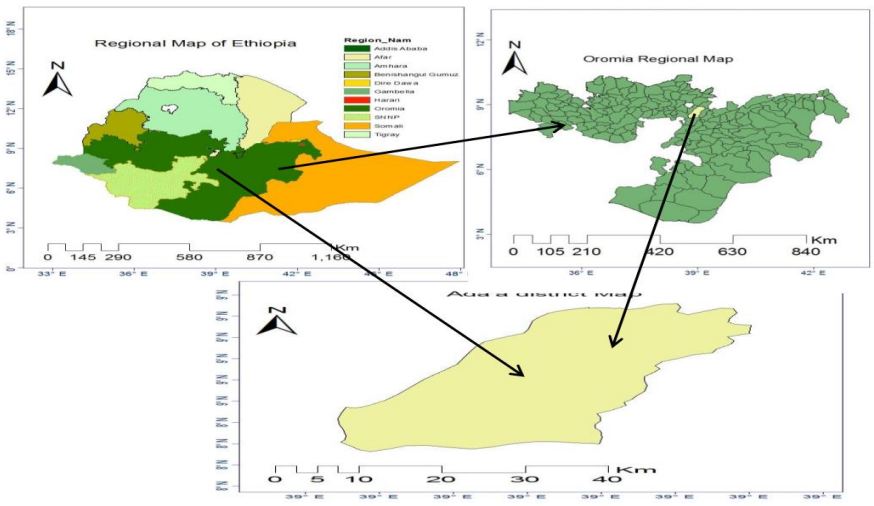


Figure1: Location map of study area

The area receives an annual mean rainfall of 851 mm. The mean maximum and minimum temperature are 28.3°C and 8.9°C, respectively with the average value of 19°C. The area is dominated by heavy soils (Vertisol). Major crops grown in the area are Tef, Wheat, Barley, Faba-beans, chickpeas, and lentils. This study area has 25 rural Kebeles and there are 69,447 male and 63,758 female from total population of 133,205. Out of 20, 362 households of the area there are 1,912 female headed households whereas 18,450 households are headed by males (CSA, 2005).

3.4. Sample Size Determination

To determine sample size of the targeted participants, Yamane sample size determination formula was used. Yamane sample size determination formula is used if working with finite population and if the population size is known and if participants are randomly selected (Israel 2003).

$$\boldsymbol{n} = \frac{\boldsymbol{N}}{\boldsymbol{1+N(e)^2}} \quad \text{…….. (1)}$$

Where; **n** is Sample size, **N** is Population size, and **e** is level of precision.

So, the sample size determined using the above formula is summarized as follows; the household head population in the selected kebeles is 1720

$$n = \frac{N}{1+N(e)^2}$$

$$n = \frac{1720}{1+1720(0.05)^2} = \frac{1720}{5.3} = 324.5 \sim 325$$

Table1. Sample size

Name of kebele	Total number of HHs in each kebele	Number of MHHs and FHHs in each kebele		Calculated representative number of HHs interviewed	Number of HHs interviewed in each kebele	
		MHHs	FHHs		MHHs	FHHs
Akaako	600	500	100	113	57	56
Denkaka	583	468	115	110	56	54
Tullu-Dimtu	537	483	54	102	50	52
Total	**1720**	**1451**	**269**	**325**	**163**	**162**

- Regarding to the sample size of qualitative research, four focus group discussions conducted (two MHHs FGD and two FHHs FGD) in the selected kebeles which are Akako and Denkaka. Each FGD conducted consisted of six participants totally twenty four participants have participated.
- Four key informants have participated in the key informant interview; these participants selected those who are knowledgeable about the objective of the study. Their profile indicated in the table 2 below.

Table2. Profile of Key informants

No.	**Position**	**Sex**	**Organization**	**Education level**
1	Woreda Agricultural bureau deputy officer	M	Ministry of agriculture	Masters
2	Extension agent	M	Ministry of agriculture	BSc
3	Extension agent	M	Ministry of agriculture	BSc
4	Farmers' cooperative Secretary	M	Farmer	Grade nine

3.5 Sampling Procedure

The entire set of cases from which sample is drawn in is called the population. Since, researchers neither have time nor the resources to address the entire population they apply sampling techniques to reduce the number of cases (Hamed, 2016). Accordingly, the targeted populations of this research were both Female and Male headed household farmers producing Chickpea in the Ada Woreda, Oromia regional state, Ethiopia, and key informants concerned.

Chickpea potential kebeles in Ada'a Woreda were selected using multistage sampling method to identify those kebeles potential and not. From those identified potential kebeles three kebeles were selected for the purpose of the study. The sample was drawn from the list of both female and male headed farmers name documented by Woreda agricultural bureau. So the study participants were selected randomly using simple random sampling and key informants were selected purposively.

- For all kebeles based on the number of representative sample calculated above, equal number of female and male headed households participated. Generally 163 MHHs and162 FHHs totally 325 participants were interviewed.
- Regarding the qualitative data collection four (two FHHs and two MHHs) focus group discussions were conducted in two selected kebeles of Ada'a Woreda (Akako and Denkaka) which consisted of 24 participants and four key informants knowledgeable about the issues were involved.

3.6 Data collection procedure

One month prior to data collection a meeting was held with Ada'a Woreda agricultural bureau, to brief the research objectives and follow up activities. Then, potential chickpea producing kebeles were selected and data based on the population of each kebeles was collected. The data collection of both qualitative and quantitative takes three weeks. Additionally, development agents in the selected kebeles were informed about the research objectives and participants who were willing were invited for an interview. Then, the researcher and enumerators went to the participant's kebeles for an interview. Before starting interview, participants were briefed about the study and agreed and signed the consent form. Amharic and Afaan Oromo languages were

the modes of communication throughout the data collection process. Following that, key informants were interviewed and focus group discussions were conducted.

3.7 Data collection techniques

Survey data were collected using structured questionnaire and seven enumerators have participated. Enumerators were selected based on the data collection experience and language skill (Afaan Oromo and Amharic). Four male and three female enumerators were selected and trained. Before the actual data collection, the data collection instruments were pretested.

Additionally, open-ended questions were used for FGD and key informant interview. Notebook and mobile recorder were also used for data.

3.8 Sources of data

The research used both primary and secondary data sources. Victor (2017) defines Primary data as the first hand data gathered by the researcher himself. Sources of primary data are surveys, observations, questionnaires, and interviews. Survey method is one of the primary sources of data which is used to collect quantitative information about items in a population. Interviewing is a technique that is primarily used to gain an understanding of the underlying reasons and motivations for people's attitudes, preferences or behavior. Interviews can be undertaken on a personal one-to-one basis or in a group. In this research primary data were gathered from selected participants through survey method from (three hundred twenty five) (163 MHHs and 162 FHHs) 325 household heads and two FGD discussions and four key informant interviews were conducted).

While secondary data are the data collected by a party not related to the research study but collected or may even be compiled for some other purposes at different times in the past. Sources of secondary data are government publications, websites, books, journal articles, internal records (Victor, 2017). Thus, for this research purposes secondary sources like; books, journal articles, internal records were reviewed.

3.9 Data analysis

Qualitative data were collected through interviews. Major themes were used and analyzed categorically in complement with research questions and summarized for utilization in descriptive analysis. According to Braun & Clarke (2012), thematic analysis is an accessible, flexible, and increasingly popular method of qualitative data analysis. It can legitimately focus on analyzing the meaning across the entire dataset, or examine one particular aspect of a phenomenon in depth. So for this research, major themes of qualitative data were identified and analyzed. Furthermore, feminist economist theory was used during analysis to consider how social roles and relationships, and how these, in turn, are affected by their ascribed social identities, including their gender, race, and ethnicity of FHHs and MHHs farmers in Ada'a Woreda.

Regarding the quantitative data, the collected survey data were coded and entered into SPSS software to prepare for analysis. After coding the survey data, data cleaning and preparing for analysis were done.

Multiple linear regression is a method of analysis for assessing the strength of the relationship between each of a set of explanatory variables, and a single response (or dependent) variable. It is a model that associates one continuous dependent variable to two or more independent variables and examines the simultaneous effect of several explanatory variables. Applying multiple regression analysis to a set of data results in what are known as regression coefficients, one for each explanatory variable. These coefficients give the estimated change in the response variable associated with a unit change in the corresponding explanatory variable, conditional on the other explanatory variables remaining constant. Mathematically, the model is specified as:
Y=$\beta_o + \beta_i x_i + \cdots \beta_k x_k + \varepsilon_{12}$. From the model βi show the magnitude and direction of association of their respective variables (xi) and the dependent variable (y). β1 measure the change in y associated with one unit change in x1 assuming all other values for the remaining variables are held constant (Landau and Brian, 2003). So to examine the effect explanatory variables on the chickpea yield per hectare of land multiple linear regression method of analysis is selected. Additionally, frequency, mean (average) and percentage were used for analysis.

As an independent sample t-test tells the researcher whether there is a statistically significant difference in the mean scores for the two groups or not. In statistical terms it means that the researcher is testing the probability that the two sets of data came from the same population. Additionally, the one-sample t-test is used to compare a sample mean to a specific value. A researcher can use one-sample t-test to compare the mean of a sample with a hypothesized population mean to see if the sample is significantly different (Gerald, 2018). Thus, the one-sample t-test was used to analyze the significant difference between potential yield of chickpea and average farmers yield. And also an independent sample t-test was used to assess whether there is significant difference between FHH's and MHH's chickpea yield in the study area. Finally, the results were presented using tables, and charts, and explanations were provided to clarify the results.

3.10 Research Ethics

With regard to the research ethics, discussion with the participants, data protection, participants anonymity and the dignity of the participants were given due attention throughout all phases of this research. This research minimized the power imbalance between the researcher and participants by giving priority to the opinions of the participants.

To make sure that targeted participants fully agree with the process of the research, letters of consent were signed. Participants were guaranteed that the process can be interrupted or ended, if they feel uncomfortable to answer questions and they can express all their inconvenience at any time. For confidentiality purposes, the research did not include any names of targeted participants as well.

Chapter Four

4. Data Presentation and Analysis

This study in general is set to examine the gender disaggregated chickpea yield gap analysis of FHHs and MHHs in the study area. This chapter presents the findings along with discussions of quantitative and qualitative data analysis results in line with the specific objectives of the study. First, socio-economic characteristics of FHHs and MHHs are discussed. Following that, the yield gap between potential yield of chickpea and average farmers yield is analyzed and discussed. Thirdly, the yield gap between FHHs and MHHs is analyzed and discussed. Finally, factors that contributed for productivity increment of FHHs and MHHs are analyzed and discussed.

4.1 Socioeconomic characteristics

4.1.1 Educational characteristics

For the case of this study, elementary education represent from grade 1-8, secondary education from 9- 10, and preparatory 11- 12. According to the survey data, education levels of MHHs in this study is summarized as follows; 30.7% illiterate, 8.6% adult education, 49.7% elementary education, 10.4% secondary education, and 0.6% college education. Whereas, Education levels FHHs in the study are: 57.4% unable to read and write, 8.6% adult education and 34.0% elementary education.

So 27.7% more FHHs are unable to read and write than their male counterparts, 15.7% more MHHs attended elementary education than their female counterparts, 10.4% more MHHs attended secondary education, 0.6% more MHHs attended college education, and 8.6% of FHHs and MHHs attended adult education.

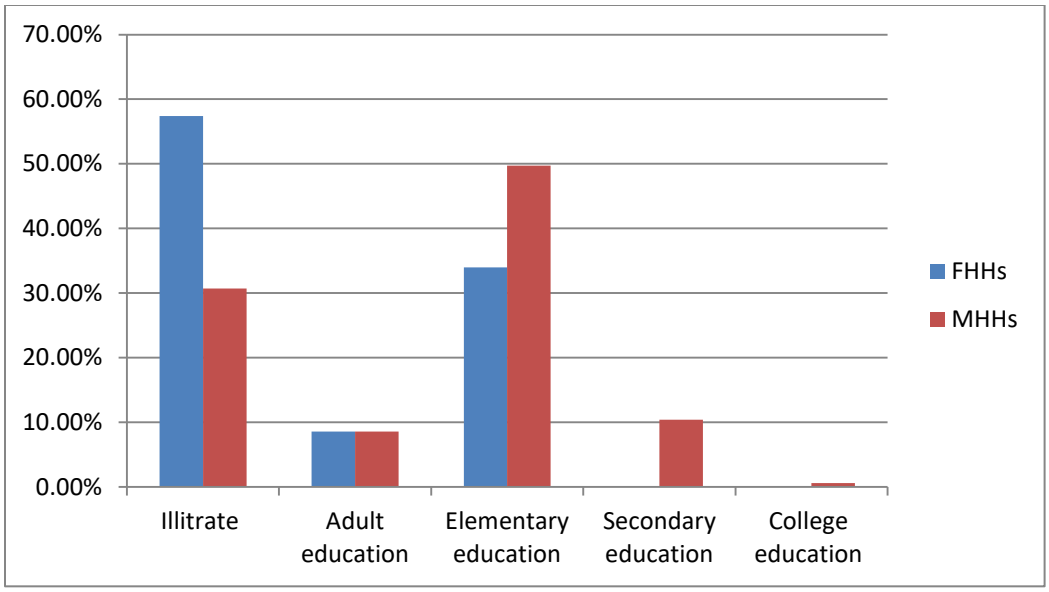


Figure 2: Educational characteristics of FHHs and MHHs in Ada'a Woreda

As indicated in the above figure, female farmer heads educational background is lower than that of their male counterparts and the higher number of FHHs are illiterate than their male counterparts. This implies that in the study area more male are sent to school and the education of female is not appreciated equally with male.

4.1.2 Household Amenities

As it is evident, the types of dwelling houses have been an indication of wealth and the income one the family is generating. The types of houses in the study area that farmers are dwelling in are either thatched roofed or tin roofed. The survey result indicated that 87.1% of household heads live in Tin roofed house, 2.2% live in thatched roofed house and 10.8% households live in both type of house.

From 325 total samples taken in the study area 78.8% of MHHs and 95.6% of FHHs live in Tin roofed houses respectively. This indicates that 16.8 % more FHHs live in Tin roofed houses than their male counterparts. Additionally, 4.2% MHHs and 0% of FHHs live in Thatched roofed house and, 17% MHHs and 4.4% FHHs live in both type of house (Thatched roofed and Tin roofed). Thus, this implies that most of household heads in the study area live in the tin roofed houses, it is because of the income they received from crop sell is sufficient for their livelihood.

4.1.3 Land allocation and ownership

Land ownership is the most decisive asset for farmers' livelihood. Farmers almost all income come from land owned and it is also the decisive factor for the wealth of farmers. Thus, the survey result indicates that average land owned by household heads in the study area is 1.65ha. On the other hand MHHs average land ownership is 2.04ha and 1.2ha for FHHs. So in the study area average land owned by MHHs is higher than their women counterparts by 0.84ha.

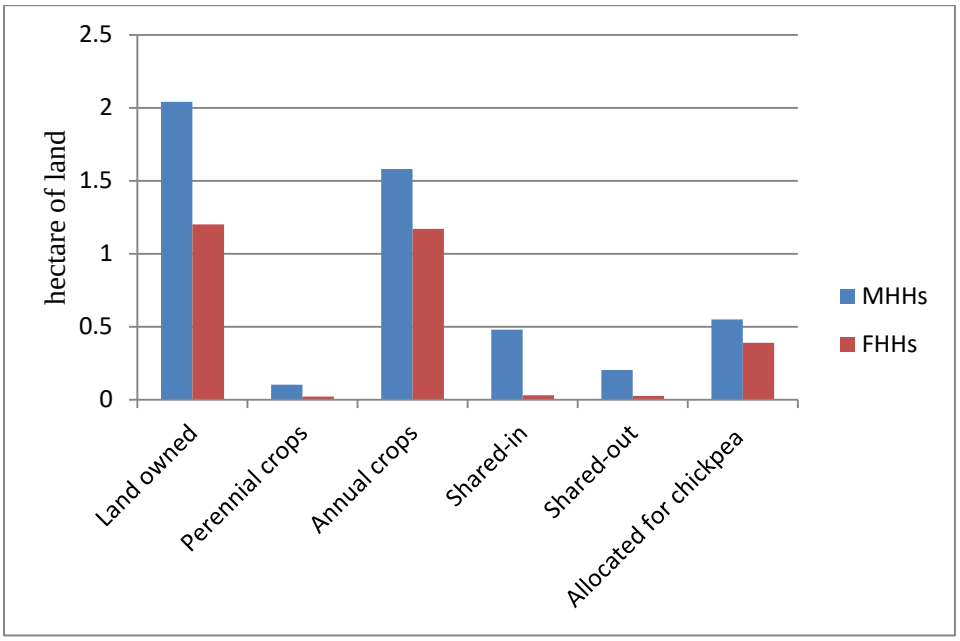


Figure 3: Average land allocations by Hectare

The allocation of owned land by household heads in the study area for different purposes is summarized as follows: the average land allocated for perennial crops by FHHs is 0.022 ha whereas it is 0.102 ha for MHHs. This indicated that, MHH's average land covered by perennial crops exceeds FHH's by 0.08ha.

The average land allocated for annual crops by FHHs is 1.17 ha whereas 1.58ha by MHHs. Land allocated for annual crops by MHHs is higher by 0.41ha than FHHs in the study area. In the study area the average land shared-in by MHHs is 0.48 ha whereas 0.03ha for FHHs, which is higher by 0.45ha. The average land shared-out by FHHs is 0.025 ha while 0.204ha for MHHs in the study area, MHH's shared-out land is higher by 0.179 ha than their female counterparts.

From the average land 1.65ha owned by household heads in the study area, the average land allocated for chickpea is 0.55 ha. On the other hand, average land allocated for chickpea by FHHs is 0.39ha whereas 0.55ha for MHHs.

Thus, it can be summed-up that in the study area higher percentage of land owned by MHHs than their female counterparts. So this has its own contribution for yield gap between FHHs and MHHs. Having wider land is important to share-out the far plot and share in nearby plots for a good management. This is one of the experiences of MHHs in the study area that helped them to increase their productivity.

4.1.4 Assets ownership

The survey result indicates that percentage of mobile owned by MHHs is 85.9% whereas FHHs owned 55.6%, which is lower by 30.3%. Mobile phone owned by spouse in MHHs is 42.3%. Mobile phone owned by youths in MHHs is 36.8% whereas in FHHs 45.7% which is higher by 8.9%, MHHs owning solar power is 55.20% whereas it is 45.70% for FHHs, which is lower by 9.5.

Electricity owned by MHHs is 0.60% whereas 0% for FHHs, percentage of Energy saving stove owned by MHHs is 18.40% whereas it is 6.80% for FHHs which is lower by 11.6%, Knapsack sprayer owned by MHHs 44.20% whereas 43.80% for FHHs which is lower by 1.6%, and Bio-gas owned by MMHs is 2.50% while 0.00% for FHHs which is lower by 2.5%.

Additionally, the percentage of MHHs owning functional radio is 64.40% whereas 44.70% for FHHs, which is lower by 19.7%, functional TV owned is 3.70% for MHHs whereas 0% for FHHs which is lower by 3.7%, motorbike owned by is MHHs 0.60% whereas 0% for FHHs which is lower by 0.6%.

In the study area both MHHs and FHHs do not own combine harvester, tractor, and car or bicycle. Cart owned by MHHs is 15.30% whereas 1.2% for FHHs which is lower by 14.1% , motor pipe owned by MHHs is 3.10% whereas 0.60% for FHHs which is lower by 2.5%, and Bajaj owned by MHHs is 2.50% whereas 0.00% for FHHs which is lower by 2.5%.

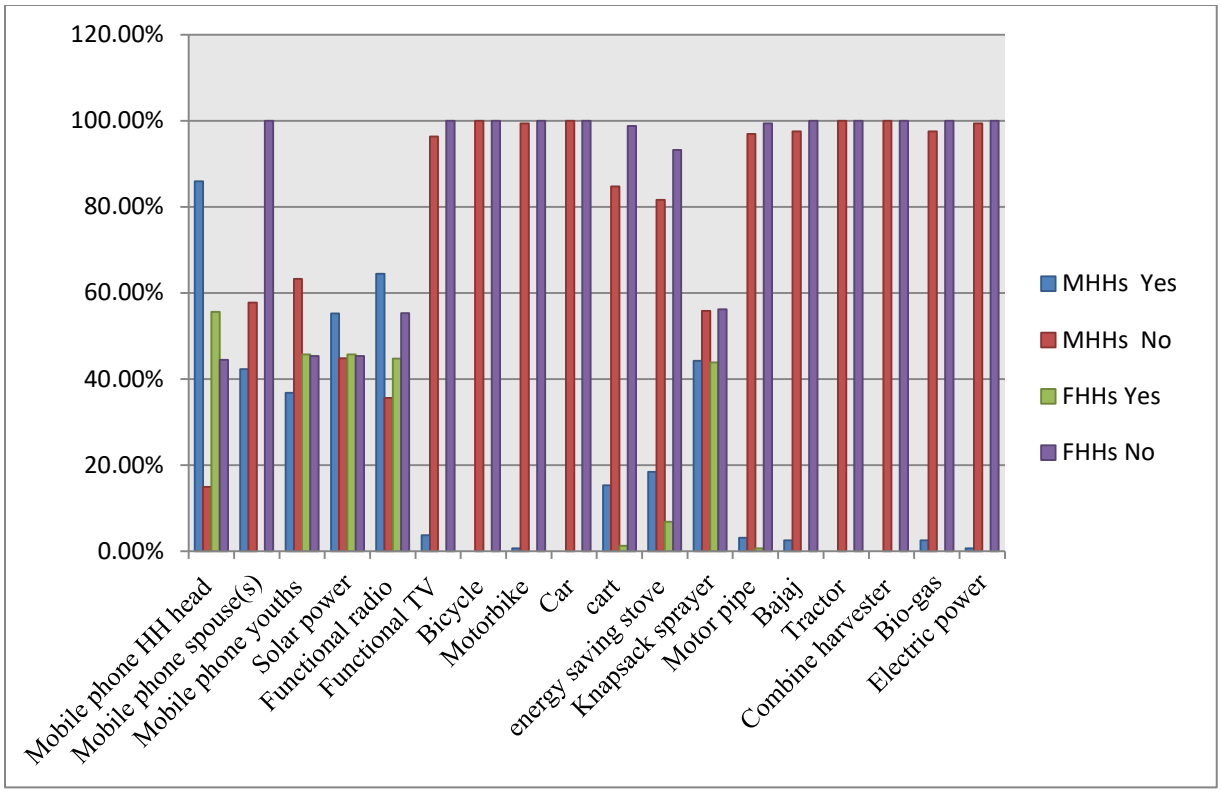


Figure 4: Assets owned by FHHs and MHHs in Ada'a Woreda

Thus, in the study area MHHs have more assets like functional radio, functional TV, motorbike, cart, motor pipe, and bajaj, mobile, solar power, electricity, Energy saving stove, and bio-gas than FHHs. This indicated that FHHs income from crop sell is lower than their male counterpart, so they could not buy assets important for agricultural activities. Additionally, FHHs have no information on the importance of those agricultural assets.

4.1.5 Economic benefit and decision making

The survey result indicated that, the average annual income households received from crop sell in the study area is 23,282.62 birr. And also the average income of MHHs from crop sell is 33,069.94 birr while it is 13,434.90 birr for FHHs in the study area.

Table 3. **Independent Samples Test of economic benefit and decision making**

	Levene's Test for Equality of Variances		t-test for Equality of Means						
								95% Confidence Interval of the Difference	
	F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	Lower	Upper
Equal variances assumed	19.4	0	3.058	323	0.002	19635	6421	7004	32266
Equal variances not assumed			3.067	180	0.002	19635	6403	7001	32269

The above table is the test of significance difference between the income gained by MHHs and FHHs from crop sold. The mean difference indicated in the table is 19,635.044 birr between FHHs and MHHs. The more important sections for independent sample test are t, df, and Sig. (2- tailed). Their results are t= 3.058, df = 323, Sig. (2-tailed) = 0.002 at 95% confidence interval and 5% significance level. The result is t (df) = t (323) = 3.058, p (3.058) = 0.002 < 0.05, so the result indicates the income from the crop sell FHHs got is statistically significantly lower (19,635 birr) than their male counterparts.

Decision on the income gained from chickpea sold by FHHs and MHHs in the study area is summarized as follows. Decision on the income gained from sale of chickpea by MHHs in study area is 85.4% by the husband, 13.9% by the husband and wife both equally, and 0.6% made by the wife in MHHs. This indicates that wife in MHHs have no equal decision making power on the income gained from chickpea sale. However, decision powers vary based on the type of agricultural products sold. Spouse in the MHHs or wife decision making power is on the limited agricultural activities like; Cattle, Milk, Chicken, Egg, Cow-dung, off farm, and crop sale. On the contrary, FHHs has full decision making power on the income collected from chickpea sale and others.

4.1.6. Tools Used to Harvest and Thresh chickpea

FHHs and MHHs in the study area harvested and threshed their chickpea using family labor and bought labor. The percentage family labor is 32 % for FHHs whereas 41% for MHHs which is higher by 11% than FHHs. The percentage of bought labor used for harvesting is 59% for MHHs whereas 68% for FHHs which is higher than MHHs by 9%. Thus, the survey result indicates that MHHs uses family labor more than FHHs whereas FHHs uses bought labor more than MHHs.

4.2. Yield gap between potential and average farmers yield of chickpea

Ethiopia is currently among the top ten countries for area, production, productivity and export of chickpea. It has the highest average yield of chickpea (1.7 t ha-1) among the countries having chickpea it has an area of more than 200,000 ha (Asnake, 2014). The average farmers yield in the study area is 1543 kg per hectare in 2011/12 while the potential yield of chickpea is 1.7 t ha-1or 1700 kg ha-1, the mean difference is 157 kg ha-1. So the average farmers yield is statistically significantly different from potential yield of chickpea as stated by one-sample statistical test. The results of one-sample test statistics are indicated on the table below.

Table 4. One-Sample test Statistics of yield gap between potential and average farmers yield of chickpea

	N	Mean	Std. Deviation	Std. Error Mean
total amount of chickpea produced per allocated land in 2011/12 in kg	325	1542.82	1265.565	70.201

According to the above one-Sample Statistics significant difference test statistics, there is

One-Sample Test

	Test Value = 1700					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
total amount of chickpea produced per allocated land in 2011/12 in kg	-2.239	324	.026	-157.185	-295.29	-19.08

significance difference between the mean score of farmers' yield which is 1542.82 kg ha-1and potential yield of chickpea which is 17000 kg ha-1. This is because of the significance level of average farmers yield and potential yield of chickpea is 0.026 which is < 0.05. So we can conclude that average farmers yield in study area is statistically significantly lower by 157.2 kg ha-1 than the potential yield of chickpea.

The reasons identified for lower productivity of farmers in the study area by key informants are summarized as follows:

"At research station everything is mechanized and the workers are trained very well and each step are seriously conducted and followed. However, farmers' in our area depend on labor intensive agriculture and most of them use local varieties. So there is big difference between average farmers yield and potential yield of chickpea. Secondly, at research station, clean improved seeds are used; whereas farmers use either local or outdated improved seed which is not pure and lasted for a long time. Thirdly, research station uses machineries for plough, planting, harvesting, threshing and transportations whereas regular farmers use animal and human labor. The fourth factor is land allocation: the type of land allocated for chickpea at research station is selected based on the character of chickpea whereas farmers do not take into consideration the type of land needed for chickpea. They merely produce rotating it on any plot without thorough consideration of suitability. Finally, management; chickpea field at research station is managed by well-educated experts following the recommendations whereas farmers do not take considerations of the packages that much" (Extension agents, Farmers' coops secretary and Woreda Agricultural bureau deputy officer).

Thus, we can summarize that not using improved technology equally with research make farmers' productivity lower.

4.3. Yield gap between MHHs and FHHs in Ada'a Woreda

As indicated in the table 3 below, in the study area in 2011/12 production year average productivity of MHHs was 1797.59 Kg/ha whereas 1286.47 Kg/ha for FHHs. So the mean difference between FHHs and MHHs was 511.120 Kg/ha that means there is 28.5% yield difference between MHHs and FHHs in the study area.

Table5. Independent Samples Test of Yield gap between MHHs and FHHs in Ada'a Woreda

Group Statistics

	sex of respondent	N	Mean	Std. Deviation	Std. Error Mean
total amount of chickpea produced per allocated land in 2011/12 in kg	Male	163	1797.59	1324.481	103.741
	Female	162	1286.47	1151.618	90.48

Independent Samples Test

		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Total amount of chickpea produced per allocated land in 2011/12 in kg	Equal variances assumed	6.971	0.009	3.711	323	0	511.12	137.714	240.19	782.049
	Equal variances not assumed			3.713	317.4	0	511.12	137.655	240.289	781.951

The independent sample test table above, t =0.8, df= 322, P=.000<0.05, indicates that FHHs chickpea yield per hectare is statistically significantly lower which is by 522.12 kg ha-1 than their male counterparts in the study area.

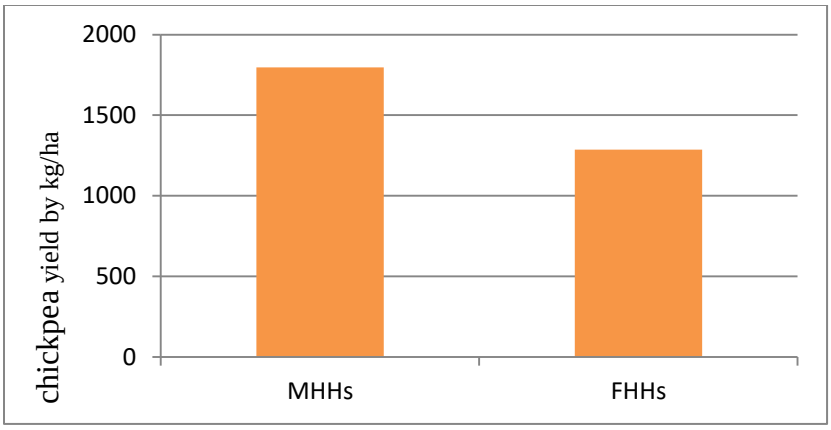


Figure 5: Chickpea yield of FHHs and MHHs in Ada'a Woreda

4.4 Contributing factors for chickpea yield gap

Overcoming stagnating agricultural productivity and food insecurity hinges on increasing agricultural productivity. In many parts of sub-Saharan Africa, where subsistence agriculture predominates, it is paramount to place strong emphasis on increasing the productivity of labor, land, capital, and other resources. Agricultural productivity may vary by gender if men and women use different technologies or different quantities of production factors, or if there are differences in the quality of these factors (Saito, et al., 1994). So this research assesses both technical and gender related factors contributed to less productivity of FHHs in the study area.

4.4.1. Multiple Linear regression function

Survey data were used to assess the degree to which productivity is affected by various explanatory variables. The explanatory variables assumed to influence the yield per hectare of chickpea either positively (+), negatively (-) or positively and/or negatively (+/-). The regression function is expressed as:

$$Y=\beta_o + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \cdots \beta_{12} x_{121} + \varepsilon_{12} \ldots\ldots (2)$$

Where:

Y= chickpea yield in kg/ha

x_1= Age of the respondent

x_2= Education level of the respondent

x_3 = Land allocated for chickpea

x_4 = labor resources

x_5 =Type of chickpea produced

x_6 = Fertility of Chickpea land

x_7 =Frequency of plough

x_8 = Keeping from birds and thief

x_9 =Pesticide or insecticide application

x_{10} =Farmers' association membership

x_{11} =Extension services

x_{12} =Number of Ox ownership

β_o = constant/intercept

ε= Residual or Error term

4.4.2. Model Results

4.4.2.1. Model results of data from both FHHs and MHHs in Ada'a Woreda

FHH's model summary data R=0.674 indicated that a good level of prediction of total chickpea yield in kg/ha by independent variables. On the other hand R^2= 0.595 value indicates independent or explanatory variables influence 59.5 % of the variability of the chickpea yield in kg/ha. 40.5% (100% - 59.5%) of the variation is caused by other factors other than the predictors included in this model.

MHH's model summary indicates that R= 0.846 which is a good level of prediction of total amount of chickpea yield produced in kg/ha by independent variables. Additionally, R^2= 0.820

value indicates independent or explanatory variables influenced 82.0 % of the variability of the chickpea yield in kg/ha. 18% (100% - 82.0%) of the variation is caused by other factors other than the predictors included in this model.

Table 6: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
FHHs	.674a	0.595	0.532	881.919
MHHs	.846a	0.82	0.792	1168.563

a. Predictors: Farmers' association membership, which type of chickpea is produced in 2011/12, Pesticide/insecticide application in chickpea, Frequency of chickpea field plough, Education level of the respondent, Fertility of Chickpea land, land allocated for chickpea in 2011/12, Age of the respondent, Number of Ox owned, Extension services on improved crop management, Labor resource, Keeping chickpea field from birds and thief.

Thus, MHHs chickpea yield per hectare is 25.1% and more influenced by explanatory variables in the model than the FHHs. According to the model result there are other factors influencing the FHHs chickpea yield per hectare in addition to the explanatory variables included in the model. This could be due to gender inequalities in the communities' structural arrangement like social norms, practices and beliefs as indicated by Mugisha et al. (2019) that as the communities' structural arrangement like social norms, practices and beliefs can have significant influence on yield increment of FHHs.

ANOVA table provides an F-test that of explanatory variables relation to the dependent variables and if "R Square" in ANOVA is zero, indicates there is no relation between dependent and independent variables (Sabine and Brian, 2003). Thus, the ANOVA table below indicates, MHHs, $F(13,149) = 4.55$, $p(.000) < .05$ and for FHHs $F(11,150) = 11.321$, $P(0.000) < 0.05$ respectively. Additionally, R Square in in the table 4 above is different from zero. Thus, we can conclude that there are some estimated explanatory variables included in the model statistically significantly predict the dependent variable.

Table 7: Analysis of Variance

	Sum of Squares		df		Mean Square		F		Sig.	
	MHHs	FHHs	MHHs	FHHs	MHHs	FHHs	MHHs	FHHs	MHHs	FHHs
Regression	80723174	96854727	13	11	6209475	8804975	4.55	11.32	.000b	.000b
Residual	203465426	116667282	149	150	1365540	777782				
Total	284188600	213522008	162	161						

a. Dependent Variable: Total amount of chickpea produced per allocated land in 2011/12 in kg

b. Predictors: Extension services, Number of Ox owned, Labor resources, Frequency of chickpea plough, Pesticide/ insecticide application, Age of the respondent, Education level, Fertility of Chickpea land, keeping from birds and thief, Farmers' association membership, Land allocation, and Type of chickpea is produced in 2011/12

During the focus group discussion with FHHs they indicated the main factors contribute for chickpea yield increment as follows: extension contact, improved seed, information, good management skill, equal treatment, training, labour, and resource ownership. While, MHHs identified factors that contribute for productivity increment are; extension contact, resource, clean and improved seed, using pesticide/insecticide.

In addition to the FGD data collected from group of FHHs and MHHs, key informants also identified factors contribute for productivity of both FHHs and MHHs.

"Farmers contact with development agents is very important to update their knowledge of improved chickpea varieties. Organizing experience sharing events for poor and low productive farmers with the host of model farmers at kebele level is really important to increase productivity. Capacity building training by different stakeholders for all type of farmers has contribution for yield increment. Using improved seeds has a great contribution for the yield gap between FHHs and MHHs. Mostly FHHs produce local seed than their male counterparts because they have limitation to access of information and do not attend trainings when they are invited. The other factors contributing for yield gap are lack of information about the full package of improved seed they are producing; they might get the improved seed from different sources like: local market, neighbors and others" (extension agents, Woreda Agricultural bureau deputy officer, and farmers' coop secretary).

Thus, factors identified that contribute for yield gap between FHHs and MHHs during focus group discussions and key informant interview are: improved seed, resource, information access, good management skill, equal treatment, training, labour, extension contact, resource, pesticide/insecticide, and experience sharing events.

4.4.2.2. Statistical significance and Estimated Model of Coefficients

Independent variables affect chickpea yield ha-1 in the multiple linear regression model are Age of the respondent, Education level of the respondent, Land allocated for chickpea, labor resources, Type of chickpea produced, Fertility of Chickpea land, Frequency of plough, Keeping from birds and thief, Pesticide or insecticide application, Farmers' association membership, Extension services, and Number of Ox ownership.

However, as indicated in the table 6 and 7 below, statistically significant factors for chickpea yield ha-1 of FHHs and MHHs identified by the multiple linear regression model for MHHs are Age, Type of chickpea produced (improved or local), Fertility of chickpea field, and Extension services. While; Age, Land allocation for chickpea, labor resources , Type of chickpea produced (improved or local), Fertility of chickpea field, Number of ox owned and Extension services are significant factors for chickpea yield ha-1 of FHHs in the study area.

On the contrary, Education level, Land allocated for chickpea, labor resources, keeping from birds and thief, Frequency of plough, Pesticide or insecticide application, and Number of Ox ownership are statistically insignificant factors for chickpea yield ha-1of MHH in the study areas. Additionally, insignificant factors for chickpea yield ha-1of FHHs are; Education level, Frequency of plough, keeping from birds and thief, Pesticide or insecticide application, Farmers' association membership in the study area.

Beta and B in the table 6 and 7 below represent, “Beta”, measures the rank of explanatory variables based on their contribution (irrespective of sign) in explaining the outcome. Whereas, “B”; measures, for each of the explanatory variables, the predicted change in the dependent variable when the explanatory variable is increased by one unit conditional on all the other variables in the model remaining constant (Sabine and Brian, 2003).

As indicated on table 6 below MHHs, estimated model coefficients indicated that the extent of explanatory variables statistically significantly affects the chickpea productivity summarized as follows: As age of MHHs increased by one, total chickpea productivity decreased by 28.14kg/ha. Producing local type of chickpea decreased chickpea productivity by 465.0 kg/ha and vice versa. And also decreased soil fertility of chickpea field, decreased total chickpea productivity by 561.6kg/ha. Additionally, not being a member of farmers association decreased the total chickpea yield by 554.5 kg/ha and vice versa. Furthermore, extension service helped to increase total productivity of chickpea by 784.4 kg/ha for MHHs.

Table 8: Estimated model coefficients for chickpea yield increment of MHHs

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	5332.01	649.907		8.204	0.00
age of the respondent	-28.136	6.852	-0.312	-4.106	0.00
type of chickpea produced	-464.742	232.314	-0.166	-2	0.047
Soil fertility	-561.601	272.322	-0.163	-2.062	0.041
Membership farmers' association	554.484	218.494	0.2	2.538	0.012
extension services	784.359	225.618	0.262	3.476	0.001

a. Dependent Variable: total amount of chickpea produced per allocated land in 2011/12 in kg

The decreasing rank of explanatory variables based on their degree of influence on MHHs chickpea productivity is; Age of household head, Extension services, Farmers Association membership, type of chickpea produced, and Soil fertility of chickpea field.

As indicated on the table7 below FHHs, estimated model coefficients indicated that the extent of explanatory variables affected the chickpea productivity summarized as follows: As age of FHHs increases chickpea productivity decreases by 52.5 kg/ha, increases land allocated for chickpea decreases productivity by 1676.4 kg/ha, increases number of labor resources increases chickpea productivity by 595.4kg/ha, decreases soil fertility of chickpea field decreases productivity by 449.6kg/ha, increases number of ox owned increases chickpea productivity by 328.4kg/ha, more

extension contact increases chickpea productivity by 72.4kg/ha and type of chickpea increases chickpea productivity by 338.3 kg/ha respectively.

Table 9.Estimated model coefficients for chickpea yield increment of FHHs

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	4971.655	614.41		8.092	0.00
age of the respondent	-52.49	9.438	-0.396	-5.562	0.00
land allocated for chickpea	-1676.362	449.617	-0.268	-3.728	0.00
labor resources	595.359	178.293	0.255	3.339	0.001
type of chickpea is produced	339.282	175.508	0.143	1.933	0.044
Soil fertility	-449.568	173.472	-0.183	-2.592	0.011
Ox owned	328.44	63.8	0.415	5.148	0.00
extension services	-72.372	215.306	-0.28	-3.123	0.002

The decreasing rank of explanatory variables based on their degree of influence is; Number of ox owned, Age, Extension services, Land allocation for chickpea, Labor resources, soil fertility, and type of chickpea seed respectively. So the following variables are significant factors that contribute for low productivity of FHHs compared to their male counterparts.

4.4.2.3 Type and sources of chickpea seed produced

In the study area FHHs produced 62.5% improved and 37.5% local type of chickpea. Whereas, MHHs produced 64.2% improved and 35.8% local type of chickpea respectively. This indicates that both FHHs and MHHs had access to improved seed in the study area. Regarding to the color of the seed, MHHs had produced Kabuli (white) 99.4% and 0.6% Desi (red) type of chickpea, whereas FHHs had produced 100% Kabuli type of chickpea respectively. This indicates that, Kabuli type of chickpea is highly produced in the study area. It is because of Kabuli type of chickpea has higher market demand than that of the Desi type.

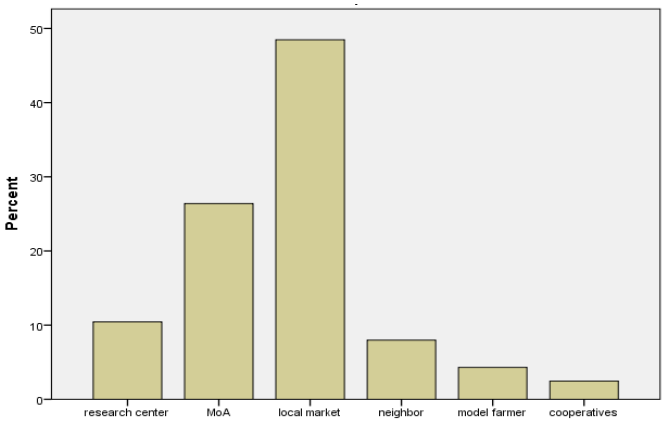


Figure 6: MHHs sources of chickpea seed

Producing the improved type of chickpea helps to increase the productivity. This is because quality seed is decisive for yield increment and to produce quality yield. Additionally, to get quality seed the sources from where farmers' access improved variety is very important for yield increment. In the study area MHHs chickpea seed sources are; Research center, MoA, Local market, Neighbor, Model farmers and Cooperatives. From these seed sources the highest percentage (48.5%) goes to local market, the second is MoA (26.4%), the third is research (10.4%), the fourth is neighbor (8%), the fifth is model farmer (4.3%) and the sixth is cooperatives.

While, FHHs chickpea seed source are: Research center, MoA, Local market, Neighbor and Home saved. From those seed sources the highest percentage goes to the local market (56.7%), the second MoA (24.6), the third is neighbor (12.6%), the fourth is home saved (5.5 %) and the fifth is research center (0.6%).

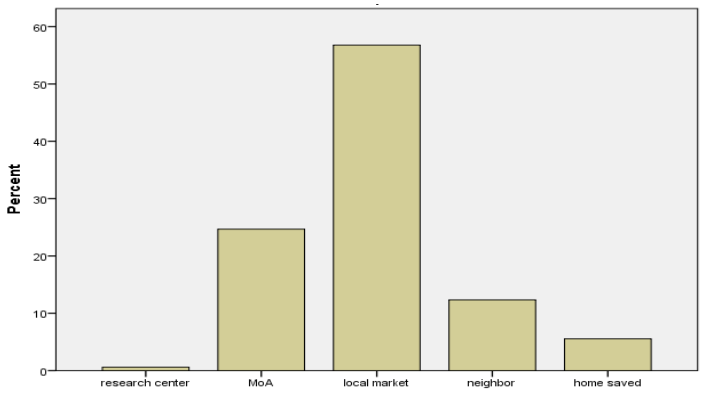


Figure 7: Source of seed for FHHs

Additionally, FHHs access to seed from research (0.6%) is lower by 9.8% as compared to MHHs (10.4%). FHHs' access of seed from MoA is (24.7%) lower by 1.7% as compared to MHHs' (26.4). On the other hand, FHHs have no access of seed from cooperatives whereas MHH's is 2.5% and MHHs have no access of seed from home-saved seed.

Thus, the survey result indicates that FHHs access of seed from formal sector is lower than their male counterparts. It is because of:

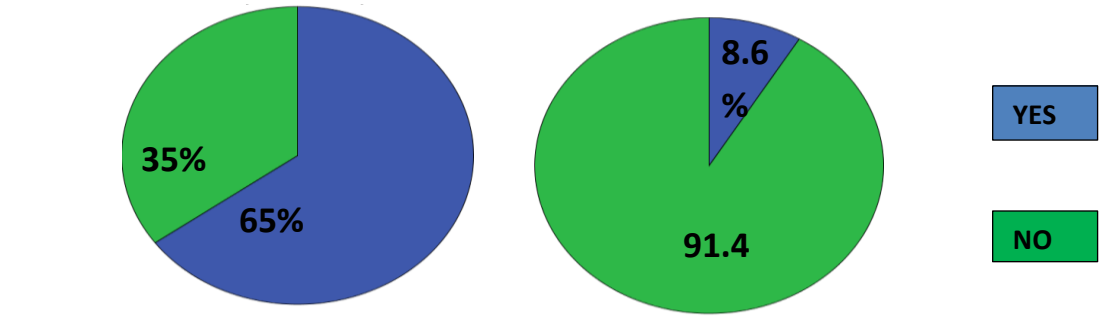
"MHHs have frequent extension contact and get information through different means like; walking to distance market, attending trainings, mobile phone contact, by their position, relative, through friendship and at local alcohol drinking place. However, we stay all the day long at home and busy, and we do not get information from extension agents" FHHs' FGD.

"we have access to training, extension contact, and walk long distance to access improved seed and FHHs are persistent to change and have no enough resources to access the new technology" MHHs' FGD.

Thus, we can summarize that FHHs in the study area are inhibited by the gender based constraints like; limited mobility, gender division of labor which expect women to stay at home to manage variety of works, and lack of information sources to get clean improved chickpea variety.

4.4.2.4. Farmers Cooperatives Membership

The chart below indicated that, 65% of MHHs and 8.6% of FHHs are member of farmers' cooperatives; this indicated that MHHs membership is higher by 56.4% than FHHs. Additionally, 35% of MHHs and 91.4 % of FHHs have no membership of farmer's association; this indicated that FHHs' is higher by 56.4%. Thus, we can summarize that FHHs' farmers' association membership is lower than their male counterparts in the study area.



MHHs Farmers Association membership FHHs Farmers Association membership

Figure 8.Farmers Association memberships of FHHs and MHHs in Ada'a Woreda

To get access of input like improved seed, fertilizer, information, and others timely being the member of farmers association is mandatory. However, FHHs are not the beneficiary of the farmers' association/cooperatives.

4.4.2.4.1 Farmers Cooperative Membership of FHHs and MHHs

Almost all FGD result indicated that FHHs do not have equal access to be a member of farmers association in their kebele. Additionally, they claim that the criteria to be a member are not inclusive as it is more of men targeted. The criteria are; number of labor they administer, availability anytime they are wanted, owned resources, and wider land. So it is known that they do not have these listed resources as criteria.

There are some FHHs who are member of cooperatives in the study area. However, their membership is not because they fulfill the criteria, it is rather because either their late husbands were member before he died or when he could not attend because of health related problems and model FHHs. FHHs added as they could be productive as their male counterparts if they had given equal chance to be a member of farmers' cooperative. Because being member of farmers cooperative is important to get improved seed, training, and other inputs timely.

However the survey result indicates as FHHs cooperative membership is lower than their male counterparts MHHs indicated as both FHHs and MHHs have equal right to be a member of cooperatives. But, they claim that to be a member it requires fulfilling criteria set for resources owned, labor administered, and availability at any time they are required to. Additionally, they claim as the criteria to be a member of farmers' cooperatives are not inclusive of all type of farmers like; disable and poor MHH farmers.

"Being community member, having experience of participation in different societal activities, large size of land, obeying rule and regulations, administering enough labor resources, being strong and active, age level, and location of their field with respect to proximity to accessing road are some of criteria that should be fulfilled by both FHHs and MHHs to grant cooperative membership" Farmers' cooperative Secretary.

Thus, we can summarize that being member of farmers' cooperative is very important for farmers to get easily improved technology, inputs like; fertilizer, pesticides/insecticides, extension contact, trainings and others required for being productive in every agricultural crop types. However, the criteria to be member of farmers' cooperative are difficult for most of FHHs and poor MHHs. This is because of the criteria to be member of cooperative needs resources and do not take into consideration the gender based problems of FHHs like: limited mobility, access of resources, information access and their triple labor burden (productiion, reproduction and communal responsibilities).

4.4.2.5 Ox ownership

Survey result of Ox ownership of FHHs in the study area indicated that 4.9% of them have no, 30.2 % have one, 42.6 % have two, 21.6 % of them have 3-6, and 0.6 % of them have eight Oxen respectively. Whereas MHHs Ox ownership collected from survey result are 6.1% have no, 17.2 % have one, 30.7% have two, 47.9 % have three to six, and 4.3 % have eight Oxen respectively. Comparing the number of oxen owned by FHHs and MHHs, more than 70% of FHHs owned two and less whereas, more than 80% of MHHs owned two and more.

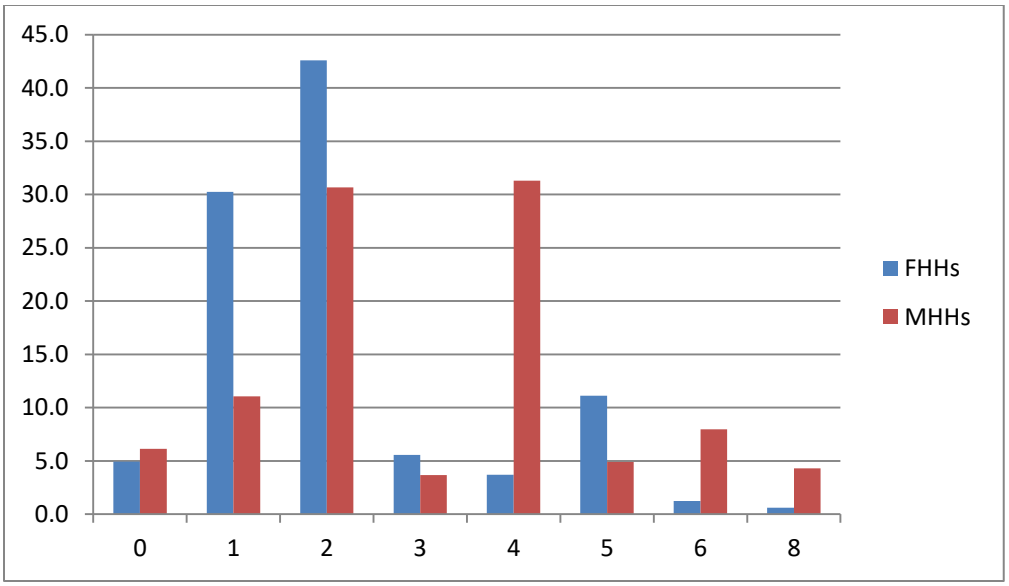


Figure 9: Percentage of ox owned by household heads in study area

The survey data indicated that FHHs Ox ownership is statistically significantly lower than their MHHs counterparts in the study area. Ox ownership is very important asset for the success of farming in Ethiopia because mostly land preparation, planting, and threshing activities are carried out using Oxen. So the survey result indicate that most of FHHs in the study area use rented oxen for land preparation, planting, and threshing activities which has a big contribution for low productivity of them by limiting them not to prepare their land timely, frequency of plough, and timely thresh. Thus, the number of Oxen owned determines the productivity of household heads in study area.

4.4.2.6. Soil Fertility

Land fertility between FHHs and MHHs is statistically significantly different. The independent samples test of land fertility of FHHs and MHHs indicated that MHH's chickpea field is more fertile by 13.3% than their female counterparts. On the other hand, infertile or not fertile land for MHHs is 67.9 % and for FHHs is 82.2%.

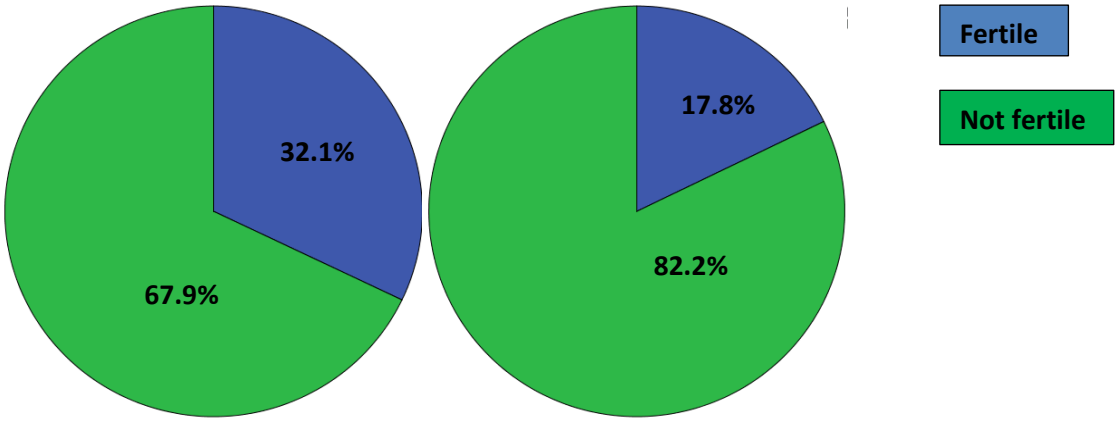


Figure 10: Land fertility of FHHs and MHHs in Ada'a Woreda

This indicated that the higher percentage of FHH's land is not fertile which is by 14.3% than their male counterparts. Following this Key informants' evaluate crop management and soil conservation skill of FHHs and MHHs as follows;

"MHHs have higher soil conservation and crop management skill than their female counterparts. This is because both soil conservation and crop management needs strength and labor resources. So MHHs have more labor and time, and have awareness than their female counterparts. But, if FHHs have enough labor, they could manage their field more than their male counterparts" extension agents.

This indicate that the reason for less fertility of FHHs land is because of lack of enough labor to manage the plot effectively, awareness about what is needed to increase the fertility of their plot, and lack of time because of they are busy all the day by other works in and outside the home. Thus, we can summarize that soil fertility is one of the factor that contributed for less productivity of FHHs compared to their male counterparts in the study area.

4.4.2.7. Extension services

Access to extension service is very important for farmers to have the updated information about different agricultural technologies. However, extension agent communication of FHHs and MHHs varied in the study area. The independent sample test showed that FHHs extension communication is lower than that of their male counterparts.

The survey result showed that 74% of MHHs and 35% of FHHs have extension agent communication; this indicates that 37% more MHHs have extension contact than their female counterparts. On the other hands, 26% of MHHs and 65% of FHHs have no extension contact, which is 39% difference of extension contact in the study area.

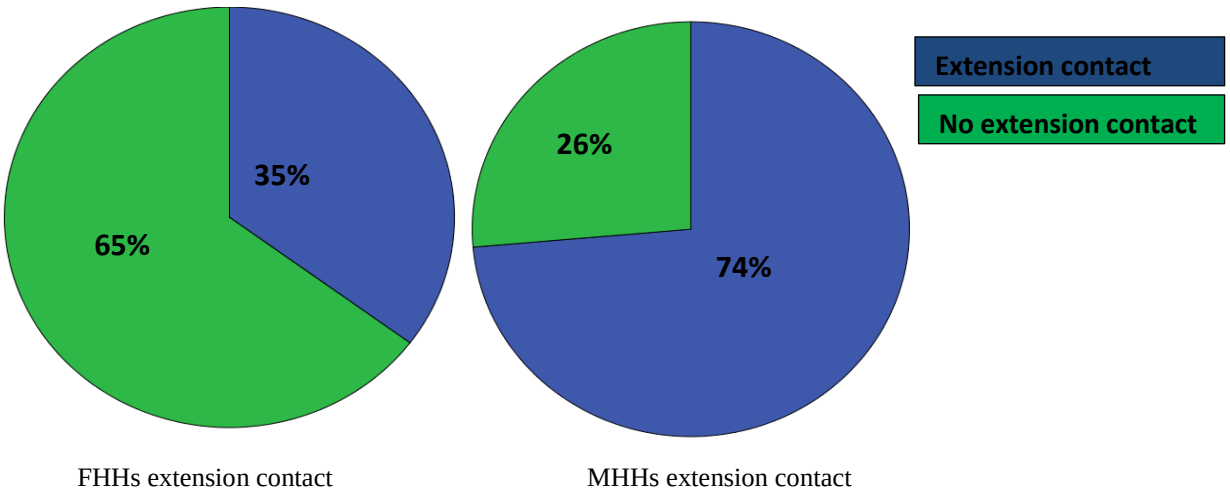


Figure 11: Extension contact of FHHs and MHHs.

4.4.2.7.1 Treatment of development workers for FHHs and MHHs

The survey result indicates as FHHs have lower extension contact than their male counterparts in the study area. Based on the survey data FHHs and MHHs focus group discussions summarized as follows:

"We had no communications with development agents in our kebele and even we do not know them in person. Mostly MHHs are invited for any extension services. We live with the help of God and lead a kind of hand to mouth way of living. We even have no information when several kinds of projects are carried out in our kebele. This is because MHHs and model FHHs are preferred, and which cause us to be ignored or left behind" FHHs FGD.

However the survey result indicates as FHHs extension contact is lower by 39% than their male counterparts, MHHs group discussion claim as there is equal treatment of extension agents in the area.

"Development workers treat us and our female counterparts equally however there is a difference in equal participation. FHHs are busy all day to be available timely on different

development works. Sometimes trainings organized at nearby town and Woreda, thus FHHs could not participate at the training. That is because of the distance of walking and the time needed to stay at the Woreda and they are the only person who is responsible for everything" MHHs FGD.

Thus, we can summarize both the survey result and focus group discussions as FHHs have no extension agents' communication compared to their male counterparts. This is because of un-equal treatment of FHHs and MHHs by the extension agents. So lack of extension agents' contact let the FHHs productivity lower than their male counterparts in the study area.

4.4.2.7.1 Preferred Farmers for Extension Services Delivery from FHHs and MHHs

In the above it is summarized as FHHs' lower productivity is because of lack of extension agents' services equally with their male counterparts. However, to get extension agents services it needs to be preferred by them. So how extension select farmers and who is preferred by extension agents for extension service delivery is important.

"Model farmers mostly preferred for extension services because they have significant resources and comparatively can easily manage farming and related works. We can reach other farmers through those model farmers and they can save our resources and time. Because model farmers are more active, easily understand and helpful in facilitating our communication with the rest of the farmers" extension agent and farmers' coops secretary.

Additionally, they indicate as they invite both FHHs and MHHs equally for extension services. However the problem is MHHs more punctual and accept new idea easily compared to their female counterparts.

"We invite both FHHs and MHHs; however FHHs cannot be available at any time they are invited and they are not actively participating compared to their male counterparts. Additionally, they are slow to changes and to implement what they had learnt" extension agent and Woreda Agricultural bureau deputy officer.

Thus, we can summarize that MHHs are more preferred for extension services than the FHHs because of consideration of FHHs as weak and not punctual. So this has a big contribution for lower productivity of FHHs compared to their male counterparts.

4.4.2.8 Training on Newly Released Chickpea Varieties

Training on chickpea newly released varieties for both FHHs and MHHs is very important to understand the full package of the technology and manage accordingly. So the independent sample test indicated that training on newly released chickpea varieties of FHHs is statistically significantly lower than their male counterparts in the study area. The survey result indicated that 25% of FHHs and 48% of MHHs attended the chickpea training. This shows that FHHs are mostly not invited for training as compared to MHHs.

Training on newly released chickpea varieties organized by different organization like MoA, Research, NGO, etc, is very important to be familiarized with the technology and to understand the comparative advantage of the new varieties. So this had contribution for FHHs to produce the local type of chickpea and less productive in the study area.

4.4.2.8.1 Process of selection of farmers for training by development workers

Attending trainings is important for farmers to develop their capacity regarding agricultural activities and to update their knowledge and skills. However the process of farmer selection has effect on FHHs and MHHs to attend equally. So the view of FHHs and MHHs on the process of farmer selection for trainings collected during FGD summarized as follows:

"We have no information about how development agents select farmers for training and we even not invited for the issues related to them. We hear and see when MHHs go and comeback from training" FHHs FGD.

As the survey result indicated only 25% of FHHs attend chickpea trainings organized in the study area while 48% of MHHs attend chickpea trainings. Thus, MHHs pointed as farmers selected randomly and by chance for trainings which is intended to make equal participation of both FHHs and MHHs.

"Development agents select farmers by chance or randomly, out of those who have resources, enough labor, capable of management, model and whose field is near to road. Additionally, they select farmers who can manage the field for field days very well" MHHs FGD.

Thus, we can summarize that the process of development agents uses to select farmers for trainings had a negative effect on the FHHs to be the user of new chickpea varieties equally with their male counterparts. So this has made FHHs less producer of chickpea compared to their male counterparts in the study area.

4.4.2.8.2 Time and place of trainings organized

The time and place trainings organized have effect on the equal participation of FHHs with their male counterparts because FHHs have gender based constraints that limit them. The view of both FHHs and MHHs summarized below.

"Because of we were not invited for any training, we could not mention anything about the time and place trainings organized. Few FHHs who attend trainings said: the time of trainings organized were not suitable for us because we are always busy, especially at the morning. Regarding the places where the trainings organized were far and not suitable to attend and we could not stay there the whole time the trainings could last" FHHs FGD.

As most of MHHs attended chickpea trainings they indicated as they have no problem with place where the trainings were organized however they claim about the time trainings organized.

"In our kebele training is not organized regularly and frequently; the organized trainings are not at our free time or at off-season. Mostly trainings organized in the month of July and August. At these months we are very much busy as it is the peak season. So in order not to lose the opportunity we compromise our activity and decide to attend. Regarding the place the training organized, we do not have problem, as our cost is covered by the organizing body" MHHs FGD.

Thus, we can summarize that the time trainings organized were not suitable for FHHs and MHHs in the study area. As the time the trainings organized were not take in to consideration the time when FHHs be free in addition to off season when both FHHs and MHHs are free. Regarding the place trainings were organized FHHs problem which is limited mobility and triple labor burden of women not taken into account. So FHHs are not comfortable with the time and place the trainings were organized while MHHs are not comfortable with time trainings organized.

4.4.2.9. Extent of satisfaction on extension services

The extent of satisfaction on the extension services provided in the study area of both FHHs and MHHs are indicated as follows. FHHs satisfaction is 3.7% and 10.4 % of MHHs are very satisfied, 26.5 % of FHHs and 41.7% of MHHs rated it medium. Furthermore, 13.0 % of FHHs and 31.9% of MHHs rated it Poor. Finally, 56.8% of FHHs and 16.0% of MHHs rate it not well at all.

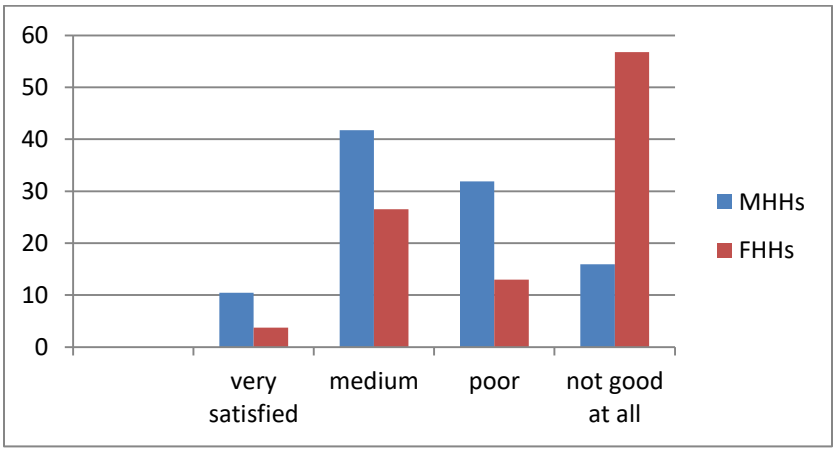


Figure 12.Extent of satisfaction on extension services

Based on the treatment of extension agents for FHHs and their male counterparts, process of FHHs' and MHHs' selection for trainings, the time and place trainings were organized, and extension agent communication FHHs and MHHs rated the satisfaction level on extension services given generally. So the result indicates that both FHHs and MHHs are not satisfied by the extension services given in the study area, however the rate of satisfaction of FHHs' lower than their male counterparts.

Thus, we can summarize that extension services given in the study area is not satisfactory, though extension contact is an important factor for chickpea productivity increment of both FHHs and MHHs.

4.4.2 .10 Effect of Religious/Cultural Taboos for FHHs and MHHs Farmers Productivity

Religious/cultural taboos have effect on the productivity of FHHs and MHHs because of their education easily accepted by the society without any doubt. So the effect of Religious/cultural taboos on FHHs and MHHs collected from FGD summarized as follows:

"At the time when our husbands were alive we did not participate on managing role, and had no role outside the house. Now, the past experience which is living without our husband put us every responsibility on our shoulder and we are struggling to manage every burden of activities inside and outside their home. So our all our problem is because of cultural norms that treat us differently, and limited us in home and drive us blind to the outside world" FHHs FGD.

Furthermore, they claim communities' structural arrangements like; cultural norms and religious education restricted them not to participate in different development activities equally with their male counterparts. They indicated as development agents perceive them weak and passive for new technology. And also the unwillingness of development agents to discuss with them about problems related to farming and how to increase their productivity is the other problem FHHs indicated. They added that all these problems are because of communities' structural arrangements and religious taboos that restricted them not to participate in development activities like; training, extension contact, being a member of farmers' association/cooperatives, and others treated them weaker than their male counterparts. Religious/Cultural taboos like; triple labor burden (reproduction, production and communal works), limited movement, and limited responsibility restricted them not to practice their right equally with their men counterparts.

On the other hand, most of MHHs argued that there are no any religious/cultural Taboos that restricted them from participating in development activities. However, some of them indicated existence of religious/cultural taboos that restricted them from participating in development activities like; **"Warra Guma"** this is Afaan Oromo word which is called family and or kinship of the person who killed other. This means a farmer who is the family of the person who had killed the others' family member would not attend the same trainings and be a member of the same cooperatives together with the family of the late person. They articulated the situation as follows;

"One of our friends is repelled to be a member of our proximate cooperatives without committing any sin by himself. However, the act was done by his aunt and the families of the late person deny him to participate in the development activities."

Key informants indicated as there is no yield difference between FHHs and MHHs because of socially constructed structures. But, they articulate as culture and or religion have their own contribution for low productivity of farmers in general compared to potential yield. They indicated that their view as follows:

"Most of farmers skip several days as holydays, working days are very few and they waste what they had accumulated for religious purposes. Finally, they are exposed to lack of capital to buy inputs needed for their farm activities so that their productivity becomes lower" extension agents and Woreda Agricultural bureau deputy officer.

Some of key informants added their views as follows:

"For MHHs there is no any communities' gender relation, Norms, culture, and religion contributions for yield increment. However, for FHHs it restricts them to participate in different development activities like; on training, field days and others. It is not convenient for FHHs to participate in trainings out of their village and they are busy all days because of labor burden on them and household responsibilities. Every activity of FHHs is limited by the cultural norms that they cannot deviate from the culturally stated line to conduct their day to day activities. So FHHs are in the line stated by communities' gender relation, Norms, culture, religion whereas MHHs are free" (Farmers' coops secretary and Woreda Agricultural bureau deputy officer)

Thus, we can summarize that cultural/religious taboos and communities structural arrangement restricted FHHs mostly and MHHs at some level not to participate in development activities like: being cooperatives member, attending trainings and others.

Chapter Five: Conclusion and Recommendations

5.1 Conclusion

The outcome Socio-economic characteristics of households in the study area indicated that: FHHs in the study area are unequal socially, economically, and by social structural arrangement. Socially they could not read and write compared to their male counterparts. Which affects them to access information from different sources like; magazine, posts and others and they have no network with different stakeholders to get the agricultural updated information timely. The income they received from agricultural activities is lower and it could not afford to buy agricultural facilities needed for increasing agricultural productivity.

The lower yield of average farmers yield in the study area compared to the potential yield of chickpea can be concluded that household head farmers' means of agricultural production based on the tradition way of farming using: human labor, oxen, hand planting, hand threshing, hand harvesting, and animal transportation. On the other hand potential yield of chickpea is higher because it is produced using skilled human labor, improved varieties, and using machineries for planting, threshing, harvesting, and transporting. So depending on the traditional means of farming decreased the productivity of farmers in the study area compared to the potential yield of chickpea.

Conclusion of the yield gap between FHHs and MHHs can be indicated that FHHs in the study area produced significantly lower chickpea yield than their male counterparts. So the factors contributed for lower yield of FHHs compared to their male counterparts are both the technical and gender based factors. Gender based factors like: unequal treatment of FHHs and MHHs by extension agents, limited mobility, triple labor burden (productive, reproductive and communal activities) to participate in the different trainings, and unequal treatment of religion and technical factors like: use of inputs (fertilizer, pesticide /insecticides, improved chickpea varieties), trainings, cooperatives membership, assets ownership, soil fertility, and use of extension services.

Generally, the social structural arrangement and gender based constraints highly contributed for lower productivity FHHs' by: limiting their movement, limiting their decision making power and lack of control on the resources they have. Specially, those women who are in the MHHs or

wives are double victims of gender based constraints like: oppression which comes from their husbands because of socialization like; denying decision making power, being financially dependent, and lack of freedom to participate in development activities. And gender based factors are the base for technical factors that contributed for lower productivity of FHHs in the study area.

5.2 Recommendations

Based on the findings, the following six points are recommended:

- The time farmers could be free needs to be identified by any organizations to deliver any agricultural information and other important for agricultural development activity equally.
- Before any development programs started the impact of the project has on FHHs and MHHs needs to be identified.
- When any development projects initiated both FHHs and MHHs needs to be participated starting from the problem identification stage to implementation.
- Frequent monitoring and evaluation should be conducted by concerned bodies from Ministry of Agriculture to assess whether both FHHs and MHHs are equally benefiting from development projects initiated.
- Awareness should be created on the impact of socially created structures like; limited movement, decision making power, and perceiving women farmers as weak on FHHs
- Before the employment of extension agents gender mainstreaming trainings should be given.
- Agricultural extension service should be equally provided for FHHs and MHHs.

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Annex I

Addis Ababa University

College of Developmental Studies

Center for Gender Studies

Request for participation in research project

"Gender Disaggregated Chickpea Yield Gap Analysis: The Case of Ada'a Woreda, Oromia regional states, Ethiopia" is mixed research that aims to involve both FHHs and MHHs, produced chickpea in 2011/12 in the study area. So you are selected to participate in this research which is part of my master's thesis. The study aims to: assess whether there is chickpea yield gap between the potential yield and average farmers yield, assess whether there is chickpea yield gap between FHH and MHH farmers, and describe the underlying factors for the chickpea yield per hectare of both FHH and MHH farmers.

What does participation in this research imply?

Participation in the research requires one hour for interview. You will not be asked any personal issues out of the aim of the research. Questions are about your day to day life in the society you are living in. only answers you respond will be chosen.

What will happen to the information taken?

Confidentiality and Anonymity of all collected data will be kept. All data collected will be interpreted accordingly without mentioning your name. So no one is going to recognize you from the analyzed data in the thesis.

Voluntary Participation

It is voluntary to participate in the project, and you can at any time choose to withdraw your consent without stating any reason. If you decide to withdraw, all your personal data will be removed from the data set. The study proposal is presented to Addis Ababa University, Center for Gender studies and got an approval to conduct the field study. Should you have further questions about the research, please contact; Student researcher; Wubishet Chiche.

Phone number: ……

Consent form

I have received and understood information about the research on "Gender Disaggregated Chickpea Yield Gap analysis: the case of Ada'a Woreda, Oromia Regional States, Ethiopia" and have been given the opportunity to ask questions. I give my consent to;

- □ Participate in the structured interview
- □ Participate in semi-structured-in-depth interview
- □ My personal data to be recorded and processed in the study

I also give my consent for my personal data to be processed until the end date of the study.

Date; ---------- Signature; ----------

Annex II

GENERAL

1. Name of enumerator _____
2. Date _____
3. Woreda **Ada'a**

FARMERS' IDENTIFICATION

1. Kebele _____
2. Got _____
3. Name of the respondent_____
4. Phone No_____
5. Sex of the respondent 1) Female ☐ 2) Male ☐
6. Position of the respondent in the household 1) Household head ☐ 2) Spouse ☐
7. Age of the respondent _____
8. Education level of the household head or respondent? (years of schooling) _____
9. Household Composition & Characteristics

Family code	Name of household member (start with household head)	Relation to HH head (code A)	Sex (Codes B)	Age (years)	Education (years) Codes C
1					
2					
3					
4					
5					
6					
7					
8					
9					
10					

Code A:	**CODE B:**	**Codes C**
1. HH head 2. Relative 3. Spouse 4. Son	1.Male	0. Illiterate 101. Adult education or religious
5. Daughter 6. Hired labor 7. Other (specify	2.Female	No. of years of education completed --------- grade

LAND ALLOCATION

1. Land ownership and allocation

S. No.	Land use particulars	Currently (ha)
1	Total land owned	
2	Land covered by perennial crops	
3	Land allocated for annual crops	
4	Leased-in (shared-in) land	
5	Leased-out (shared-out) land	
6	Land allocated for chickpea in 2011/12	

ASSETS

1. Assets owned by the household:

S.N	Type of asset owned in the household	Currently		When did you own / have access to this item? Since ____ years
		Owned / have access to this? 1. Yes 2. No	If yes, how many owned?	
1	Mobile phone HH head			
2	Mobile phone spouse(s)			
3	Mobile phone youths			
4	Solar power			
5	Functional radio			
6	Functional TV			
7	Bicycle			
8	Motorbike			

9	Car			
10	Donkey/horse/camel cart			
11	Fuel/energy saving stove			
12	Knapsack sprayer			
13	Motor pipe			
14	Bajaj			
15	Tractor			
16	Combine harvester			
17	Bio-gas			
18	Electric power		xxxxxxxxx	

2. Type of house owned? A) Thatched roofed house B) Tin (corrugated) roofed house

3. Would you list labor resources you have? a) Wife ☐ b) Husband ☐ b) Boys ☐

c) Girls ☐ e) Bought labor ☐ f) Relatives ☐

4. Do you have saving account? 1. Yes ☐ 2. No ☐

5. If yes to Q4, when did you start owning_____?

6. If No to Q4, why?

_____

_____

2. Economic benefits of households from agricultural activities

How much income did the **HOUSEHOLD** get last year (2011 E.C) from sells of the following farm products?

S.No.	**Sells of products**	**Total income obtained last year in 2011 E.C (Birr)**	**Who controls this income? Code A**
1	Crops (cereals, pulses, oil crops)		
2	Fruits (peach, apple, etc)		
3	Vegetables (potato, tomato, onion, cabbage, etc)		
4	Coffee		

5	Chat		
6	Enset		
7	Hops (*Gesho*)		
8	Sells of cattle (x-bred cow, heifer, bull, cow, ox)		
9	Sells of milk & milk products (butter, cheese, etc)		
10	Sheep & goats		
11	Equines (donkey, horses, mule, camel)		
12	Chicken		
13	Honey		
14	Egg		
15	Cow dung		
16	Trees, such as Eucalyptus		
17	Fire wood		
18	Charcoal		
19	Remittance		
20	Daily labor		
21	Off-farm income sources (IGAs)		
22	PSNP (food for work and direct supports)		
23	Other income sources (specify)		

CODE A: 1. Household head 2. Wife 3. Both equally 4. FHH 5. Youths

CHICKPEA PRODUCTION

Crop type	Which type of variety is produced in 2011/12? 1)Improved 2)Local	From where have you got the seed? (For both Local & improved)* **Code A**	Total amount produced per allocated land in 2011/12____kg	Would you rate the Fertility of your land? **Code B**
Chickpea				

Code A	Code B
1) Research center 2) Woreda Agriculture and Natural Resource 3) Local Market 4) Neighbor 5) Model farmer 6) others (specify)	1) Fertile 2) Medium 3) Poor 4) others (specify)

MANAGEMENT

Crop type	Frequency of plough	Did you plant timely? 1)Yes 2)No	If No, why?	Did you weed timely? 1)Yes 2)No	If yes, frequency of weeding?	If No, why?	Did you keep your fields from Birds and thief? 1)Yes 2)No	If No, why?	Did you apply pesticide or insecticide? 1)Yes 2)No	If No, why?	Who harvest the field? **Code A**	How did you thresh? **Code B**
Chickpea												

Code A	Code B
1) Myself 2) by my family 3) bought labor 4) Machinery 5) others (specify)	1) By animals 2) By thresher 3) By family labor 4) By bought labor 5) others (specify)

PESTICIDE/ INSECTICIDES

1. Have you been given training about the usage and types of insecticide and pesticides available with their advantage and disadvantage? 1) Yes ☐ 2) No ☐

2. If yes to Q1, list the consequences (positive and negative) you are aware of?

_____

_____

3. Can you easily identify the different types of pesticides /insecticides that are necessary for the specific purposes that you need? 1) Yes ☐ 2) No ☐

4. Do you know the amount of Pesticide/ insecticides recommended for **chickpea** per plot of land?

1) Yes ☐ 2) No ☐

5. If No, Why?

_____

_____

6. Have you been used the chemical containers for different household activities

1) Yes ☐ 2) No ☐

7. If yes Q6, list the purposes used for?

_____

_____

LIVESTOCK TECHNOLOGIES

1. Current Ownership of livestock: Number of livestock owned in 2011/12

S NO.	Type of livestock	Do you own? 1. Yes 2. No	**Local**			**Cross-breed**						
			How many you owned	Number sold last year (2011/12)	Average price sold per animal (Birr)	Aware of x-bred? 1.Yes 2. No	Owned x-bred? 1.Yes 2.No	When did you start owning? Since _ years	How many you owned?	Source for the first time? **CODE A**	Number sold last year (2011/12)	Av. Price (Birr/ animal)

1	Ox											
2	Cow											
3	Heifer											
4	Bull											
5	Calves											
6	Chicken											
7	Sheep											
8	Goat											
9	Donkey					XXX	XXX	XXX	XXX	XXX	XXX	XXX
10	Horse					XXX	XXX	XXX	XXX	XXX	XXX	XXX
11	Mule					XXX	XXX	XXX	XXX	XXX	XXX	XXX
12	Camel					XXX	XXX	XXX	XXX	XXX	XXX	XXX

CODE A: First source of crossbred cows:

1. Market 2. MOA 3. Individual farmers 4. Research Centers 5. Commercial Dairy Farms

6. NGOs 7. Commercial heifer rearing farms 8. Cooperatives 9. Others (specify)

2. If not aware of X-bred livestock, why?

_____

_____

3. If you do not own crossbred cows, why?

a) I am not aware ☐ d) No market for X-bred ☐ g) Complicated management ☐ b) x-bred cows are expensive ☐ e) Disease problem ☐ c) No source of x–bred ☐ f) Feed problem ☐ h) other (specify) _____

EXTENSION SERVICES

1. Are you a member of any farmers' associations? 1) Yes ☐ 2) No ☐

2. If No, Why? _____

_____

3. Have you been given training on **Chickpea** newly released varieties?

1) Yes ☐ 2) No ☐

4. If yes to Q5, who organized the training? 1) Research center ☐ 2) Woreda Agriculture and Natural resource ☐ 3) NGO ☐ 4) Seed Enterprise ☐ 5) Others _____

5. How is the extent of your satisfaction on the extension service provision?

a) Very satisfied ☐ b) Medium ☐ c) Poor ☐ d) Not good at all ☐

= Thank you =

Annex III

Female and Male headed household FGD checklist

On Gender disaggregated Chickpea and Tef yield gap and soil conservation

GENERAL

a. Woreda_____
b. Kebele _____
c. Number of participants_____
d. Group _____ 1) Female ☐ 2) Male ☐

YIELD GAP QUESTIONS

1. Do women and male have equal right to be member of a cooperative?

2. What do you think the reason?

3. What are the factors for your productivity increment?

4. In your community, how the FHHs and MHHs treated for different development works?

5. In your community who do you think has access to improved technologies?

6. How do the development workers select farmers for training about newly released technologies?

7. What do you think about the time and place training organized when you are invited?

8. How the communities' structural arrangements and religious/cultural taboos treat you from participating in different development activities?

= Thank you =

Annex IV

Key informants interview guide

On Gender disaggregated Chickpea and Tef yield gap and soil conservation

GENERAL

1. Name _____
2. Sex_____
3. Age_____
4. Woreda _____
5. Kebele_____
6. Position _____
7. Experience in the position _____ Years
8. Phone number _____

YIELD GAP QUESTIONS

1. Do you think there is a yield difference between farms of FHHs and MHHs?

_____

2. What do you think about factors that contribute to yield increment of household heads?

_____

3. Do you think there is a yield difference between potential and average farmers yield of Chickpea?

_____

4. What do you think about factors that contribute for yield gap between potential and average farmers yield of Chickpea?

_____

5. What are criteria for both FHHs and MHHs to be farmers' association member?

_____

6. What do you think about the inclusiveness of the criteria?

_____

7. Who do you prefer mostly for extension services (Training, Demonstration, crop management, and Field day) delivery from FHHs and MHHs?

_____

8. How do you select farmers' field for demonstration for newly released chickpea varieties and other technologies?

_____

9. How do you evaluate the crop management and soil conservation skill of FHHs and MHHs?

_____

10. How do you articulate the communities' gender relation, Norms, culture, religion contributions for the yield gap?

_____

= Thank you =

Addis Ababa University

College of Development Studies

Office of the Associate Dean for Research and Technology Transfer

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Table Showing Matched and Changed Text

No.	Matched text	Changed text	Page No.
1	THESIS SUBMITTED TO CENTER FOR GENDER STUDIES IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR THE DEGREE OF MASTER OF ARTS IN GENDER STUDIES	It does not need change	Cover page
2	for a degree in any other university, and that all sources of materials used for the	It does not need change	I
3	ADDIS ABABA UNIVERSITY COLLEGE OF DEVELOPMENT STUDIES CENTER FOR GENDER STUDIES This is to clarify that the thesis	It does not need change	II
4	Woreda, Oromia Regional State, Ethiopia" is submitted in partial fulfillment of the requirements for degree of masters of art in development studies (Gender studies) complies with the regulations of university and meets the accepted standard with respect to originality and quality.	It does not need change	II
5	List of Figures, Chapter One: Introduction, Background of the study, Statement of the Problem, Objective of the Study, General Objectives, Research questions, Scope and Limitations of the study, Validity and Reliability, Literature Review	It does not need change	VIII, 1, 2,4, 5, 7
6	Strengthening women's access to, and control over is an important way of improving their status and influence within households and communities	To change women's life style and their contribution in their family and society strengthening their use of, and decision making on land is the very essential.	9
7	improving women's access to land and security of tenure has direct impacts on farm productivity	Changing women's use of land and freedom of production has important influence for yield increment	9
8	farmers in developing countries by providing a means to improve soil fertility and increase land productivity and overall crop yields	farmers in developing countries by introducing a means to improve soil fertility and increase productivity of land and generally crop productivity	12

9	access to new technology is crucial in maintaining and improving agricultural productivity	adoption of new technology is vital in sustaining and enhancing agricultural productivity	12
10	the use of purchased Technological inputs depends on the availability of complementary assets such as land, credit, education and labor, all of which tend to be more constrained for female-headed households than for male-headed households	assets like land, credit, education and labor which are constraints of FHHs influence and have impact on the use of bought technology as in put for agricultural productivities as it is compared to their male counterparts.	12
11	Adoption of improved technologies and inputs may also be constrained by women's lower ability to absorb risk and it is also dependent on time constraints	The use of new agricultural technologies and inputs may also be inhabited by lack of confidence to take responsibility and it is also hooked in to time constraints	12
12	*Feminism is a belief that ladies universally face some form of oppression or exploitation; a commitment to uncover and understand what causes and sustains oppression altogether it forms and a commitment figure individually and collectively in lifestyle to finish all sorts of oppression"*	It does not need, because quoted and indent changed	13
13	Feminist economist's intention in the sector of economics is to support its reference to social relation and denunciation of marginalizing regarding gender relations in traditional economic theories. These feminists developed an economics that serve interests of huge and different group of individuals	Feminist economists concern across the sector of economics was supported its reference to gender and on firm rejection of gender marginalization in traditional economic theories. They developed an economics which could be applied to serve the interests of huge and groups of individuals.	13-14
14	Feminist economists contributed new insights to economic thought and were creative in engaging in economics that resulted in positive difference in people's lives especially on that of women.	The contribution of feminist economists to economic thought were new understanding and were innovative in involving economics which enable or brought a positive difference in people's life styles and standard especially for women.	14

15	It has 25 rural Kebeles with a total population of 133,205; out of which, 69,447 are male and 63,758 female. The total number of rural households is 20, 362 out of which 18,450 are MHH and 1,912 are FHHs	The study area which has 25 rural Kebeles there are 69,447 male and 63,758 female from total population of 133,205. Out of 20, 362 households of the area there are 1,912 female headed households whereas 18,450 households are headed by males.	15
16	**n** is Sample size, **N** is Population size, and **e** is level of precision	It does not need	16
17	sample test are t, df, and Sig. (2- tailed)	It does not need	25
18	Y=$\beta_o + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \cdots \beta_{12} x_{121} + \varepsilon_{12}$	It does not need	28
19	Keera, Allendorf. (2007). "Do Women's Land Right Promote Empowerment and Child Health in Nepal?"World Development, Eilsevier, vol. 35(11), pages 1975-1988, November.	It does not need	52
20	Abenakyo A and Elias Damtew. (2016). Gender-based constraints and opportunities to agricultural intensification in Ethiopia: A systematic review	It does not need	52
21	Carmen D and Cherly D. (2006).The gender asset gap: what do we know and why does it matter? Fem Econ 12 (1–2):1–50	It does not need	53
22	Food and Agricultural Organization (FAO). (2010). Women in Agriculture: Closing the Gender Gap for Development.	It does not need	53
23	Naila, Kabeer. (1994). Reversed Realities, Gender Hierarchies in development thought. Verso, London, UK.	It does not need	54
24	Gender Differentials in Agricultural Production and Decision-Making among Smallholders in Ada, Lume and Gimbichu Woredas of the Central Highlands of Ethiopia.	It does not need	55