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Factors Affecting Teff Production by Female Headed Households in Abeshege Woreda of Gurage Zone, Southern Nations Nationalities and Peoples Region, Ethiopia

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Abstract
The study was conducted with the aim of investigating the level of female headed household farmers' participation in teff production and Soil and Water Conservation practices on teff farm plot and determinates of their participation in teff production of Abeshege woreda, SNNP, Ethiopia. A random sampling method was employed to select 164 participant and 70 non-participant households from purposively selected six Rural Kebeles sample respondents. Data were collected from both primary and secondary sources using interview schedule, focus group discussion, semi-structured interview, key informant discussions, and observations. The study employed both quantitative and qualitative data. The quantitative data were analyzed and interpreted by using descriptive statistics such as mean, range, percentage, standard deviation, t-test, chi-square and frequencies in order to draw conclusions and generalizations. The qualitative data were also analyzed and described by using qualitative methods such as narration, and generalizations. The study also employed the probit econometric model as a component of inferential statistical analysis. The study revealed that, there was a variation in the level of participation of female headed household in teff production in the study area. Further, the results of the study showed that 7.5% of the sampled respondents were under the category of low participation, 14.9% were under medium level of participation category and 62.7% of the respondents were under high participation category. The study showed that female headed household contribute 37.4% of labor for teff production and 41.6% of female headed house hold participants had a very good level of participation on soil and water conservation practices on teff producing farm plots. The estimation of the probit analysis revealed that size of family(X4), land size (X5), Average annual income (X6), and contact with development agents (X8) are significant at 1% probability levels. The implication of finding is that an increase in the level of any of the explanatory variables with positive sign i.e. in the case of marital status (X2), education level (X3), size of house hold members(X4), land size(X5) and contact with development agents(X8) have a positive effect on the participation of female headed household in teff production in the study area. According to this finding concerned body should give attention to those significant variables with care and design a better teff production strategy focusing on effective supervision, and training to enhance the female headed farmers' participation in teff production.
Keywords: Women participation, Teff production, Soil and Water conservation, Probit analysis

1. Introduction

Female headed household are known to play a vital role in the production of food and crops in the field to generating income and soil and water conservation for sustainable use of natural resources. However, their participation and success is impeded by lack of resources. Among resource control issues, access to even small land for female headed household has remained an important component of household food supply and crop production (Elfring, et al., 2005; Emana and Gebremedhin, 2007). The rapid development of agriculturel production particularly Teff production have a positive effect on national economic growth, and provides female headed household with attractive options for investment activities beyond the production of raw materials (Felipe, 2012). Thus increasing the integration of Teff production through improved linkages with different sectors is increasing the efficiency of agriculture.

In addition, Teff production gives an opportunity for increases female headed household farmers' participation in the market led development than other cereal crops. Increasing Teff production contributes to commercialization of the rural economy and creates income generating jobs particularly for women (Emana and Gebremedhin, 2007). Besides, the production of Teff by female headed household is often complicated by substantial problems including access to required labour force and credit, extension services, land shortage, inappropriate management and input supply (Lumpkin, et al., 2005). Production of Teff and soil and water conservation requires more labors which including women, boys, girls and men participation. Therefore, without considering factors affecting female headed household involvement in Teff production is unreachable to produce high production of Teff for the country in general and for household consumption specifically (Lumpkin, et al., 2005).

This study was done in predominantly Teff growing areas of SNNP Abeshege woreda. As to AWRDO (2014) female headed household participation in Teff production accounts 39% of the total Teff producing households in the study area. This percentage of female headed household participation is higher than the other

crops which account 24% and 19% of maize and chickpea production respectively. Nevertheless in the study community all female headed household are not participating in teff production activity. However, no study has been conducted in Abeshege woreda of Southern Ethiopia on factors affecting teff production by female headed household's participation. Therefore, the purpose of this study was to investigate the determinants, and level of participation of female headed household in teff production and soil and water conservation practices on their teff producing farm plots.

2. LITERATURE REVIEW

2.1. Overview of Teff Production and Soil and Water Conservation

Overview of Teff Production

Teff *(Eragrostistef)* is a major staple food crop in Ethiopia. Teff is grown at middle elevations between 1,800 and 2,200meter.above sea level and in regions that have adequate rainfall. Compared to other cereals, Teff is considered a lower risk crop as it can withstand adverse weather conditions (Fufa et al., 2011). While research on improved Teff varieties has been done since the mid-1950s, investments have been limited and only a small number of improved varieties have been released, i.e. about 20 in total (Fufa et al., 2011). Its grain is mainly used for making *enjera*, a spongy flatbread, the main national dish in Ethiopia (as well as Eritrea). Teff is also valued for its fine straw, which is used for animal feed as well as mixed with mud for building purposes.

Studies show that the cultivation of teff is the most labourious of the cereals. On average, teff cultivation requires eight ploughings. Repeated ploughing destroys weeds, breaks and softens the soil, and increases the water-holding capacity of the soil. Unless teff fields hold enough water before sowing, the yield will decline significantly. Before broadcasting the seed, teff fields are often trampled by cattle. The gaps between rows are also levelled, and grasses and other plant residues are removed. If teff fields are not trampled, the tiny teff seeds will be buried under the soil and weeds will dominate the crop within two or three days after sowing. However, trampling on water logged lands will bury the soil under the surface water, and for this reason waterlogged fields are not trampled (Gedef, 2010).

Overview of Soil and Water Conservation

Simply the term conservation means the protection of resources from destructive influences. The term applies to the positive work of maintenance, enhancement and wise management, of resources and to restoration by reducing and reversing rates of damage and destruction of resources. Soil conservation: The prevention of erosion on cultivated land and on other areas depends essentially on the reduction of soil detachment and runoff, and on the maintenance of adequate vegetative ground cover (Tiffen et al., 2005). Thus, good soil management is crucial for conserving soil and maintaining productivity of land.

Soil conservation involves the various methods used to reduce soil erosion, to prevent depletion of soil nutrients and soil moisture and to enrich the nutrient status of the soil. The conservation techniques include both the new and traditional techniques such as traditional bunds and the newly introduced stone bund terracing, check dams, closures and plantations. Soil conservation is a set of strategies for prevention of soil from being eroded from the earth's surface or becoming exhausted chemically by overuse, Salinization, acidification, or other chemical action. It is a combination of all methods of management and land uses that safe guard the soil against deterioration by natural or man-induced factors.

Soil and water conservation (SWC) practices in upland areas can foster the production of various kinds of ecosystem services that have both upstream and downstream benefits. By implementing practices that maintain or restore the capacity of soil to retain water along with nutrients and organic matter, farmers can dramatically reduce agricultural water demand, reduce vulnerability to climate extremes of drought and flooding, and also increase soil carbon storage, as well as productivity. By reducing runoff and the need for chemical fertilizer inputs, downstream water quality improves (CA, 2013). As the supply of any of the services becomes more limiting, human well-being will increasingly depend on achieving an acceptable balance between the trades-offs (Aylward, 2004). Soil erosion affects an estimated 1,100 million hectares of land worldwide resulting in the transport of 2.0-2.5 $\times$ 10^{10} Mg of soil to the oceans each year (Markus, 2004).

Similarly, soil erosion is one of the principal environmental problems in Ethiopia resulting in reduction of productivity of arable lands. About 1.5 billion tons of soil is lost from Ethiopia and Eritrea alone per year (Hurni, 2007) and 2 million hectares of land in Ethiopia has been severely degraded (Jagger & Pender, 2003). An annual yield reduction of 1-2% is estimated due to soil erosion in Ethiopia (Hurni, 2007). Erosion removes the most productive portion of the soil, that is, the chemically active part such as organic matter and clay fractions. It also causes a deterioration of soil structure, moisture holding capacity through lowering soil depth, increasing bulk density, soil crusting, and reducing water infiltration. The typical Ethiopian farm family of about six persons now harvests less than a tone of grain a year-less than enough for the subsistence diet-and crop yields are steadily declining due to erosion and exhausted fertility (Harrison, 2007).

2.2. Women's Role in Agricultural Development

In most societies men's roles in agricultural activities is understood to be directed and clear. However, women's role in agriculture is not clearly recognized. Hence a clear picture of women's of participation in agriculture is needed. Although these is increasing that women are involved in the world agriculture until recently have been difficult to gain a clear picture of where, and under what circumstance women particular in the farm work (Annable, 2006). Although the micro studies documenting the importance of women's roles have arisen steadily national statistics have to undercount women's agricultural labor, due to their definition of agricultural activities in their intervening producer.

Every country's development is focused mainly on the uplifting of the rural smallholder-farming sector. Most people in this group are women who Labor Day and night to sustain the family's food supply and provide extra income to the households. Majority of women in developing countries fall within the small scale subsistence sector farming and produce more than 80% of the food for the Sub-Saharan Africa (Irvine, 2006). In addition, they grow half of the world's food requirements (FAO, 2011). Women are the invisible agricultural producers in peasant society (Ellis, 2009). Nearly 85% of women's labor is spent in farming (Yeshi, 2007).

Women in Ethiopia play multiple and overlapping roles, which have increasingly put pressure on their health, food security, productivity and potential contribution to improved human welfare and economic development (Senait, 2010). Generally, women are considered as sources of food and heads of household, while all the important activities of women are hidden behind the men. But, the fact is that women play a significant role in food production and in farm family as a whole.

2.3. Women's Access to key economic resources

In Africa, the first shifting cultivation where hoe was the main tool for plowing the land. The contribution of women was much greater than men. In this system women were the dominant figures of the practice of farming whereas men's roles were only confined to clearing the land. Women prepare the soil, sowing, weeding, harvesting, threshing and transporting farm products (Boserups , 2010). In undertaking different economic activities more than men, rural women in developing countries have less property right, have no role in the economic input and they have remained economically insecure. Rural women have played significant role in livestock production in developing countries and they are active participants in the livestock management such as supply of fodder, milking, protecting animals (Boserups, 2010). Land and property right for women require urgent attention by policy makers and land reform practitioners in Africa during the last three decades (UNDP, 2006). The increased focus on a Global Realization of Women empowerment in Africa generally gets little attention. These situations are also true to Ethiopia.

The low economic status of women limits their opportunities for broader participation in society. This is compounded by the trouble women experienced in child-bearing and rearing. African (such as Nigerian) culture discriminates a lot against women and girls, especially in the area of inheritance (land). Culture is not static and in modern-day Nigeria, it is subject to pressure and influences. Modern education and the development of technology and information have introduced Nigerians to new cultural concepts and norms (Fabiyi et al., 2007).

Since culture is not static, the forces of social change may be expected to lowering the barriers against women's economic opportunities. Many women took to prostitution due to poverty and inadequate information and education. Access to education, extension services, information, land, credit facilities and other relevant agricultural innovations will entice many women to agricultural productions and will reduce poverty among women farmers (Famoriyo, 2007). Women have little access to capital and other assets that make agricultural production easy and profitable. Women also complained about inadequate extension contact, high cost of farm input and late delivery of farm input especially fertilizer. Women farmers in the study area also have little access to capital or credit facilities (Fabiyi et al., 2007).

2.4. Gender Relation and Poverty in Ethiopia

Ethiopia women have played a traditional role of motherhood and home maker in both rural and urban areas. However, their work has never been limited to the household and the family. Ethiopia women are actively involved in all aspects of their social life. Women are both producers and procreators and they are active participant in the social and cultural activities of the community. However, the important roles they play have not always been recognized. Without, equal opportunities, they have lagged behind men in all fields of self-advancement (Boserups, 2010).

In what ways has the country mobilized the labor of women to optimize human resource in the overall economic development of a nation? Important changes have taken place with the introduction of the socialist ideology, which advocate equal right for all, irrespective of sex, religious, racial or social origin. Ethiopia's women seem to have gained somewhat better experience since the 1974 socio-economic and political transportation. They have expanded their horizon with educational advancement and increased economic activity (Amarech, 2012). Since 90% of the Ethiopia inhabit in the countryside, our focus is on rural women because

women in urban a small comparison. Under changes such as the rise in the literacy an increase in school enrolment and growing competition in the employment market, have not directly affected the live of rural women.

In all these activities, women receive no remuneration for their labor, no monetary or material gains and no benefit in luxury time and improving their living condition (Mekonen, 2010). The point is not that women should place themselves above the need of their family, or that their need and wants are similar to those of urban women with higher income. Rural women spend their time in productive activities, which directly benefits their families and society in economic term. There should be some terms (measurable means) of remunerating their productive services and of providing incentives for them to produce efficiently and use their energies meaningfully (Mokonen, 2010). Although there is an overall agreement on the notion that men and women experience poverty differently, linking gender and poverty is a complex matter that has increasingly become the focus of analysis.

The growing literature on poverty has helped to broaden the definition of poverty and generated greater recognition on the multi-dimensionality of poverty. It called for better understanding of poverty not only in terms of income and expenditure, but in the broader sense of human poverty-a state of deprivation in capabilities (education, health, nutrition, etc) (Cagatay,2008). Experts (Quisumbing et al., 2010) argue that the household income/ expenditure based measures, while they are important and provide comparative analysis of incidences of poverty between male headed and female headed households, they do not show the level of poverty experienced by women and men within the households. The gender dimension of poverty emerge more clearly through approaches of social indicators and those that capture the intra-Household processes underlying resource allocation (DAI, 2005). The challenge of measurements methodology aside, there is ample empirical evidence that establishes the linkage between gender inequality and poverty.

2.5. Women's Access to financial services

In sub- Sahara Africa about 84% of women were employed in the informal business sectors. Rural women are usually employed in the informal sector that provide very low income (UNDP, 2006) when considered the time wasted, efforts and labor utilization. The income gained from such informal employment is insignificant and unbalanced. Women who were involved in the informal employment sector usually start business with little capital and little asset that is not sufficient to run their business. On the other hand, at rural area of developing countries in general and in Ethiopia in particular the micro credit support and micro-Enterprise has not expanded to reach most rural women. The number of banks that support rural women for credit support is limited. These conditions discourage rural women to engage in self- employment. Among informal employment in which rural women engaged is the domestic works (house hold activities). Since rural women are responsible for household management such as cooking, collection of fuel, feeding of large families and caring and supporting of children's, etc. they have no time to engage in other businesses.

The income earned and profit gained from informal employment of women were not only to support the family in the feeding and other consumption but also contributes for poverty reduction. Women engaged in the informal employment contribute three-Fourth (75%) of the household consumption (UNDP, 2006). Under Ethiopian condition women engaged in the informal employment not only contribute for household consumption but also to meet the medical cost, clothing, and etc, for the family. The income gained from these economic activities were used for household consumption and family support rather than re-investing it to expand their business. Similarly, being rural women, most are illiterate and have no proper skill for full employment opportunity (Linda, 2005). According to Linda (2005) men have more power to control on the income made by women and often decide to finance their own personal interest instead of the households. This is because; women have less power /right/ to make decision on the household income independently. Provisions of credit support and micro-finance facilities for rural women were one of the most important strategies for empowering rural women in the economic aspect. Credit and micro-finance support for rural women are not only for economic empowerment of rural women but also for poverty reduction and for enhancing of better living condition of poor rural women.

2.6. Soil and Water Conservation practices in Ethiopia

Prior to the 1974 revolution, soil degradation did not get policy attention it deserves (Wogayehu and Lars, 2008). The famines of 1973 and 1985 provided an impetus for conservation work through large increase in food aid mainly using imported grains and oil. Following these severe famines, the government launched an ambitious program of soil and water conservation supported by donor and non-governmental organizations (Hoben, 2006). However, this was not a long-term success and these structures had little long-term impacts in preventing soil erosion. Almost all the soil and water structures and practices were destroyed shortly after the construction in almost many place of the country. The project expected that the local people would bear all the costs of maintenance. Yet, farmers had few incentives to maintain structures or continue with practices (Pretty and Shah,

1996; Woldeamlak, 2003). Seldom were structures maintained and all often-impressive new structures and practices slowly disappeared leaving little evidence of intervention.

Because of the failure of the local people to maintain the conservation measures, the introduced conservation measures that were originally designed as a protection against erosion rather exacerbated the problem (Habtamu, 2006). During 1980s, the government of Ethiopia launched a massive program of soil and water conservation and rehabilitation. As Herweg, (1993) stated in his study after 1989 soil and water conservation practices have mainly been undertaken in a form of campaign and quite often farmers have not been involved in the planning process. It is after this period that national efforts for soil-water conservation expanded rapidly.

Farmers in the northern, central, and southern parts of Ethiopia construct stone terrace on their sloping lands to protect them from erosion and land sliding. In most cases, the terraces are not protected with vegetable cover. Between 1976and 1990, 71,000 ha of soil and stone bunds ,233,000 ha of hillside terraces for afforestation, 12,000 km of check dams in gullied lands, 390,000 ha of closed areas for natural regeneration 448,000 ha of land planted with different tree species, and 526,425 ha of bench terrace interventions were completed mainly through food-for-work (FFW) program incentives. The FFW and CFW programmers were fundamentally top-down, with little involvement of local beneficiaries. Moreover, the programs focused on promoting conservation practices on community lands with minimal consideration given to individual farms. During this period, it was normal to follow any technical guideline developed and tested elsewhere without integrating it into the local socio-economical or environmental conditions.

Despite the rich indigenous knowledge of soil-water conservation throughout Ethiopia, the FFW-based soil and water conservation programmers were aimed at promoting new or improved soil-water conservation practices, which were based on little prior research and scientific base. Nevertheless, the achievements fell far below expectations, the country still loses a tremendous amount of fertile topsoil, and the threat of land degradation is alarmingly broadening (Gebremedhin, 2004). The difficulties encountered by the programmers during their initial stage of implementation led to the realization of need for beneficiary's participation in the planning and implementation of conservation programmers and projects, including the adaptation of conservation technologies to local conditions. AS a result, several participatory approaches were used for soil and water conservation (Addisu, 2011).

However, they expect of women farmers participation and the impact of these approaches on adoption of conservation practices were limited. A real involvement and participation of women farmers could not be realized the lack of prior research and scientific base of soil and water conservation programmers was also manifested by the little consideration given to conservation needs at the waters shad level. The physical appropriate special units for research on resource conservation issue are watersheds. The watersheds context provide the natural framework for investigation into the complex and reciprocal linkage among land use, soil and water resource; the inter dependence of people in their resources (Girma, 2001).

2.7. Effect of Soil and Water Conservation on Improving Crop Yield

The soil system remains a major determinant of crop yields when compared with plant genetic potential and weather because of the environment it provides for root growth (Olson *et al*., 2011). Thus, increasing and sustaining agricultural production should aim not only at sustaining higher levels of useful biological productivity but also at ensuring that the system is stable enough to maintain soil quality (Dudal, 2013). The key soil characteristics that affect agricultural yield sustainability are nutrient content, water holding capacity**,** organic matter **c**ontent, soil reaction, topsoil depth, salinity and soil biomass (Norton *et al*., 2012).

The relationship between soil erosion and soil productivity is complex and involves various factors which often depend on each other (Ludi, 2011). The effect of erosion on soil properties and hence crop productivity varies with location and management (Olson *et al*., 2011). In general, the loss of organic matter and minerals containing plant nutrients influence crop production. Erosion can also have a direct effect on production through the formation of rills and the subsequent washing out of seeds or through accumulation of eroded materials on germinated crops (Ludi, 2011). However, total soil loss is the single most important factor in explaining productivity changes (Ellis-Jones and Tengberg, 2010).

Productivity and SWC objectives are highly complementary because conservation of soil, water and natural vegetation leads to higher productivity of crops and livestock and thus the improvement of livelihoods (Kerr, 2012). Ellis-Jones and Tengberg (2010) assumed that without any SWC, crop yields will decline approximately by 1.5% year, being equivalent to a 30% decline over 20 years. The SWC structures not only act as a partial barrier to water-induced erosion but also form a total barrier to tillage erosion (Gebrernichael *et al*., 2012).

The physical SWC measures are considered as investment for which significant benefits are expected later and for years to come. However, practical models and empirical equations are less available to estimate effects of SWC structures, as they touch many parameters and create complex interactions. In addition, the off-

site role is less feasible to estimate and commonly ignored even in existing estimations and computations.

The short-term effects of bunds or terraces are the reduction of slope length and the creation of small retention basins for runoff and sediment and to reduce the quantity and eroding capacity of the overland flow (Nyssen *et al*., 2007). The medium and long-term effects of bunds include the reduction in slope angle by forming bench terraces (Alemayehu *et al*., 2006). In the long term, slow-forming terraces induced by bunds are often associated with a high spatial variability in soil fertility and crop response which is due to water and tillage erosion in between structures (Nyssen *et al*., 2007).

Ludi (2011) calculated soil loss depth in land with conservation structures and in non-terraced fields in experimental sites in Maybar andit Tid and Anjeni, Ethiopia. The results showed that soil loss from non-terraced cropland was higher. Other comparisons made between local cultivation and SWC structures at experimental sites in Ethiopia showed that soil loss is reduced significantly for the majority of SWC treatments, such as level bunds, but production rarely increased as a result of SWC in three to five years of age (Herweg and Ludi, 2011). The study by Bekele (2005) in the Hunde-Lafto area in eastern Ethiopia showed that SWC resulted in higher yields in unfavorable rainfall condition.

2.8. Female headed household participation in Teff Production and Utilization Process

The gender pattern of labor utilization is often referred to as the triple roles of gender. These are productive, reproductive and community management roles. In Ethiopian agriculture the role of women is very high especially in post harvest production system though it is not well quantified. The main source of labor is the family, which includes the wife and the children. The average family size in most places, especially in the highlands of Ethiopia where Teff is the main crop, is more than six people per household (Alemayehu Refera, 2001). It is noted that over 50-80 percent of the labor force required in crop, livestock production as well as in environmental rehabilitation is provided by female farmers in rural Ethiopia and elsewhere in the world (UNECA/WARDIS, 2007 as cited by Wundensh, 2009).

In the Ethiopian context, females are actively involved in the following farming activities, though the degree of their involvement might vary due to various reasons such as traditional/religious influence and type of farming system Seed Cleaning. Land preparation called Gulgualo, Sowing/planting, Weeding and applying, manure, Hoeing, Scaring of birds, Harvesting, Preparation of threshing fields (includes provision of dung, water and smearing the ground), Collection and pilling, Winnowing, Storing of produce and care of stored seeds, Food preparation for labor assistance or hired labourers in the field Most of the post harvest operations such as cleaning, milling or taking to the milling plants, preparation and baking of food for the family(Winrock, 2011)..

The role of Ethiopian women in Teff production system alone is not quantified enough. Some attempts were done to quantify their role in either crop production or livestock husbandry in some regions of Ethiopia. In Teff production activities, males do most of the field activities from ploughing till threshing, storage and transport. Women have important role mostly in weeding; harvesting or collecting of harvested plants, preparation of threshing ground, transportation and selling of the seeds and the straw in the cities and towns. The rest of the activities such as milling of Teff and preparation of food in different forms including the sausages such as Wot are exclusively left to the women. However, males and females participate according to their division of labour in some organizations, hotels, teaching institutions, hospitals, military feeding centers, drought affected areas feeding centers, etc. mostly in the post harvest operations(Felipe, 2012).

A study was made in predominantly Teff growing areas of Ada, Lume and Gimbichu districts of the central highlands of Ethiopia in 1997. In this study, it was observed that unlike some African countries where the gender division of family labour by agricultural production is becoming less distinct, no woman farmer is found to have been engaged in land preparation and planting. The role of women in Teff production was observed during weeding, harvesting, transporting, threshing and storage. Preparation of Teff for food is accepted in the study district as a woman's job (Gebrernichael *et al*., 2012)..

However, Expanding production of Teff is often hindered by different factors such as lack of required labour, land shortage, inappropriate management, input supply, and credit and extension services. Moreover, labor affects land management for Teff production and gender is an important factor in affecting land management and outcomes from Teff production. Pender and Gebremedhin (2007) reported that in Tigray, female headed households use significantly less labor and draught power, probably because of labor constraints and a cultural taboo against women plowing. Hence, female headed household obtain substantially lower crop yields and incomes than male headed households. Moreover, Suleiman (2004) said that female-headed households have less access to share and rented in land than male headed households. Besides, MHHs cultivate better quality of land than female headed household.

2.9. Conceptual Framework of the Study

The factors influencing female headed household participation in teff production varies due to personal, socio-economic, and situational factors. Based on the literature review that deal with personal characteristics of female

headed household farmers which affect toward participation of teff production such as; age, marital status, level of education, and family size were assumed important and are considered in this study. According to Kacharo, (2007) variables considered as socio-economic characteristics of female headed household farmers were income of the household and size of land holding. Lastly, social participation, access to credit and extension participation were conceptualized and identified by considering as they are important situational factors. Therefore, in this study the researcher tried to identify the influence of independent variables on the dependent variable and also tried to identify the constraints of female headed household participation in teff production (see figure 1).

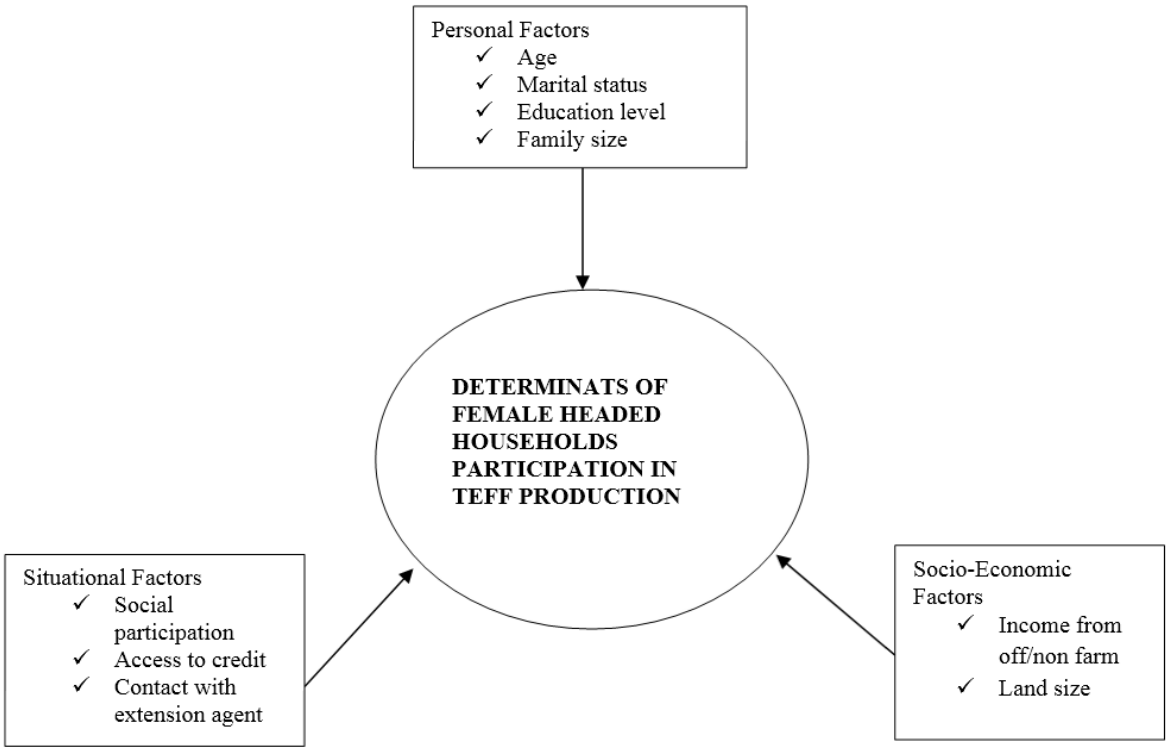


Figure 1; Conceptual framework

3. RESEARCH METHODS

3.1. Location of the Study Area

Abeshege woreda is one of the rural woredas of SNNP located about 155km south of Adiss Abeba along the Adiss Abeba to Jimma asphalt highway and 233 km south west of Hawassa city (Regional capital of SNNP). The woreda is bounded in the north, south and west by Oromia regional state and in the east by Cheha woreda and Kebena woreda. The absolute location of the study area extends 8^0 27'30'' N to 38^0 10' 50'' E (figure 2).

3.2. Description of the Bio-physical and Socio-economic condition

3.2.1. Bio-Physical Features

Geomorphology, Geology and Drainage; The different relief features of the study area are the result of the geological episodes of the tertiary period and the subsequent geomorphic processes. The relief of the study area is generally characterized by highly divided rough highlands in northern and central part and rising and falling lowlands in southern part.

Geology of the study area is characterized by the trap series of tertiary periods, similar to much of the central Ethiopian highlands (Mohr, 1971). According to Dereje et al. (2002) the area is covered by Oligocene rhyolite and very thick ignimbrite units encompassing predominantly of alkaline basalt with numerous inter bedded flow of trachyte. The granite, gneisses and basalt rock types exist in the area forming part of the basement complex and most of the soils are basaltic parent material.

The nature & orientation of the relief features resulted in the formation of numerous drainage systems namely; Wabe and Gibe. The Wabe drainage system consists of the drained basin of Wabe River above its confluence with the Gibe River. The Wabe River flows from north to Southwest direction and covering total length of 49 km and join Gibe River; its tributaries effectively drain many catchment area of the Abeshege woreda.

Climate, Vegetation and Soil Resource; The climate of Abehsege woreda ranges from cool to warm. The annual average temperature of the area is 21.25^{o}c. The annual average Rainfall is range from 801mm up to

1400mm within the last 10 years. The area receives a bimodal rainfall where the small rains are between March and April while the main rains occur mainly from July to September. During the main rains, all crops grown in the area are planted including maize, teff, wheat, pepper, haricot bean, sorghum and millet. Agro ecologically, The Woreda consists of 75% "kola" and 25% "Woina Degas" having two major seasons, namely Belg and Meher and irrigation is practiced in some areas i.e. Derelafto and Kulito. Wheat, nug and chickpea are major crops cultivated in meher season. On the other hand maize, Teff and sorghum are cultivated in Beleg season. The altitude of the woreda ranges from1001 to 2000 meter above sea level, but most of the woreda is found at about 1800 meter above sea level. Except for few hills, the woreda has agriculturally suitable land in terms of topography.

The extent of the natural vegetation in the area has been much reduced. Cutting for fuel wood and arable land expansion is disturbing most of the woodland. The major trees of the area are Bahir zaf, AbeshaTid, YeferenjTid, Weira, Warka, Agam, Kulkual(Beles), Wanza, Endod, Kinchib.

The soil of the woreda is relatively fertile and during good rains farmers can harvest good yield even without fertilizer application. However, Soil erosion in the Wabe watershed is severe and is the result of the mountainous and hilly topography, a low degree of vegetation cover and gully erosion. Soil erosion has made cultivation infeasible in several parts of watershed. This together with increasing population pressure has forced farmers to constantly cultivate new and more marginal areas. The deforestation and other devegetization process resulted significant soil erosion problems, with mudslides occurring on the area (AWARDO, 2015). The dominant soil type of the study area is fine to medium textured, sandy loam underlie with ancient Precambrian basement rocks in the plains and calcareous soil at the hills.

3.2.2. Socio-Economic Condition

Population; In Abeshege woreda, there are 24 rural kebeles and 2 urban dwellers associations with a total of 18,471 household heads (AWARDO, 2015) of which about 28% are female headed households. Hence, it is male dominating. The Woreda has the total population of about 85,852, of which 33,633 are females in 2009. Young, economically active and old age populations accounted for 41.7%, 49.2% and 9.1%, respectively. An average family size for rural area was 4.76 persons (CSA, 2010).

Ethnicity and Religion; There are about 6 major ethnic groups in the woreda(Guragea, Kebena, Oromo, Amhara, Kenbata and Hadya) but Gurage ethnic groups are the dominant groups constituting about 85 percent of the total population(AWFPO, 2013). Abeshege wereda consists orthodox, protestant and Muslim religious people, which are accounts 50%, 43 % and 7% of the total population respectively (AWFPO, 2013).

Land use, Agriculture and other economic activities; According to the AWFPO (2015), the total areal size of the District is estimated to be 147,829 hectares. The average land holding per household is estimated to be 1 hectare (0.75 hectare for crop production and 0.25 hectare for grazing). The land uses are both private (farming) and communal (grazing land) land holdings which can be identified through land use patterns. Cultivated and grazing lands are the major land use types in the area which accounts for 21.6 and 8.2%, respectively. Among the total area, the largest proportion (45%) of the land is currently unutilized and the remaining (25.2%) is covered by shrub/bush and natural and plantation forests.

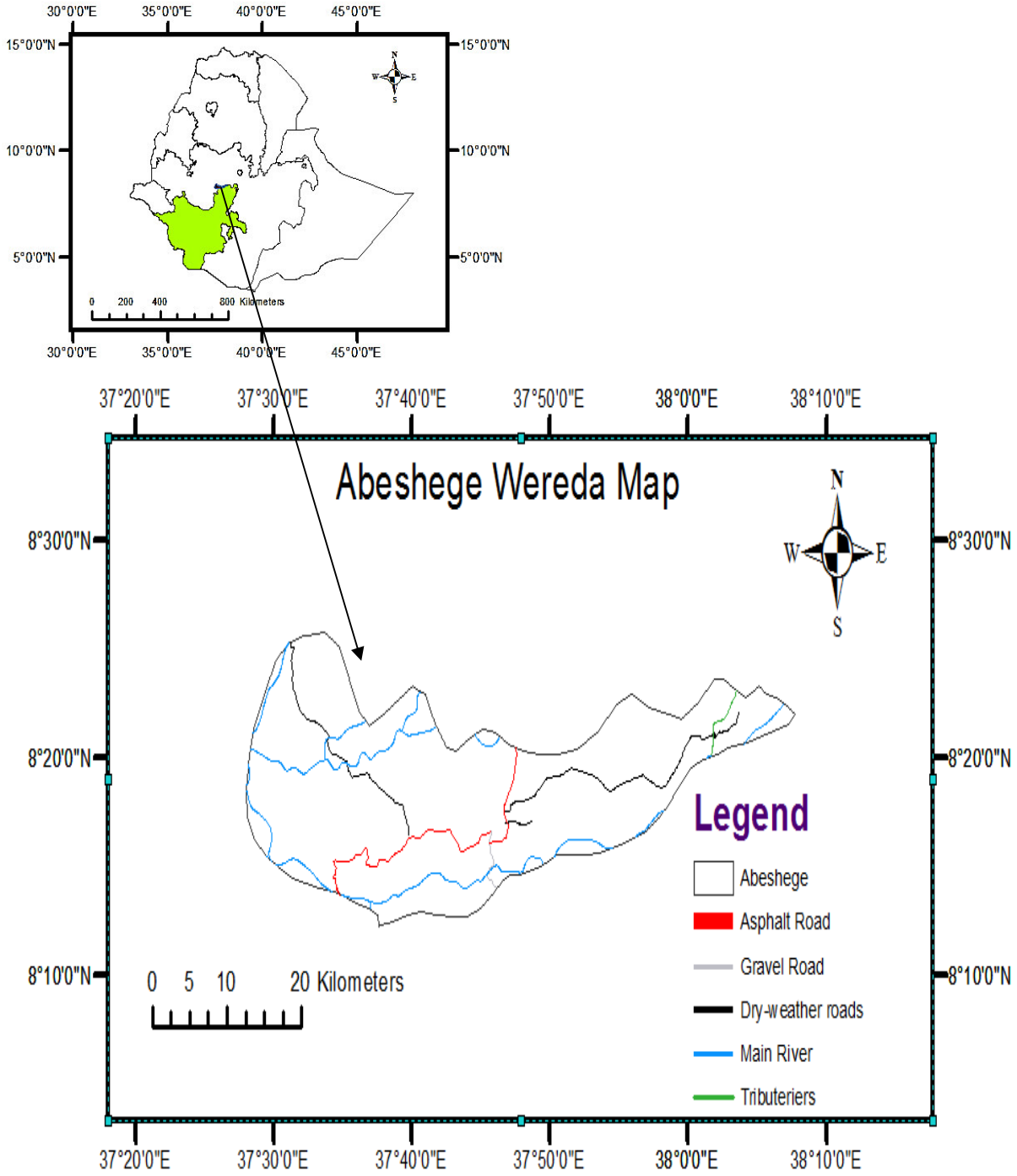
Agriculture is the predominant economic sector which is over 95% of the population engaged in this sector (AWFPO, 2015). The farming system is mixed both livestock and crop production which was characterized by subsistence methods. The overall farming system was strongly oriented towards grain production to sustain farmers' livelihoods and it practiced using oxen and horses for land ploughing and grains threshing. Crop residues and intensive grazing were major livestock feed resources in the area.

The Crop, *enset*, pepper, vegetable and fruits, and livestock system is the main farming system in Abehsege *Woreda*. In the study area crop farming system Teff is the dominant crop, followed by maize, chickpea. Livestock farming system in which cattle and goat rearing are the main activities. Besides, different types of vegetables (cabbage, tomoto, potato and pepper) and fruits (mango, papaya, orange and lemon) are also being introduced in the area. The average household land holding of the woreda is about 0.95ha. The important cash crops are Teff, soybeans and pepper (AWFPO, 2015).

3.3. Research Design

In order to achieve the main objective of this research, cross-sectional or social survey design which incorporates a mixed or combined quantitative and qualitative research methodology were applied. The purpose of using a mixed methods is to gather data that could not be obtained by adopting a single methodology and for triangulation so that the findings with a single approach can be substantiated with others. To address the level of female headed household's participation in teff production, SWC practices on teff producing farm plots and determinants of their participation on teff production, survey with semi-structured interview and detailed scheduled interview were employed. This method was selected on the assumption that it helps to gather enough information and data on the topic investigated under study. According to Best and Kahn (2005), survey method is more effective to investigate the phenomena in assessing the performance in the rural setting.

In addition, it is used to obtain relevant and precise information regarding the study subject. A survey design provides a quantitative or numeric description of trends, attitudes, or opinions of a population by studying a sample of that population. Thus the survey research methods were applied to express the current phenomenon of a situation and give prediction depending on the findings of the research. In addition, surveys gather data at a particular point in time with the intention of describing the nature of existing conditions, or identifying standards against which existing conditions can be compared, or determining the relationships that exist between specific events (Louis et al., 2005).



Source**;** (AWFPO, 2015)
Figure 2; Map of the Study Area

3.4. Data Types and Data Sources

Although the study principally employed primary data, both the primary and secondary data were considered for this study. The primary data was collected through household surveys which were administered through

questionnaires, key informant interviews and focus group discussion with rural women, men, women affair office and other concerned authorities. For this purpose, questionnaires were developed and provided to sample respondents. Most of the items were close-ended and some open-ended questions were also included due to accomplish qualitative information on the attitudes, beliefs and practices of the people in general and female headed in particular. The secondary data from both published and unpublished documents of governmental and non-governmental organizations were found out to supplement and strengthen the primary data. Historical, cultural, socio-economic backgrounds of the area were obtained by using secondary materials i.e. CSA, MoANR, AWARDO, and AWFPO.

3.5. Sampling Techniques and Sample Size

3.5.1. Sampling Techniques

The study was conducted at Abeshege Woreda, which selected purposively, of Gurage zone, Southern Nation Nationality People's Region. This study was applied both probability (simple random) and non-probability (purposive) sampling techniques. The study was carried out in 6 Rural Kebele Administrations. The Rural Kebele Administration was selected from the 26 Rural Kebele Administrations of the Woreda purposively; based upon their potential production of Teff and female headed house hold participation in the Teff production activities and Soil and Water Conservation on teff farm plots. Therefore, Six Rural kebeles Administration namely Lache, Tatesa, Tachegnaw Geraba, Dire Lafto, Tawela and Layegnaw Geraba, were selected.

Precision of facts is greater from a census. Nevertheless, due to financial and time constraints, absolute coverage of the entire community is not practical for a student research. Sampling allows the researcher to study a relatively small number of units representing the whole population (Sarantakos, 1998).

Finally, female headed household participants who have been participated for five and more than five subsequent years were indentified from the list they belong in each sampled Rural Kebeles. Hence, 389 female headed household participants who have lasted five years and more in teff production were identified. Then 164 participants and 70 non participants were drawn using systematic random sampling technique based on probability proportional to sample size. Then, a total of 234 sample female headed households were selected for household survey/scheduled interview (Table 1).

Table 1; Distribution of sample Female headed households and sample rural kebeles.

Sample RKAs	Female households Total	Participant female headed households		Non-participant female headed households		Total sample
		Total	Sample	Total	Sample	
Dire lafto	101	70	31	32	13	42
Tachegnaw Geraba	72	51	21	21	9	30
Laygnaw Geraba	111	75	32	36	15	46
Tatesa	94	65	27	29	11	39
Lache	85	58	24	26	10	35
Tawela	101	70	29	31	12	42

Source: Own computation result, 2016

3.5.2. Sample Size Determination

It is obvious that taking all population in research is very difficult because of time and resource constraints especially if the research is conducted on the area like participation of women. It becomes more difficult to take the whole population; as a result the researcher was used sample for the study. Therefore, the sample size for collecting quantitative and qualitative data for this research was determined by using (yemane, 1977) formula. The study used the following formula to calculate sample size;

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

Where;

n =designates the sample size the research uses;
N= designates total number of female headed households in six kebeles
e =designates maximum variability or margin for error 5 %(0.05);
1=designates the probability of the event occurring.

Therefore;

$$n = \frac{N}{1+N(e)^2} = \frac{564}{1+564(0.05)^2} = 234$$

3.6. Data Collection Procedures

To fulfill the objectives of the study, both quantitative and qualitative data were gathered from primary and secondary sources. Quantitative data were generated through female headed household survey by employing structured interviews from a total of 234 respondents. For the household survey, enumerators who are familiar with the study area were selected and trained on the objectives, methods of data collection and interviewing techniques. The questionnaires for the household survey were pre-tested before conducting the actual interviews. The qualitative data were gathered through focus group discussion, key informant's interviews, informal discussions with farmers, and personal observations.

Household Survey

Structured questionnaires were developed for the participants and non-participant female headed household survey based on the available information from development agents, experience and knowledge of the researcher and administered face to face to the household head.

The questionnaires were on demographic and socio- economic conditions, level of female headed household's participation in teff production, Soil and Water Conservation practices on teff farm plots and determinants of female headed household's participation in teff production etc. Moreover, the household survey questionnaire was also intended to capture information on the female headed household trends towards the production of teff.

Focus Group Discussion (FGD)

The focus group discussions were conducted with different groups comprising of six members. The FGDs were held with representatives of the selected villages in each kebele. In this regard, six focus group discussions were applied with selected participant and non participant female headed household around the study area. The overall aims of focus group discussion in each RKAs were to get full picture about the determinates, level of participation of female headed household in teff production and Soil and Water Conservation practices on teff producing farm plots that practiced by local communities.

Key Informant Interview (KII)

The key informant interviews were selected from each of the selected kebeles. Accordingly, two key informants were selected from each kebeles based on how long they lived in the village; the experience and position in their local village with the consultation of development agents and a total of 12 key informants were selected. The interviews were carried out with key informant interviewees DAs, RKAs leader and professionals on the subject matter to get about the overall information on the study (Appendix I).

3.7. Method of Data Analysis

Descriptive statistics such as mean, standard deviation, range, frequency and percentage were applied to describe the socio-demographic and socio-economic situation of the households. Moreover, to compare and test the mean difference between participants and non-participants female headed household in relation to a range of selected characteristics, test statistic methods such as t- test and $\chi 2$ (Chi square) test were employed. SPSS version 20 and STATA-12 were the statistical tools employed to analyze the quantitative data. The results of analysis data were categorized, summarized, discussed and presented in relevant formats (Tables and graphs). The qualitative data was partly analyzed on spot during data collection to fill the gaps in the quantitative data. Any idea that cannot be captured through quantitative analysis was analyzed qualitatively based on the ideas from the key interview and focus group discussion.

Additionally, Inferential Statistics: Probit model was used to analyze the relationship between selected socio-economic, situational and personal characteristics of the respondent and their participation in teff production. Female headed household's participation in teff production was assigned a discrete choice variable (yes or no) to indicate whether she participates in teff production or not.

Model specification

According to Oni, Oladele and Oyewole (2005), the probit model is expressed as: $Y = Bo + BiXi + ei$

Where Y is dichotomous dependent variable which can be explained as;

Y = 1, if Female headed household's participate,

Y = 0, if Female headed household's did not participate,

Bo = the intercept

Bi = regression coefficients that explain the probability of participation by female headed household farmers,

Xi= Vectors of parameters to be estimated

ei = the error term.

Given teff production as an occupational technology, the socio-economic and demographic characteristics of the

Female headed household's farmers may influence the level of their participation in teff production (Damisa *et al.,* 2007).

Xi = Vectors of parameters to be estimated, i.e independent variables (i =1, 2, 3…11) where: X1= Age (years), X2= Marital status, X3=Level of education (Years of formal education) , X4= Family Size (Actual number), X5= Land size, X6=Average annual income, X7= Social participation (Dummy; Yes =1, No = 0) , X8= DAs' contact (Dummy; Yes =1, No = 0), X9= Access to credit facilities(Dummy; Yes =1, No = 0).

3.8. Variables and their Definitions

3.8.1. Dependent variable

The dependant variable of the study is female headed household's participation in teff production. The variable is operationalzed as participation of female headed households on teff production practices for the last consecutive five years.

3.8.2. Independent variables

For this study, the following independent variables were hypothesized to influence the dependent variable. Out of these variables some were continuous and others were discrete. Independent variables include the personal characteristics, socio-economic and situational factors of rural Female headed household's that may influence the dependant variables. The selection of independent variables is based on the past research and published literature related to the study.

Age: is measured in terms of number of years of age of the respondents. Since age is a factor that normally makes the rural women confined more to household chores, it was assumed that age would have a negative relationship with female headed households participation in teff production.

Marital status (MA_STAT): indicates whether respondents were married, unmarried, single, or widowed. Since married women were having more roles to be performed, positive relationships were anticipated between marital status and participation in teff production of farm Female headed household's (Kacharo, 2007).

Education level (ED_LEVE): Education refers to the level of formal and non-formal education and measured in terms of ability to read and write and enrolment in primary, secondary schools or above. Educational level as a variable helping exposure to information, but also positively affects use of information to participate in teff production (Habtemariam, 2004).

Income (AVANN_INCM): income is operationally defined as the value of the products of the household after home consumption and income obtained from off-farm and non-farm activities that are expressed in birr per year. The income level were had a positive relationship with the dependant variable since normally it becomes a facilitating factor (Mulugeta, 2010).

Size of land holding (LAND_SIZE): This refers to the area (local unit 'Timad') of cultivated land possessed by the respondents or their families. It was assumed that larger the farm size, the Female headed household's farmer has, better access to use combination of technological packages and participate well. Therefore, it was hypothesized that land size has a positive relationship with the dependant variable (Habtemariam, 2004).

Family size (TFASIZE): is the size of the family of the respondent measured in terms of total number of members in the family including aged persons and children. Higher number of family members leads to decision to participate in teff production. Therefore, family size contributes to the variation participation in teff production. In this study, family sizes have positive relation to Female headed household's participation in teff production (Melaku, 2012).

Access to credit (ACCS_CREDIT): Access to credit can relax the financial constraints of women farmers. It indicates whether respondents have access to credit or not. In this study that male headed household farmers have better access to credit than Female headed household'. Therefore, access to credit has impact on level of utilization of recommended technological packages and this in turn will expose them to participate in teff production. Therefore, the variable was assumed to have a positive relationship with the dependant variable (Mulugeta, 2010).

Extension participation(DA_CONT): This represents Female headed household's farmers' frequency of contact with development agents and frequency of participation in extension planning, training, farmers' field day, on-farm trial and demonstration regarding to crop production in general and teff production in particular. It has a positive relationship with the Female headed household's participation in output (Rahemet, 2007).

SOCIAL PARTICIPATION (SOCPAR): membership and leadership in community organization assumes that farmers who have some position in rural kebele and different cooperatives were more likely to be aware of new practices as they are easily exposed to information (Freeman *et al,* 1996; Chilot *et al,* 1996; van Den Ban and Hawkins, 1996; Asfew *et al,* 1997; Habtemariam, 2004). It is, therefore, hypothesized that those female headed households farmers who participated in some social organizational as member or leader are more likely to participate on teff production.

Table 2; Summary of variables used in the study and expected sign

Variable acronym	Description	Expected sign
AGE (X1)	Continuous ; It measures age of the household head in years	-
MA_STAT (X2)	Dummy variable, which takes a value of 1 = if the household is married and 0 = if not.	+
ED_LEVE (X3)	Dummy; Education level of head of the female household =1, if household attended formal schooling ,otherwise =0	+
TFASIZE (X4)	Continuous ;The number of family per/household	+
LAND_SIZE (X5)	Continuous ; the total acres of land owned by the respondents	+
AVann_INCM(X6)	Continuous; Average annual income of female households.	+/-
SOCPAR (X7)	Dummy; social participation of female house hold	+
DA_cont(X8)	Dummy; contact of FHH with DAs	+
ACCS_CRE DIT (X9)	Dummy; credit used to purchase improved inputs	+

4. RESULTS AND DISCUSSION

4.1. Demographic and Socio-Economic Information

Quantitative data was collected and analyzed on demographic and social characteristics of survey respondents. Respondents were asked about their age, sex, marital status, and family size, religion, educational background, and family annual income, number of farm plots, possession of land, occupation and period of stay in the village.

4.1.1. Demographic Characteristics of Survey Respondents

Marital status and religion of the household: With regards to the marital status, from the total sample respondents, 2.2%, 46.3%, 47.2% and 4.3% were single, married, widowed and divorced, respectively. There was no significance difference between participant and non-participant female headed households in terms of marital status (Table 3). In terms of religion, from the total sample respondents, 57.6%, 41.8% and 0.9% were Orthodox Christian, Muslim and protestant respectively. About 57.8% of the participants were Orthodox Christians and the remaining 41.6% Muslims and 1.4% were protestant. The corresponding figures for non-participants were 57.1%, 41.4 and 0.6%, respectively. The Chi-square value of 0.4 was significant at 1% probability level of significance (Table 3). Thus, there was a significance difference between the two groups in term of the religion which might indicate that more Christian's households demanded to participate on teff production than Muslims households.

Educational status of sample households: The result revealed that 35.5% of the sample female household heads were illiterate, whereas 64.5% were literate. In participant sample, 27.3% and 72.7% of them were literate and illiterate, respectively whereas in non-participant 45.7% and 54.3% were literate and illiterate, respectively. There was significant difference between participants and non-participants in terms of their literacy level, the percentage of literate in participant group was more than that in the non-participant group which might indicate that literate Female headed household's demanded more to participate on teff production than illiterate households (Table 3).

In Abeshege Woreda, women constitute nearly half of the total population and play a vital role in the woreda economy. They need to be considered equal partners' in the development process. Not only do education and training go a long way in achieving this goal, but also in raising the status of women, enable development of their potential and help them to live as independent and equal partners. According to Kiasen (2009), gender inequalities in education have direct impact on growth and through distorting incentives and indirect impact on investment and population growth. Similarly, he stated that gender bias in employment is associated with low growth in Sub-Saharan Africa, reducing growth by 0.3%. Furthermore, it is estimated that countries that are off-track in meeting the gender parity in primary and secondary enrolments might lose 0.1-0.3 percentage point in annual economic growth between 1995 and 2005 and an average of 0.4 percentage points between 2005 and 2015 (Abu Ghaida, et al., 2012).

Table 3; Distribution of sample female headed households by sex, marital status, religion and literacy level

Characteristics		Participant (N=164)		Non-participant (N=70)		X^2 -Value	Total sample (N=234)	
		N	**%**	**N**	**%**		N	%
Marital Status	Single	5	3.1	3	5	21.1	8	2.2
	Married	61	52.8	46	31.4		107	46.3
	Divorced	8	6.2	2	0		10	4.3
	Widowed	88	37.9	21	20.8		109	47.2
Religion								
	Orthodox	92	57.8	45	57.1	4.0***	137	57.6
	Muslim	71	41.6	19	41.4		96	41.6
	Protestant	1	1.4	1	0.6		2	0.9
Education Level	illiterate	55	27.3	25	54.3	24.8***	80	35.5
	can read and write	38	23	19	28.6		57	24.7
	primary school(1-4)	31	22.4	13	11.4		44	19.0
	Primary school(grade 5-8)	35	24.2	8	5.7		43	18.6
	secondary school(9-10)	3	2.5	1	0		4	1.7
	preparatory(11-12)	4	0.6	-	0		4	0.4

Source: Own computation result, 2016

Age of the household heads: Age of the total sample respondents ranged from 25 to 76 years with mean of 45.94 years and standard deviation of 10.19. The average age of the participants was 46.88 years, while that of non-participants was 45.84 years. The result showed that the mean difference between participant and non-participant with regard to age was statistically insignificant (Table 4).

Family size of sample households: Family size of the total sample respondents ranged from 3 to 14 persons, with an average family size of 7.44 and a standard deviation of 2.49. The average family size in the sample was higher than the average family size of the district, zone, region and the national average family size of 6.02, 5.83, 5.61 and 5.32 persons, respectively (CSA, 2011). The average family size of the participant and non-participant households was 7.65 and 7.22, with standard deviations of 2.64 and 2.34, respectively. However, family size between the two groups was statistically insignificant (Table 4)

Table 4; Distribution of the sampled female headed households by age and family size

Characteristic	Participant (N=164)	Non-participant (N=70)	Difference in Means	t-value	Total sample (N=234)
	Mean (SD)	Mean (SD)	Mn ean(SD)		Mean (SD)
Age(years)	46.04 (9.22)	45.84 (11.143)	0.200(2.614)	0.12	45.94 (10.19)
Minimum	26	25			25
Maximum	65	76			76
Family size (number)	7.65 (2.64)	7.22 (2.34)	0.425(0.156)	1.08	7.44 (2.497)
Minimum	3	3			3
Maximum	14	13			14

Source: Own computation result, 2016

Period of stay in the village; Length of time stay in the study area most (95.7%) of respondents claimed to have lived for more than 10 years (table 5). Period of stay in specific area is important for acquiring local knowledge and the adaptation to the environment (Abu Ghaida, et al., 2012).

Table 5**;** Distribution of sampled respondents based on their personal characteristics

(N = 234) Attributes		Frequency	Percent (%)
period of stay in the village	1-5year	1	0.4
	6-10year	12	3.9
	above 10year	221	95.7
	Total	234	100

Source; Own field survey, 2016

4.1.2. Socio- economic characteristics of survey respondents

Land size and farm plots: Land is a primary source of livelihood for all rural households. It was assumed that larger the farm size, higher is the possibility to use a combination of technological packages and participate on teff production. In the study area, the size of the land owned differed from household to household. The land size of sample households also varied between 0.25 to 3 hectares with an average holding of 1.75 hectares and a standard deviation of 0.85. The average land size of participants was 1.75 hectares with a standard deviation of 0.84, while that of the non-participants was 0.6 with standard deviation of 0.25. Statistically, there was significant difference between participants and nonparticipants in terms of land size (Table 6).

The findings were in line with national reports indicating the small land ownership in the rural areas. With the uncontrolled growth in population and the ensuing fragmentation of land, land holding size by farmers is very small. Focus group discussion and interviews with official confirmed the above reality. According to them most women in rural area by social and cultural beliefs suffer from discriminatory practices that prevent them from accessing land in the same way and extent as men either from government bodies or from the parents. An average of two plots per household was found. Besides, plots controlled by female households have been distinguished within one household since most households held two Teff production plots. The average farm plot of participants was 2.1 with a standard deviation of 0.75, while that of the non-participants was 1.1 with standard deviation of 0.4. Statistically, there was significant difference between participants and nonparticipants in terms of farm plots (Table 6).

Livestock holding: Next To land, livestock is the most important asset for rural households in the study area. Based on Storck *et al*. (1991) standard conversion factors, the livestock population number was converted into Tropical Livestock Unit (TLU), so as to facilitate comparison between the two groups. On the average, a sample household had 6.164 TLU with standard deviation of 3.196 before five years (2012) and in survey year (2016) the average holding of livestock became 7.157 TLU. Participants owned on average 5.589 and 7.206 TLU in 2012 and 2016, respectively whereas non-participants owned on average 6.739 and 7.108 TLU, respectively. There was significant difference between the two groups in terms of change in livestock holding for the years 2012-2016 which was 1.617 and 0.369 TLU for participants and non-participants, respectively. The change was significant at 1% probability level which might indicate that due to the impact of teff production, participants owned more livestock during 20012-2016 than non-participants (Table 6).

Table 6; Distribution of sample households by Land size, Farm plot and Livestock holding

Characteristics	Participant (N=164)	Non-participant (N=70)	Difference in means	t-value	Total sample (N=234)
	Mean(SD)	Mean(SD)	Mean(SD)		Mean(SD)
Average land size	1.75 (0.836)	0.625(0.253)	1.125(0.211)	1.44***	1.75 (0.847)
Minimum	0.5	0.25			0.25
Maximum	3	1			2
Average farm plots	2.112(0.75)	1.1(0.374)	1.01(0.376)	1.11**	1.76(0.462)
Minimum	1	0			1
Maximum	4	2			2.2
Total average livestock holding 2012	5.589 (2.695)	6.739 (3.553)	1.150(0.442)	2.31**	6.164 (3.196)
Minimum	0	0.61			0
Maximum	12.9	18.52			18
livestock holding 2016	7.206 (2.674)	7.108 (2.893)	0.098(0.194)	0.22	7.157 (2.777)
Minimum	0.99	0.46			0.46
Maximum	14.20	18.52			18.52
Chang of total livestock holding 2012-2016	1.617 (2.388)	0.369 (2.459)	1.248(0.383)	3.26***	0.993 (2.496)

Source; own field survey, 2016

Households' income and expenditure in monetary value: Value of total produced crops, sale of live animals and animal products, and non/off-farm income were used to calculate the total annual income of the sample

households. The average income earned from crops, livestock and livestock product in 2015/16 production year was birr 29,737. Whereas the average income from non-farm sources was birr 2,087 and the overall average annual income of the sample household was birr 31,824 (Table 7). On average, the total annual income of participants was birr 33,818 while that of non-participants was birr 29,830. From this it can be observed that the total annual income of participants was greater than that of non-participants though it was statically insignificant.

Moreover, participants earned from non-farm income, on average birr 2,831 whereas non-participants, earned on average birr 1,343. The Mean difference between participants and non-participants with regard to non-farm income was found to be statistically significant at less than 1% probability level (Table 7). This implies that participants had earned more non-farm income than non-participants thereby improving their annual income. The major non-farm income generating activities practiced in the study area were livestock trading, retail of grains and vegetables, homemade drinks, carpentry, etc. On the other hand, the overall mean consumption expenditure of the sample household was birr 27,911 with standard deviation of 8,184 (Table 7). The mean consumption expenditure of participants and non-participants was birr 28,615 and 27,207 with standard deviation of 7,808 and 8,533, respectively. However, the mean difference of consumption expenditure for the two groups was statistically insignificant (Table 7).

Table 7; Distribution of the sample households by income and expenditure

Variable	Participant (N=164)		Non-participant (N=70)		t-value	Total sample (N=234)	
	Mean	SD	Mean	SD		Mean	SD
Farm income	30987	24957	28487	10195	1.24	29737	12821
Non/off-farm Income	2831	2426	1343	2109	3.31***	2087	2932
Total income	33818	15836	29830	10746	1.38	31824	13570
Food expenditure	15986	4165	14717	3765	2.02**	15351	4009
Non food Expenditure	12629	6329	12490	7200	0.13	12560	6757
Total expenditure	28615	7808	27207	8533	1.09	27911	8184

Source; own field survey, 2016

4.2. Female headed household participations in Teff production

4.2.1. Kinds and Level of female headed household participation in Teff Production

According to respondents female headed household participate in various activities at different levels to produce teff products. The study revealed that female headed household was involved in almost all activities in the teff production procedures except plowing, which is culturally considered as men's duty. They involved in the activities such as weeding and transporting, land preparation/gulgualo, harvesting, food preparation for worker, and threshing land preparation/awoduma than men. They did also participate on other activities together with other family members except plowing.

Female headed household were involved in almost all activities in the teff production (Table 8). However, participants in the Focus group discussion have indicated that female headed household was less efficient than male headed household, since female headed household lack labor due to their various responsibilities at farm, off farm and household chores. The data from the group discussions also revealed that female headed household lack access to different alternative markets to get better price, lack information and exposure, and are afraid to borrow larger amount of money on credit and a theft problem which is often manifested on women's farms influence their initiation to invest in the teff production. Consistent with this finding, Almaz (2006) also found that women's farming productivity and efficiency levels often remain low due to lack of knowledge and skill on production and marketing and cultural influences.

To calculate the average participation of female headed households in Teff production activities very high degree of participation were taken as reference to differentiate Female household members (Almaz, 2006). Table 9 below show that 81.9% of participate women have high degree level of decide to produce teff, 57.7% of women to purchasing agricultural inputs, 21.1% to sowing, 42.2% women to weeding, and 26.7% decide to sell

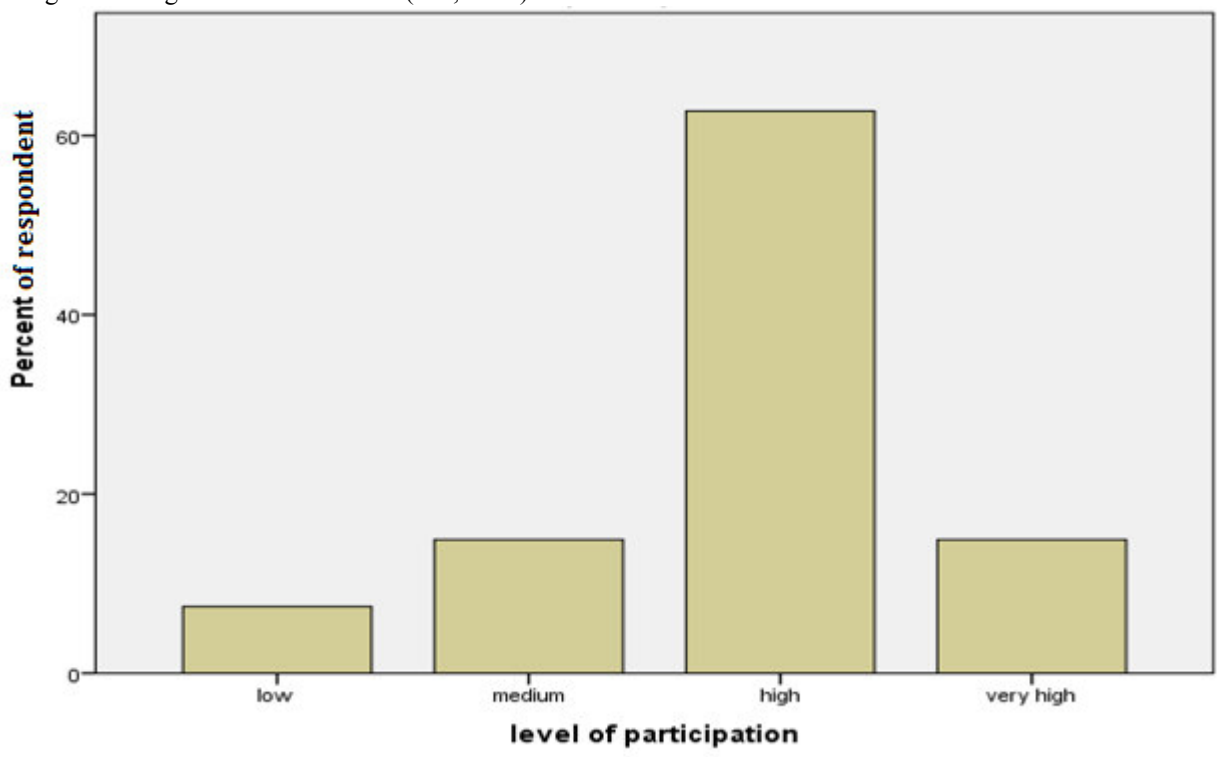
Table 8**;** Participation of Female household members in teff production in sample RKAs May, 2016

Teff production activities	Women		Boys		Girls		Hired labors(boys)	
	Frequency	%	Frequency	%	Frequency	%	Frequency	%
Decide what to produce	132	81.9	29	18.1	0	0	0	0
Purchasing AGR input	93	57.7	45	27	12	7.4	11	6.8
Land preparation /gulgalo	67	41.6	56	34.7	13	8.07	25	15.52
Ploughing	0	0	84	52.2	0	0	77	47.8
Sowing	34	21.1	66	40.9	23	14.4	38	23.6
Weeding	68	42.2	34	21.1	32	19.9	27	16.8
Harvesting	43	26.7	54	33.5	34	21.1	30	18.6
Collecting harvested teff	24	14.9	53	32.9	45	27.9	39	24.2
Transporting	34	21.1	42	26.1	34	21.1	51	31.7
Preparation of threshing ground /awoduma	98	60.9	12	7.4	32	19.9	19	11.8
Threshing	5	3.1	74	45.9	7	4.4	75	46.6
How much and how to sell	123	76.4	27	16.8	11	6.8	0	0

Source; Own field survey, 2016

4.2.2. Responses on the level of female headed household participation in Teff production activities

As shown on the bar chart (Figure 3) below majorities of (62.7%) the respondent were high in their level of participation in Teff production activities followed by 14.9% of respondents reported very high and 14.9% of the respondents medium and 7.5% were reported as low participation on teff production activity. Hence, this shows their participation was more on teff production activity to increase their annual incomes. Clearly stated that focus group discussion (FGD) and by key informant interviews, even if female headed household's participation is high in production activity they have low status and their works were not recognized. This study results was conformation with women in Ethiopia, like their fellow sisters in other developing countries women have been victims of gender based oppression and exploitation in all aspects of life. Moreover, their contribution has never been adequately recognized nor given economic value (UN, 2002)



Source; own field survey, 2016

Figure 3; level of female headed house hold participation in production of teff, 2016

4.2.3. Institutional Factors for Income Difference between participant and non-participant Female headed households

Extension contact: Extension service is provided by extension workers (development agents). Two to three development agents were assigned at each RKA to give frequent and continuous technical support and advice. The result of the study indicated that almost all (95.6%) respondents had extension contact and a few respondents (4.5%) did not have any contact with extension agents. An average number of extension contact days for participant and non-participant sample female headed households were 6.11 and 4.42 days per year, respectively. The mean difference was statistically significant at 1% level in terms of extension contact days between the two groups (Table 9).

Table 9; Sample female headed households by extension service

Characteristics	Participant (N=164)	Non-participant (N=70)	Difference in means	t-value	Total sample (N=234)
	Mean(SD)	Mean(SD)	Mean(SD)		Mean(SD)
Extension contact days per year	6.11 (2.187)	4.42 (2.293)	1.69 (0.125)	4.76***	5.31 (2.313)
Minimum	0	0			0
Maximum	10	9			10

Source; own field survey, 2016

Participant and non-participant respondents pointed out, female headed household had knowledge and skill gap in order to be efficient in the production of teff. Hence, female headed household need additional extension services support especially practical training on the areas of teff production, selection of better varieties and information on market access and profitability. Consistent with this finding CTA, (2002) noted that female headed household need information on a wide range of subjects, including teff production, processing, marketing and exchange of indigenous knowledge than men.

Credit: The availability of credit facilitates participation of on teff production activities. It is more essential to introduce farm technologies like fertilizer, which the farmers perceive the technology to be costly engage in the production of teff. The study revealed about 87% and 27% of participant and non-participant female headed respondents respectively had access to credit services. Among the participants who took loan, 78 % of participant female headed households and 47% of participant female headed households have repaid their loans (Table 10). Furthermore, the focus group discussant indicated that credit is an important factor to improve the productivity of teff. They also indicated that credit is essential to introduce technologies such as purchasing of teff production inputs, to buy oxen and donkey to transport the produce to the market and to hire labor.

Generally, credit empowers poor female headed household who do not have access to credit from individuals. Consistent with this result (Feder *et al*., 2005) found that credit programmes enable farmers to purchase inputs or acquire physical capital needed for technology adoption. In other words, the availability of credit facilitates technology adoption.

Table 10; participant and non participant female headed households' access to credit and loan repayment status **(%)**

Household Type	access to credit		Loan repayment status	
	YES	NO	not paid	repaid
Participant	87	13	22	78
Non-participant	27	73	53	47

Source; own field survey, 2016

4.3. Female headed household's participation in soil and water conservation practices on teff farm plots

4.3.1. Participant female headed household engagement soil and water conservation practices on teff producing farm plots

According to the FGDs and other sources of qualitative data female headed farmers in the study area are actively participating in physical and biological methods of soil and water conservation practices like diversion canal (making water ways), stone bunds, contour trench, soil bunds, hill side terraces, and area closure of grazing land. Further, more women were actively engaged in different types of SWC practices on their teff producing farming plots.

Table 11 below shows that of the sampled respondents were engaged soil bund, organic manure, agro forestry, crop rotation, water way, stone bund and contour plowing on their teff producing farm plots. Fallowing

is not highly practiced in the study area because most of the female headed households own small land holding. But it is practiced in the area where there is high land holding. Water ways were the dominant (50.3%) types of Soil and Water Conservation practices female headed household engaged on their teff producing farm plots.

Table 11; Kinds of female headed house hold engagement SWC practices on their Teff farm plots

Soil and water conservation practice	Frequency	Percent (%)
Soil bund	27	16.8
Organic manure	26	16.1
Agro forestry	3	1.9
Crop rotation	13	8.1
water ways	81	50.3
Stone bund	6	3.1
Contour plowing	8	3.7
Total	164	100.0

Source: Own Field Survey, 2016

4.3.2. Female headed household participation level in soil and water conservation practices on teff producing farm plots

All of the sampled female headed household farmers have been participating in soil and water conservation practices both on their farm plots and community SWC sites. According to AWORD, they participate 56 free workdays in a year community campaign in SWC works without any form of payment. According to FGDs female headed household decide to freely participate (without any payment) in the conservation works but in practice they are not motivated to work due to low level of livelihood and their emphasis on short term benefits. Table 12 below shows the level of female headed household participation in SWC practices on teff producing farm plots. Majority (41.6%) of the respondents replied that it is in very good level and no respondents replied the level of participation is very poor.

Table 12; female headed household response on the level of participation to engage SWC practices on teff producing farm plots.

Degree/level of participation	Frequency	Percent
very poor	0	0
Poor	6	3.7
Average	26	16.1
Good	62	38.5
very good	70	41.6
Total	**164**	**100.0**

Source: Own Field Survey, 2016

According to the FGDs all of them agreed that they play a significant role in managing and conserving soil and water in teff producing farm plots. Most of the group discussant agreed that the level of female headed household is at very good level. Only few of the group discussion member replied that the level of women participation is poor. They engage different method of soil and water conservation practices, both traditional and modern; to decrease soil erosion and to enhance soil fertility and they also play in managing and controlling the uses of resources. According to Gebremedhin, 2004 the level and genuine community participation on natural resource conservation depends on the extent of the tangible amount of social and economic benefits the community members receive as individuals and groups.

4.3.3. Factors Affecting female headed household participation in soil and water conservation practices on teff farm plot

There are many factors that affect female headed household Participation in soil and water conservation practices on teff farm plot. Some of the major factors are the level of education, farm size, age level, cultural value, size of the members, information level. The focus group discussion members said that ―education is the key to life. But we are illiterate. Thus at every moment of our life, we face various types of problems. At that time we could not solve it. If we were educated, our level of understanding about the short and long term benefits and disadvantages of soil and water conservation works and our level of participation would have be improved. In addition, 89% of the participant female headed household heads reported low level of education limits their participation whereas 11% said no (Table 13).

Table 13; Factors that affect the level of female headed household Participation in soil and water conservation practices on teff farm plot

Do the following factors affect your level of participation in soil and water conservation Practices on teff farm plot?	Participant female headed household response				Total	
	yes		No			
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Low income	128	78	36	22	164	100
Low level of education	146	89	18	11	164	100
Low level of information	93	56.7	71	44.3	164	100
Age level	70	42.7	94	57.3	164	100
Size of house hold	38	23.2	126	76.8	164	100
Cultural values and belief of the community	107	65.2	57	34.8	164	100
Distance from home	94	57.3	70	42.7	164	100
Small Farm size	145	88.4	19	21.6	164	100

Source; own field survey, 2016

In addition to low level of education, the low level of income also affects female headed household Participation in soil and water conservation practices on teff farm plot. According to FGDs the low level of income of the female headed household negatively affects conservation practice. In line with this, the findings of the household survey also shows that out of the total 164 household heads, 78% of the respondents expressed that low level of income constrains their participation in soil and water conservation practices on teff farm plot. Only 22% of the sample female headed farmers said that low level of income doesn‘t influence our genuine participation in soil and water conservation on teff farm plot works.

In addition, the findings of the household survey showed that farm size which account 88.4%, low level of information which account 56.7%, Cultural values and belief of the community which account 65.2%, Distance from home which account 57.3%, age level which account 42.7%, and size of house hold which account 23.2% were identified as additional challenges which created an influence on female headed household participation in soil and water conservation practices on teff farm plot.

4.4. Factors that Influence female headed household's Participation in Teff Production

In Abeshege Woreda, there is a male domination over the women. Patriarchal system of gender relations was observed, where the male enjoys economic, political, and normative and ideological privileges over the female. By oppression we mean the domination of the other by force; and exploitation is taking advantage for one self, of some body's right unjustly (Abeshege Women's Youth and children office, 2016).

The contributing factors that influences female headed households participation in teff production depends upon illiteracy, ignorance, low social status and traditional religious and cultural dominance, political and economic status. With regard to the degree of influence, 38.5% of respondents claimed that education level contributes to the domination (Table 14). However, from focus group discussion women's participation in teff production depends on the attitude of women themselves, due to lack of self-esteem, less awareness of women's status in society and illiteracy.

Table 14**;** factors influencing the domination of male headed household over the female headed households on teff production

Influencing Factors	No of Respondents	
	Frequency	Percent
education level	89	38.5
cultural barriers	44	19.0
economic status	51	22.1
Religious	2	0.9
political status	6	1.3
work load	42	18.2
Total	234	100.0

Source; own field survey, 2016

4.4.1. Influence of independent variables on participation of female headed households in teff production

4.4.1.1 Probit Estimates of selected explanatory variables

The probit model was used to examine the influence of selected socio-economic, situational, personal characteristics of female headed households and access to economic resources on their participation in teff production. Econometric analysis with cross-sectional data is usually associated with problems of multicollinearity effect of outliers in the variables. Multi colinearity effect among explanatory variables can lead to imprecise parameter estimates. Thus, prior to running the probit model the presence or absence of multi colliniarity was checked using Variance Inflation Factor (VIF) for testing association among the continuous explanatory variables and Contingency Coefficients (CC) for the dummy variables.

According to Gujarati (2004) if the value of VIF is 10 and above, the variables are said to be collinear. Computed through STATA program version 12, the values of the VIF for the four continuous variables were found to be small (i.e. VIF value < 10) indicating that the data have no serious problem of multicollinearity (Appendix 2). Hence, all the four continuous explanatory variables were retained and entered into the binary logistics analysis. Similarly, contingency coefficients were computed for dummy variables from chi-square ($\chi 2$) value to detect multicollinearity problem (the degree of association between dummy variables). According to Paulos (2002), if the value of contingency coefficient greater than 0.75, the variables said to be collinear. The result of the Contingency Coefficient, (Appendix 2), reveals absence of strong association among independent variables. All the screened variables included in the model for analysis.

Various measures were checked and validated to confirm that the model fits the data. The likelihood ratio test statistics exceeds the Chi-square critical value at less than 1% probability level. This implies that the hypothesis, which says all coefficients except the intercept is zero, was rejected. The value of the Pearson Chi-square test shows the overall appropriacy of fit of the model at less than 1% probability level.

The model were estimated the log likelihood of the explanatory variables that influence the dependent variable; the level of significance and true relationship of this influence was also appropriately estimated and indicated by the model. The empirical estimation of the Probit analysis result as presented in Table 17 reveals a log likelihood of -36.658888 , Prob > chi^2 = 0.0000, Pseudo R^2 = 0.7413 and LR chi^2 (9) = 210.08, all significant at 5 percent probability level; this shows that the model has a good fit. Considering p>|z| values for all the variables included in the model as shown in Table 15 marital status (X2) and education level (X3) were both significant at 5 percent _levels; having confidence interval of 95 percent each. On the other hand family size (X4), land size (X5), average annual income(X6) and DAs contact (X8) were significant at 1% probability levels.

The implication of these from the finding was that increase in the level of any of the explanatory variables with positive sign, marital status(X2), education level (X3), family size(X4), land size(X5) and DAs contact (X8) in this case have a positive effect on the female headed households participation in teff production, whereas those explanatory variables with negative sign, average annual income (X6) exert a negative relationship on female headed households participation in teff production. However, marital status (X2) and education level (X3), and family size (X4), land size (X5) and DAs contact (X8) being positive and significant at 5 percent and 1 percent significant level indicates that, it is a strong factor considered for female headed households participation in teff production; although its coefficient being positive is contrary to a priori expectation because it is expected to be contributing negatively to participation, the positive sign could be attributed to more emphasis being placed on teff production.

However, average annual income of households are negatively significant at 1 percent _level ; this means that, it is important factors towards participation in teff production but its negative coefficients is at variance with a-priori expectations and findings of (Damisa et al; 2007) because, average annual income should measure income generating ability of household; generally, an increase in average annual income is likely to increase the probability of participation in teff production; all things being equal; this probably means that, they easily affordable teff production input. In conclusion, some of these findings are contrary to a prior expectations and findings of (Oni et al., 2005 and Damisa et al., 2007) but may be explained by Poor record keeping and the use of memory estimates by the respondents also contribute to the little deviation from the a priori expectations experienced.

Total Family Size (TFASIZE); total family size has significant and positive effect on female headed household decision to participate on teff production at less than 1% level (P<0.000). One unit increase in family size, the probability of female headed household farmer's participation in teff production increase by 14.7% keeping other variables constant (Table 15). Because household size can influence participation, due to the fact that its association with labor endowment. It is argued that a larger household size enables the participation decision on teff production by availing the necessary labour force in one hand (Croppenstedt et al., 2003) and enabling the generation of additional income from extra labor invested in off farm activities (Yirga 2007). The finding of this study was similar with of the result of Tagel (2013).

Farm Size (LAND_SIZE); has highly statistically significant explanatory variable at less than 1% (P<0.000)

percent probability level. The positive sign of its coefficient indicates the presence of positive relationship between farm size and female headed household farmer's decision for participating on teff production in Abehsege woreda. For instance, one hectare increases in the farm size from its mean increase the likelihood for participation by 14.2% holding other things at their respective mean (Table 15). The result of this study is in line with the hypothesized direction of effects of this variable. For instance, the bigger the size of the farm, the greater the proportion of land allocated for modern crop varieties the participation strategies that the female headed household farmer is likely to adopt.

Development Agents Contact (DA_CONT); has high statistically significant explanatory variable at less than 1% (P<0.000) percent probability level (Table 15). The positive sign of its coefficient indicates the presence of positive relationship between development agent's contact and female headed household farmer's decision for participating on teff production. One unit increase in development agent contact, the probability of female headed household participation on teff production increase by 28.3% keeping other variables constant. The result of this study is in line with the hypothesized direction of effects of this variable.

Average annual income (AVANN_INCM(X6); is also highly significant explanatory variable at less than 1% (P<0.000) percent probability level (Table 15). Its coefficient indicates the presence of relationship between average annual income and female headed household farmer's decision for participating on teff production. One unit increase in average annual income, the probability of female headed household participation on teff production decrease by 6% keeping other variables constant. The result of this study is in line with the hypothesized direction of effects of this variable.

Table 15**;** Probit Estimates of selected explanatory variables on the dependent variable

Participa_OTF |	**Coef.**	**Std. Err.**	**z**	**P>|z**	**Marginal Effects dy/dx**
AGE(X1)	0.1661269	0.3431322	0.48	0.628	0.017189
MA_STAT (X2)	0.5184373	0.2167428	2.39	0.017**	0.0536421
ED_LEVE (X3)	0.4677399	0.2033751	2.30	0.021**	0.0483965
TFASIZE (X4)	1.419982	0.3266624	4.35	0.000***	0.1469239
LAND_SIZE (X5)	1.374786	0.279533	4.92	0.000 ***	0.1422475
AVANN_INCM(X6)	-0.5827595	0.1930818	-3.02	0.003***	-0.0602975
SOCPAR (X7)	-2.168169	1.451531	-1.49	0.135	-0.2243379
DA_CONT (X8)	1.536188	0.433186	3.55	0.000***	0.2839453
ACCS_CREDIT (X9)	0.5535774	0.341027	1.62	0.105	0.0672971
_cons |	-3.258087	1.739836	-1.87	0.061	

Source: own Field survey, 2016

Log likelihood = -36.658888, LR chi^2 (9) = 210.08, Prob > chi^2 = 0.0000,
Pseudo R^2 = 0.7413

** Significant at 5% probability level, *** Significant at 1% probability level

5. SUMMARY, CONCLUSION AND RECOMMENDATION

5.1. SUMMARY AND CONCULSION

The purpose of this study was to assess factors affecting teff production by female headed households in Abeshege Woreda. The study attempted to answer the following basic research questions.

1. To investigate the level of female headed house hold participation in Teff production
2. To assess the level of female headed house hold participation in soil and water conservation on teff producing farm plots and
3. To evaluate the determinants of female headed house hold participation in Teff production

In order to deal with these basic questions, the research was carried out by using cross-sectional study design. The total sample sizes of household respondents encompassed in the study were 234 (164 participant and 70 non-participant female headed household respondents) households which selected from the six RKAs (Dire lafto, Tachegnaw geraba, Layegnaw geraba, Tatesa, Tawela and Lache) of Abeshege Woreda. A random sampling method was employed to select sample respondents from purposively selected RKAs. Data were collected from both primary and secondary sources using interview scheduled, Focus group discussion, semi-structured interview, key informant discussions, and observations. The study employed both quantitative and qualitative data. The quantitative data were analyzed and interpreted by using descriptive statistics such as mean, range, percentage, standard deviation, chi-square and frequencies in order to draw conclusions and generalizations. The qualitative data were also analyzed and described by using qualitative methods such as narration, and generalizations. The study also employed the probit econometric model as a component of inferential statistical analysis.

The study indicates there was no significance difference between participant and non-participant respondent in terms of marital status. About 57.8% of the participants were Orthodox Christians and the remaining 41.6% Muslims and 1.4% were protestant; the corresponding figures for non-participants were 57.1%, 41.4 and 0.6%, respectively. The average age of the participants was 46.88 years, while that of non-participants was 45.84 years. Family size of the total sample respondents ranged from 3 to 14 persons, with an average family size of 7.44 and a standard deviation of 2.49. Also, there was significant difference between participants and non-participants in terms of their literacy level, the percentage of literate in participant group was more than that of non-participant respondents which might indicate that literate female headed households demanded more to participate on teff production than illiterate households.

The land size of sample households also varied between 0.25 to 3 hectares with an average holding of 1.75 hectares and a standard deviation of 0.85. The findings were in line with national reports indicating the small land ownership in the rural areas. An average number of extension contact days for participant and non-participant sample female headed households were 6.11 and 4.42 days per year, respectively. Moreover, participants earned from non-farm income, on average birr 2,831 whereas non-participants, earned on average birr 1,343. The Mean difference between participants and non-participants with regard to non-farm income was found to be statistically significant at less than 1% probability level.

Majority of the households were earning income from both sale of crop and livestock production in addition to participating in off or non-farm activities. Also, indicated that 34.8% of participate female headed households were earned more than 6000 birr of an average annual income from teff production. On the other hand, 62.1 % of MHHs were earned an average annual income of 6000 birr from teff production. Comparatively MHHs were benefiting more from the teff production than female headed households as men had better access and opportunities to labor and other resources. Yet female headed households obtain less income as compared to MHHs in both participant and non-participant households. However, the comparison between participant and non-participant female headed households shows that participant female headed households were by far benefiting economically and socially than non-participant female headed households. The institutional factors such as field supervision and Credit were the major factors for income difference between sampled female headed households.

The study revealed that 81.9% of female headed households have high degree level of decision to produce teff, 57.7% of women to purchasing agricultural inputs, 21.1% to sowing, 42.2% women to weeding, and 26.7% of them decide to sell. Further, Majorities of (62.7%) the respondent were high in their level of participation in Teff production activities followed by 14.9% of very high and 14.9% of the respondent's medium and 7.5% were reported as low participation on teff production activity. variables such as household size, marital status, land size, access to credit, were shown to have significant effect on female headed households participation in teff production. Also, this study pointed out that, the role of some personal and socioeconomic variables as well as assets such as social capital, land size, income from non-farm and off farm is central in determining the female headed household's participation in teff production. The findings of the data therefore lead to the conclusion that female headed households are the major working forces of teff production in the study community. They involved in the teff production activities such as weeding and transporting, land preparation/gulgualo, harvesting, food preparation for worker, and preparation of threshing land /awoduma. Hence, the study concludes that, there is high rate of involvement of female headed households in teff production in the study area.

Further, the finding showed that the sampled participant female headed households respondents were engaged multiple of soil water conservation practices on their teff producing farm plots which accounts 16.8 % of them were engaged soil bund on their teff farm plots, 16.1 % of them were organic manure, 1.9% were agro forestry, 8.1% were engaged crop rotation, 50.3% were water way, 3.1% were stone bund and 3.7% of the sampled participate female headed households were engaged contour plowing on their teff producing farm plots. In addition the study showed that level of female headed households participation on soil water conservation practices in teff farm plots, majority (41.6%) of the respondents replied that it is in very good level and no respondents replied the level of participation is very poor.

Probit Model econometric estimation procedure was employed to analyze the effects of different explanatory variables on female headed household farmers' participation in teff production. With regard to the probit model results, nine variables hypothesized to affect female headed household Farmers' participation were included. The results of the probit model revealed that the coefficients of 5 variables were found to be significantly creating variation on the probability of female headed household farmers' participation on teff production. The variables that turned out to be significant include: education level, land size, DAs contact, and family labour and marital status of the households.

The implication of these from the finding is that increase in the level of any of the explanatory variables with positive sign i.e. marital status (X2), education level (X3), family size (X4), land size (X5) and DAs contact (X8) have a positive effect on the female headed households participation in teff production, whereas those

explanatory variables with negative sign, average annual income (X6) exert a negative relationship on female headed households participation in teff production.

5.2. RECOMMENDATIONS

On the basis of this study, the following recommendations are suggested for overcoming challenging factors hindering female headed households being participant in teff production. It is also used for policy makers and implementers to follow correct pathway to promote female headed households being participant in teff production. The recommendations of this study are described as follows:

- ✓ From the survey result obtained that, frequency of contacts with development agents positively influencing the participation of female headed household at 1% level of significance. Additionally, it is also important for getting technical support to manage teff production on how to use it practically for increasing the production performance of the commodity in the real life situation. Therefore, strengthening female headed household training centers is important to increase participation of female headed household participation on teff production.
- ✓ Credit service provision is an important and positively influencing female headed household participation decision on teff production in the study area at 10% level of significance. Therefore, the credit service to be delivered must be gap and need-based to achieve the intended goals of the agricultural program through technology adoption.
- ✓ Education level is significantly influencing female headed household participation on teff production at 5% level of significance. It is found the important factor that enhances female headed households being participant in teff production. Female headed households should access education nearby their village. Therefore, the government and other stakeholders should strength, expand and monitor adult teaching program.
- ✓ Family size/labor is significantly and positively influencing female headed households being participant in teff production at 1% level of significance. It is critically important for managing the teff production according to the technical demand required for it. Therefore, making the available manpower well equipped with the necessary skill and knowledge through training is important to increase the production performance of the teff through improving the capacity of the productive labor force of the households.
- ✓ In order to improve the level of female headed household's participation to engage soil and water conservation practices on their teff farm land, the appropriateness of conservation measure for the land practiced needs to get great emphasis from all stakeholders.
- ✓ Land size is significantly and positively influencing female headed households being participant in teff production at 1% level of significance. Therefore concerned body should be solving land regard problems for female headed household to increase their involvement in teff production.

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