

**Preliminary Gendered Analysis of
Household Survey
Conducted in the Lentil-Chickpea
Zones of North-Shewa
Amhara Region**

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PROGRAM ON
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Dryland Cereals



Preliminary Gendered Analysis of Household Survey Conducted in the Lentil-Chickpea Zones of North-Shewa Amhara Region

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Introduction

Adoption of improved technologies is an outcome of optimization where a decision to adopt is made only when some benefits are expected. The propensity and speed of adoption, however, varies across individuals and is highly correlated with farmers' ability to adopt including their access to and control over essential resources (Rogers, 1982). There is rich literature on adoption of agricultural technologies where farm and farmer characteristics are identified as important determinants. Among the dominant factors that influence adoption are proximity to pioneer farmers as it increases the chance to learn (Conley and Udry, 2010), size of the farm (Neill and Lee, 2001, Feder and Umali, 1993), human capital (Adesina and Baidu-Forson, 1995), availability of labor (Lee, 2005), education, health, age and gender (Mendola, 2007), and farmers subjective assessment of the relevance of technologies to their specific needs (Zinnah et al, 1993). Adoption can also have different implications on different groups of the society.

The study aims to look at the challenges and opportunities recommended cereal and legume production packages present for men, women and youth engaged in the production system, and explore variations within distinct agricultural livelihood types. This report presents a preliminary analysis of the household survey to establish a general gendered understanding of the roles of different groups of the society in the production system; as well as their capabilities in terms of human, natural, physical, financial, and social capitals. The findings will be used to guide the follow-up study which specifically explores differences and commonalities of challenges and opportunities among the five Agricultural Livelihood Systems, and the potential effect of gender in adopting the recommended packages.

The study is conducted in Ethiopia where subsistence agriculture is the main pillar of the economy providing employment, and producing local and foreign income. In rural Ethiopia farmers mainly produce cereals. According to CSA data for 2018, there were about 15.5 million holders that produced 267,790 tons of cereal on 10 million hectare of land (CSA, 2018a). Pulses, including faba beans, field peas, white and red haricot beans, chickpeas, lentils, grass peas, soya beans, fenugreek, mung bean and 'gibto' are the second largest group of crops grown in Ethiopia by 8 million holders on 1.5 million ha of land (CSA, 2018a).

Chickpeas and lentils, which are among the focus crops of the Grain Legumes Dryland Cereals (GLDC) CRP are grown in Ethiopia by about 684 and 873 thousand households with an area of 243 and 119 thousand ha respectively. The yield of chickpea is almost 21 ton per ha whereas that of lentil is 15 ton/ha. Among all regions in Ethiopia, Oromia and Amhara regions constitute the highest holders and area coverage in cereal and pulse production. However, most of the cereals and pulses produced are used by the household. For instance, in the 2017/18 agricultural year, 68% of cereals and 59% pulses produced in the country were directly consumed by households, while 17% of the cereals and 25% of the pulses were sold in the market, and 11.5% and 12.92% of cereals and pulses were used as seed. In the Amhara region 68.58%, 10.79% 15% of cereals were used for direct consumption, as seed and for sale respectively. On the other hand, pulses had greater contribution to income as over 30% of the total pulses produced in the region were sold (CSA, 2018c).

The household survey was conducted in Moretina Jiru Woreda (District) located in North Shewa Zone of Amhara Region. The site was randomly selected from among similar cereal and pulse production systems in the region. The study sites are presented in Figure 1.



General Description of the study area

The Woreda has about 93 thousand people with 48 thousand male and 45 thousand female. 53% of the residents are less than 20 years old. The majority of the population in the district are from Amhara ethnic group which share similar culture, tradition and religion (Ethiopian Orthodox Church) (Girma, Tefera, & Dadi, 2011). With an area of 706.16 km², Moretina Jiru has a population density of 139 people per km², which is higher than the Zone average of 121. The altitude of the district ranges from 2600-2700 m.a.s.l. Topographically, the district sits on a large plateau with some part of it in the Nile gorge. The area has one main rainy season and has an average rain fall of 950mm per annum. The soil is predominantly heavy vertisol (Merere). Moretina Jiru is surrounded by the Jemma river; and shares borders with Siyadebirnawayu in the South, Ensaro on the south west, Merhabete on the northwest, Menz Keya on the northeast, and Bassonawerana on the east. The administrative center of the Woreda is called Enewarie, followed by another small town called Jihur.

Agriculture in the area is based on a crop-livestock production system and is the dominant livelihood strategy in the District (Girma et al., 2011). The average farm size in the area is 1.81 ha per household with standard deviation of 0.69 ha (Girma et al., 2011). The production system is rainfed based, with occasional use irrigation from small rivers, natural streams, and in rare occasions groundwater. Cereals and pulses including long maturing crops of wheat, teff, sorghum, lentil, chickpea, fababean, and mung bean are mainly grown under rainfed agriculture. Irrigation water is used to grow onion, garlic, carrot, potato and cabbage to generate income. Farmers also grow oil crops such as sesame and linseed; as well as horticulture crops such as orange, mango, lemon, shallot, and tomato.

As for livestock production, farmers in the Woreda mainly rear cattle, goat, equine and poultry to generate income. Sources of animal feed in the area include communal grazing, crop residues, hay, tree lucerne, salsabania and industrial by-products. The woreda is also endowed with several natural resources such as eucalyptus trees, natural shrubs, fodder trees and acacia. The district is also home to 56 socially established cooperatives (8 multipurpose and 7 seed producer and marketing) that play a crucial role in input supply, market access, saving and credit services, and capital accumulation.

Data and Methodology

The data was collected from 360 farming households who grow lentil and/or chickpea in Moretna Jiru Woreda/District in North Shewa Zone. Purposive and random sampling techniques were used to select the households. First, potential kebeles that grow lentil and chickpea were purposively selected from the district, out of which four sample kebeles - namely Gerba, Jihur, Mangudo and Kusay were randomly selected. Secondly, a list of farmers from all the villages considered was taken from Kebele administration. An average of 90 households were then randomly selected per Kebele from among the four selected kebeles. The household head or a member of the household who is knowledgeable about farming activities of the household were interviewed, as such 93% of the respondents were household heads.

Data Analysis

Livelihood strategies of the respondents were analyzed using descriptive analysis focusing on human, natural, physical, financial, and social capitals as conceptualized in the Sustainable Livelihood Framework.

Human Capital

Human capital encompasses the abilities, experience, work skills and the good health that allow populations to engage with different livelihood strategies (UNDP, 2017). At the household level human capital is an important factor that determines the quantity and quality of available workforce and is often captured through several proxy variables including - demography, experience in agricultural technologies, and roles or skills.

Demography

Preliminary analysis of the data indicates that about 95% of the households are headed by adult men (46 years old) (Table 1). No significant difference on the average age of men and women heads of household were noted (Table 2). On average household heads have about 5 years of formal education, and each household has an average of 4 members. Ethiopian agriculture heavily relies on human labor, hence households with large family members are considered to be better off in terms of cheap labor force for agricultural activity. However, it is important to note that all household members might not be a working member. It was found that, on average, a household has 2 dependent members on which the two working members are expected to take care of the whole household member. To exactly know the household size composition and if it is expected to contribute for labor allocation; adult equivalent unit per household was calculated. The result shows that on average a household has 3 adults.

Table 1 - Summary of Human Capital Variables

Human Capital Variables – Demography	Mean/SD
Sex of the household head	.9472(.2239)
Age of the HH head	45.525(12.2315)
Education level of the respondent	4.5871(4.0637)
Household size	3.4872(1.5415)
No of dependent members	1.5128(1.2279)

No of working members	2.0323(1.0497)
Adult equivalent unit	2.903(1.3635)
<i>Observations</i>	360

Gender wise comparison (Table 2) shows the presence of a statistically significant difference among male and female headed household members on household size. The t-test comparison shows that female heads have a smaller number of members. Similarly, the adult equivalent unit among male and female heads explain how female household heads have a lower number of adults in the household. This shows the presence of lower working capital in terms of labor among female headed households.

Human capital variables – demography per gender of head (ttest)	Male Headed Mean/SE	Female Headed Mean/SE	Mean difference (female-male)
Age of the HH head	45.5484	45.1053	-.4431
	(3.203)	(0.6579)	(2.8871)
Education level of the respondent	4.5816	4.6842	.1026
	(2.1967)	(1.0789)	.9595
Household size	3.5482	2.4211	-1.1271***
	(.0840)	(.3089)	(.3591)
No of dependent members	1.5422	1	-.5421*
	(.0670)	(.2861)	(.2886)
No of working members	2.0492	1.6875	-.3617
	(.0587)	(.1983)	(.2684)
Adult equivalent unit	2.9552	1.9905	-.9646
	(1.3534)	(1.2403)	(.3179)***
Observations	341	19	

Table 2 – t-test on Human capital variable - demography - per gender

Agricultural Knowledge/Experience

In rural Ethiopia farmers mainly generate their livelihood from agriculture. Level of knowledge and experience in agriculture is assumed to enhance efficiency and is thus considered one of the factors that contribute to building of human capital at the household level. About 13% of the respondents participated on non-farming activity (Table 3) while almost all households participated in farming activities. This could explain that some of the groups are diversifying their source of income. It is interesting to note that those who participated in non-farming activity has 9 years. The t-test presented on Table 4 shows there is no significance mean difference among women and men headed households on their experience on non-farm

activity. Female household heads, on the other hand, participated on non-farm activity more than male heads (21% vs 12%). However, the findings show that women's participation was mainly in non-farm activity that do not generate substantial income such as selling of firewood, processing and marketing food and drinks that help cover their day-to-day expenses but do not make substantial change in their livelihoods. Location wise comparison of means shows that (Table 5) both non-farm participation and experience is higher among residents of Jihur.

Almost all households participated on farming activity. A household has on average 23 years of farming experience. Farming experience of female headed households is significantly lower than male headed households. This could be an indication of the presence of lower capital among female headed households. In Ethiopia, it is rare to find a woman to be the head of household unless she is unmarried, becomes widowed or gets separated. That means it is rare to find a woman being a head if she is a married one. Hence, a change on her position could also contribute to the lower years of experience.

Human capital variables – Experience	Mean/SD
Participated on farming occupation	.9972 (.0527)
Participated on non-farm occupation	.1306 (.3374)
Farming experience in yrs	22.6083 (10.7288)
Non-farm experience in years	1.2778 (4.2591)
Practice cereal-legume association?	1 (0)
Experience of cereal legume association in years	15.575 (10.4809)
Used improved seed at least in one of the crops	.9861 (.1172)
Used improved lentil seed	.8361 (.3707)
Used improved chickpea seed	.1 (.3004)
Chemical fertilizer used	.9972 (.0527)
Amount of urea used in kg	403.0613 (231.916)
Amount of NPS used in kg	474.2799 (266.3595)
Pesticides/insecticide used	.9639 (.1868)
Herbicide used	.9861 (.1172)
Total area of lentil as main & associated crop main season	.6232 (.4631)
Share of area of lentil on main season per hh	.3696 (.1992)
Total area of chickpea as main & associated crop main season	.007 (.0437)
Share of area of chickpea on main season	.0036 (.0218)
Qty of main crop harvested per HH in kg main season	3065.458(1748.37)

Qty of associated crop harvested per HH in kg main season	285.4222(469.9413)
Qty of main and associated crop harvested per HH in kg main season	3350.881(1824.113)
If the hh are using crop residue	1(0)
Do you use crop residue from lentil	.9944(.0744)
Do you use crop residue from chickpea	.0917(.289)
If a HH can cover its food needs from production	.95(.2182)
No of months the farm own production cover food needs of the family	11.6333(.9435)
Observations	360

Table 3 - Summary of human capital variable - experience

Regarding agricultural farming experience almost all respondents practice cereal-legume association. The household found to have experience of practicing cereal-legume for an average of 16 years ranging from 2 to 57 years (Table 3). All male and female head households found to practice cereal-legume association and there is no statistical difference among male and female heads on experience associated with cereal-legume. Similarly, farmers living in all location experienced the cereal-legume cultivation but those living in Mangudo have more years of experience in practicing cereal legume association.

Human capital variables – Experience per gender (mean for categorical var and T-test for continuous var)	Male Headed (SD) (SE for ttset)	Female Headed (SD) (SE for ttest)	Mean difference (SE) (Female-Male)
Participated on farming occupation	.9971(.05)	1(0)	
Participated on non-farm occupation	.13(.33)	.2105(.41)	
Farming experience in yrs	22.95(.57)	16.36(2.55)	-6.58(2.50)**
Non-farm experience in yrs	1.29(.23)	0.94(.56)	-0.35(1.005)
Practice cereal-legume association?	1(0)	1(0)	
Experience of cereal legume association in years	15.68(.56)	13.63(2.35)	-2.05(2.47)
Used improved lentil seed	.83(.37)	.95(.23)	
Used improved chickpea	.10(.30)	.0526(.23)	
Used improved seed at least in one of the crops	.9853(.12)	1(0)	
Chemical fertilizer used	.9971(.05)	1(0)	
Amount of urea used in kg	408.16(12.59)	311.63(47.66)	-96.52(54.51)*

Amount of NPS used in kg	479.57(14.46)	379.42(54.85)	-100.1442(62.65)
Pesticides/insecticide used	.9619(.19)	1(0)	
Herbicide used	.9853(.12)	1(0)	
Total area of lentil as main & associated crop in main season	.6324(.03)	.46(.06)	-.17(.11)
Share of area of lentil on main season per household	.3701(.01)	.36(.04)	-.0093(.05)
Total area of chickpea as main & associated crop main season	.0074(.002)	0(0)	-.0074 (.0103)
Share of area of chickpea on main season	.0039(.001)	0(0)	-.0038(.0051)
Qty of main crop harvested per HH in kg main season	3087.58(94.94)	2668.42(379.09)	-419.16(412.16)
Qty of associated crop harvested per HH in kg main season	284.02(25.33)	310.53(119.18)	26.50(110.92)
Qty of main and associated crop harvested per HH in kg main season	3371.60(98.67)	2978.95(428.99)	-392.65(430.08)
If the household are using crop residue	1(0)	1 (0)	
Do you use crop residue from lentil	.99(.08)	1(0)	
Do you use crop residue from chickpea	.09(.30)	0(0)	
If a HH can cover its food needs from production	.95(.22)	.95(.23)	
No of months the farm own production cover food needs of the family	11.65(.32)	11.36(.05)	-.36(.22)
Observations	341	19	

Table 4 - ttest/summary of Human capital variable - experience - per gender

It was found that most household heads (43% and 44%) are practicing cereal-legume association in order to increase the productivity of the crop and fertility of soil respectively (figure 2). This shows the highest increase of awareness on use and benefits of crop-legume association.

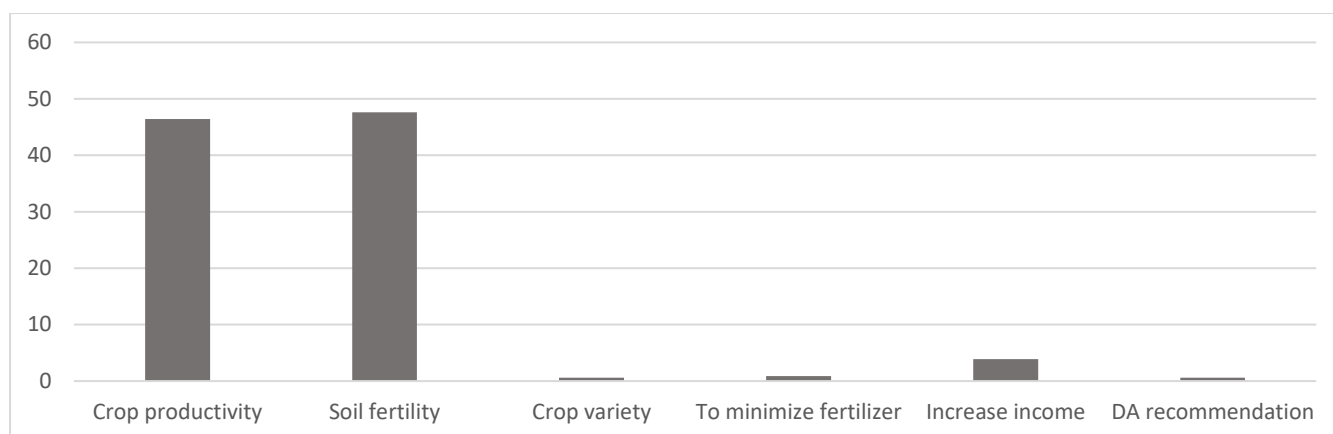


Figure 1 - Reason for practicing cereal-legume association

Human capital variables Experience per Kebele	Gerba	Jihur	Mangudo	Kussay
Participated on farming occupation	1	1	1	.9885
	(0)	(0)	(0)	(.1072)
Participated on non-farm occupation	.0978	.2065	.1236	.092
	(.2987)	(.407)	(.331)	(.2906)
Farming experience in yrs	22.5109	22.1739	23.3034	22.4598
	(9.6641)	(11.1932)	(10.5426)	(11.6037)
Non-farm experience in yrs	.913	2.087	1.5506	.5287
	(3.1853)	(5.4605)	(5.1852)	(2.1067)
Practice cereal-legume association?	1	1	1	1
	(0)	(0)	(0)	(0)
Experience of cereal legume association in years	13.7609	15.9348	17.3596	15.2874
	(8.3907)	(10.338)	(11.8956)	(10.915)
Used improved lentil seed	.8587	.8261	.8427	.8161
	(.3502)	(.3811)	(.3661)	(.3897)
Used improved chickpea seed	.1522	.1413	.0449	.0575
	(.3612)	(.3502)	(.2084)	(.2341)
Used improved seed at least in one of the crops	.9891	.9674	1	.9885

	(.1043)	(.1786)	(0)	(.1072)
Chemical fertilizer used	.9891	1	1	1
	(.1043)	(0)	(0)	(0)
Amount of urea used in kg	475.1875	356.1609	421.4944	357.5287
	(254.8877)	(205.8525)	(250.1168)	(191.1987)
Amount of NPS used in kg	532.6467	436.6467	499.2107	426.8506
	(315.152)	(237.8544)	(276.1004)	(212.4202)
Pesticides/insecticide used	.9348	.9674	.9888	.9655
	(.2483)	(.1786)	(.106)	(.1835)
Herbicide used	1	1	.9775	.9655
	(0)	(0)	(.1491)	(.1835)
Total area of lentil as main & associated crop main season	.7615	.5688	.5204	.639
	(.5862)	(.3517)	(.3821)	(.4641)
share of area of lentil on main season per household	.3674	.3962	.2911	.4245
	(.1968)	(.1988)	(.175)	(.2031)
Total area of chickpea as main & associated crop main season	.0095	.0147	.0028	.0007
	(.0592)	(.0566)	(.0265)	(.0067)
share of area of chickpea on main season	.0037	.0087	.0014	.0006
	(.0208)	(.0347)	(.0133)	(.006)
Qty of main crop harvested per HH in kg main season	3191.304	2934.348	3437.191	2690.747
	(2077.517)	(1424.989)	(1895.83)	(1430.576)
Qty of associated crop harvested per HH in kg main season	340.7609	256.413	203.5056	341.3793
	(539.2266)	(456.089)	(406.541)	(459.0313)
Qty of main and associated crop harvested per HH in kg main season	3532.065	3190.761	3640.697	3032.126

	(2093.837)	(1553.421)	(1964.721)	(1579.653)
If the household are using crop residue	1	1	1	1
	(0)	(0)	(0)	(0)
Do you use crop residue from lentil	1	1	.9888	.9885
	(0)	(0)	(.106)	(.1072)
Do you use crop residue from chickpea	.1739	.1304	.0449	.0115
	(.3811)	(.3386)	(.2084)	(.1072)
If a HH can cover its food needs from production	.9457	.9239	.9438	.9885
	(.2279)	(.2666)	(.2316)	(.1072)
No of months the farm own production cover food needs of the family	11.6196	11.5652	11.5393	11.8161
	(.9474)	(1.0824)	(.9541)	(.7397)
Observations	92	92	89	87

Table 5 - Summary of human capital variable - experience - per kebele

The first widely popular cereal-legume association in the area is wheat-lentil. It was adopted by 92% of the households. The second type is teff-lentil (5%) as presented on Table 6. This might explain how intensively cereal-legume association being practiced within the zone and how lentil is widely cultivated in the study area. During 2017 main agricultural season on average lentil was cultivated on 0.62 ha of land per household. That is on average, among the total area of land a household has, lentil was cultivated on 37% of the plots (Table 3). There is no significant statistical difference among male and female headed households. Residents of Gerba cultivated lentil on a relatively large area as compared to other Kebeles. However, share of area of lentil is higher among residents of Kussay.

Crop for cereal-legume	Freq.	Percent	Valid	Cum.
Teff – lentil	18	5.00	5.00	5.00
Wheat – lentil	332	92.22	92.22	97.22
Sorghum -lentil	1	0.28	0.28	97.50
Wheat - Faba bean	7	1.94	1.94	99.44
Wheat - field pea	1	0.28	0.28	99.72
Teff - Haricot bean	1	0.28	0.28	100.00
Total	360	100.00	100.00	

Table 6 – Crop used in cereal-legume association

98% of the heads reported as they experience an increase in yield due to use of cereal-legume association. Figure 3 presented practice of farmers on crop rotation. 65% of farmers are changing the cereal associated with legume. 35% of farmers practiced cereal-legume association by keeping similar cereal-legume over time.

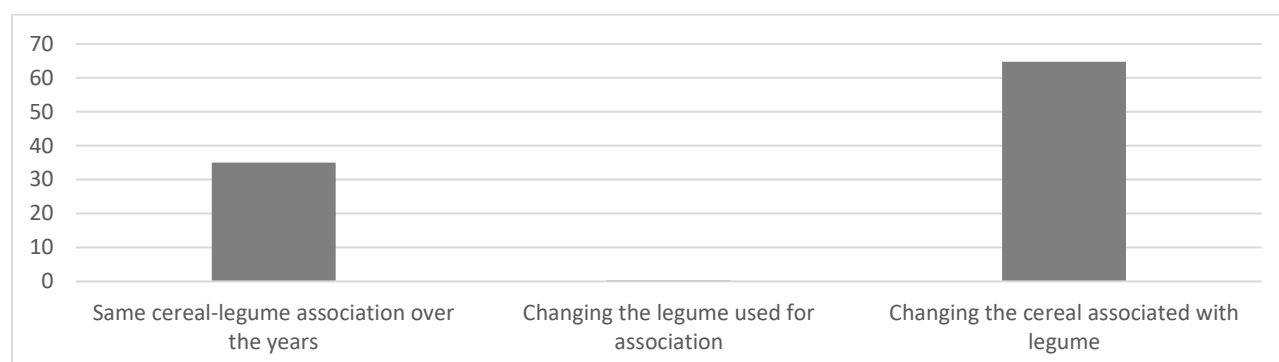


Figure 2 - crop rotation practice with cereal-legume association

Experience and use of agricultural technology are also assumed to improve the livelihood of farmers. Almost all farmers (98%) were found to use improved seed at least in one of their plots (Table 3). Percentage of households that used improved seed at least in one of their plots was almost similar among male and female headed households (Table 4). Yet participation of female heads on use of improved seeds is a bit higher than male heads (100% vs 98.5%).

Similarly, in all Kebeles almost all farmers used improved seed at least in one of the plots during 2017 main agricultural season. This study was mainly focused on lentil and chickpea. Use of improved seed among lentil and chickpea growers was 84% and 10%. It requires the attention of policy makers the reason behind lower number of farmers use improved chickpea seed. Interestingly, greater number of female-headed farmers used improved lentil seed as compared to male headed farmers (95% vs 83%). As presented on table 4 number of female-headed farmers who used improved chickpea seed very minimum than male headed. Distribution of households that used improved lentil seed per their location is almost uniform with a slight increase in Gerba Kebele (Table 5).

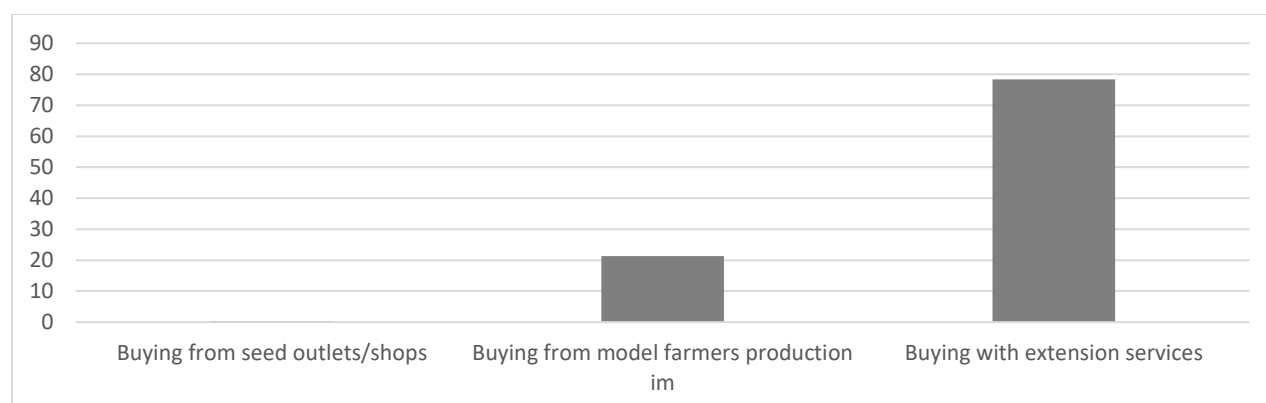


Figure 3 - Access mode to lentil improved seed

Figure 4 presented how farmers were getting improved seed. 78% farmers are getting improved lentil seed from extension services. This shows the contribution of extension service on improved seed distribution in the study site especially for lentil. For chickpea also, the main source of improved seed is extension services, though the percentage of users is low as compared to those who use improved lentil seeds. In Ethiopia, extension service plays a great role in the distribution of agricultural information, inputs and

technology packages. Reasons for not using improved chickpea seed varieties included cost of the seed, challenges with seed supply, lack of confidence in the productivity of the seed, etc. Respondents responses are presented below under Figure 5.

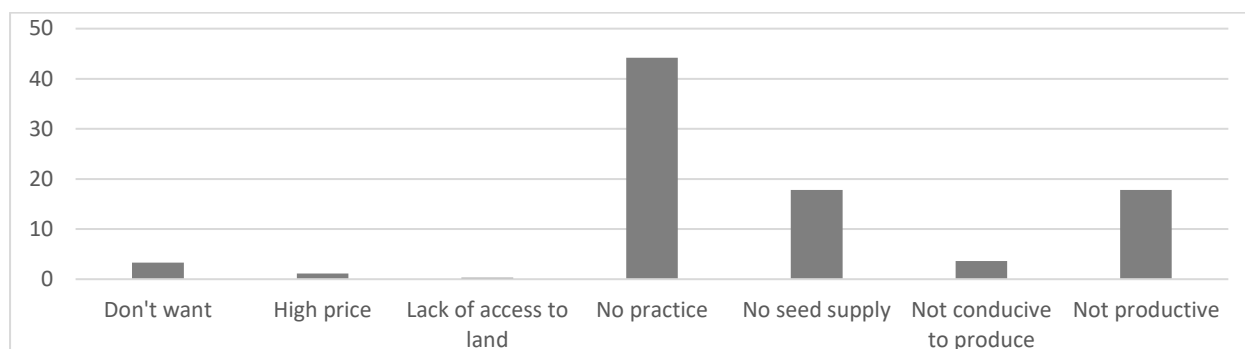


Figure 4 - Reason for not using improved chickpea

Household heads were also found to widely use chemical fertilizers, pesticides, insecticide and herbicide. On average more than 95% of the household respondents implemented all the package. The result on Table 4 depicts a lower use of amount of urea and NPS among female headed household heads. Location wise comparisons show no uniform disparity of fertilizer application (Table 5). Almost 100% of the respondents use crop residue from lentil and chickpea as animal feed. 99% of the respondents use residue from lentil. Using residue from chickpea is not that common in the area. However, the use of chickpea residue is higher for those living in Gerba and Jihur, 17% and 13% respectively. Implementation of crop residue technique is similar among male and female headed households.

In 2017's main agricultural season, a household on average harvested about 3,065 kg of main crop, and 285 kg of associated crop. There is no statistically significant difference on quantity of crop harvested among men and female headed households. Larger quantity of crop was harvested in Mangudo (3437kg) than in Gerba (3191kg). It is important to note that more than 95% of the household can cover their food needs from their own production. When translated into number of months, a household is on average able to meet the family food needs for 11.63 months through own production. A similar trend was registered among male and female headed households. However, this is not the case for most parts of the country where farmers are not food self-sufficient. Among the 4 kebeles considered in the study, the greatest level of food self-sufficiency was reported in Kussay kebele (99%) followed by Jihur 92%.

Gender Roles on Agricultural Activities

It is advisable to study gender roles on agriculture to analyze time allocation among household members, to capture gender difference on labour allocation, to study experience of members on agriculture, to make appropriate recommendations for improved and efficient performance in agricultural activities. Table 5 presents roles of household members on each agricultural activity. Analysis of collected data indicate that men predominantly engage in ploughing, planting, and fertilizer application; while both men and women focus on weeding, harvesting, packaging, marketing, and feeding; and women played predominant roles in processing animal products. Household use hired labor mainly during harvesting and rarely use child labor to meet labor demand.

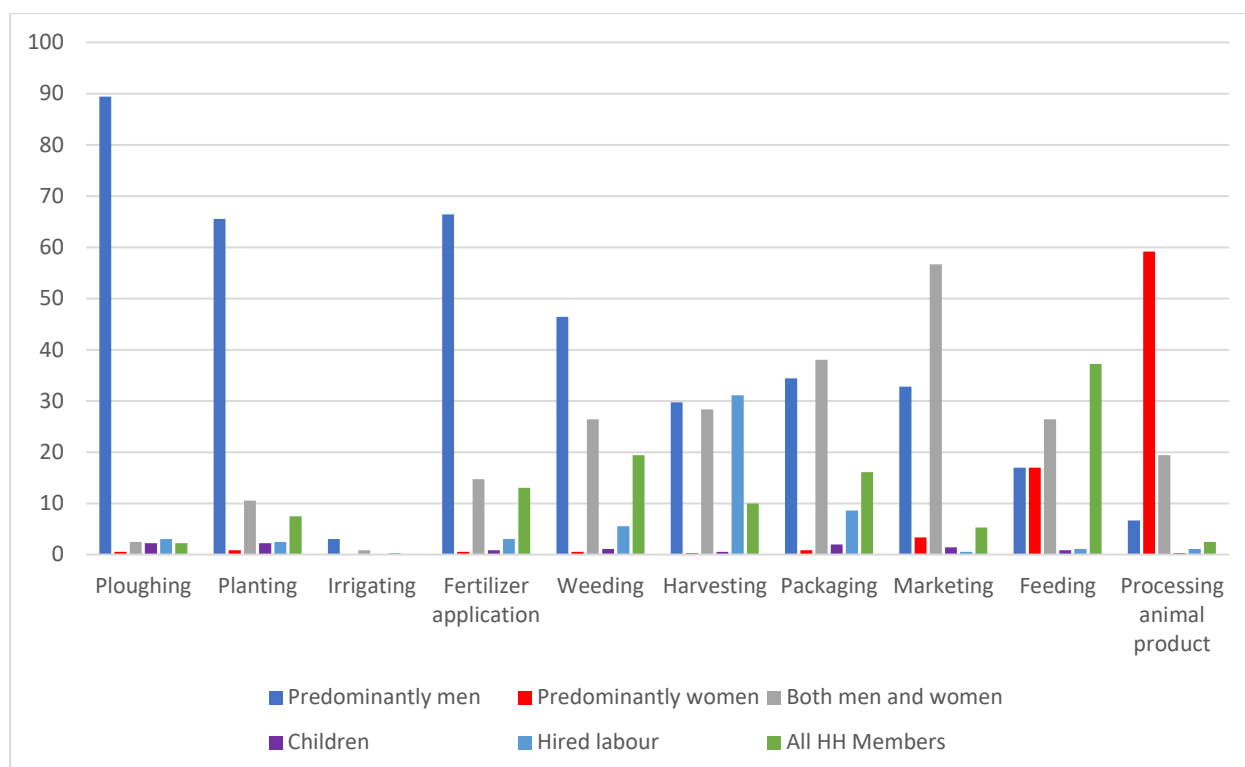


Figure 5 - Gender roles on agriculture

In general, the finding shows that all heads have a good experience of agriculture, application of agricultural technologies including cereal-legume association. Hence, farmers in the study area are considered to have a strong human capital in terms of agricultural experience. Analysis of gender roles also indicate even distribution of roles between males and females. There is also not that much difference on application of agricultural technology between female and male headed households.

Natural Capital

To analyze natural capital of the study object; it is vital to focus on the existence of different kinds of natural resources that are important for agriculture including location, land size, infrastructure, and water (UNDP, 2017). These variables were considered as proxy indicators to assess the bigger picture.

Location

Distance, or location of the farm from main service providers including markets, is one of the factors that affect farmers' access to improved agricultural technology packages. It was found that, on average a household located 5.30km far from the nearest market (Table 7). In the presence of transportation, the market could be accessible. However, it is interesting to note that the female headed households need to travel 6.2 km to get the nearest market while male headed to travel 5.23km (Table 8). The respondents asked how long it will take for them to access paved road and male respondents can get the paved road with 0.9km distance whereas female are getting it by travelling 8km. In addition, there is a big difference among male and female heads on accessing water bodies such as lake, pond or river. Male headed can access water bodies with a distance of 0.68km whereas female resides relatively far away from water bodies (.9km). Even though the difference between male and female headed household on access to market, paved road and water bodies are not statistically significant; women seem to be relatively disadvantaged in accessing

water bodies, market and paved road which could show the presence of lower natural capital as compared to men. It was summarized on Table 9 that residents of Mangudo are living far from market whereas those living in Jihur can access market within a shorter period. The table also shows that water bodies can be accessed relatively within a shorter period for households living in Jihur (.52km) and Mangudo (.58km) than in Kussay (.82km) and Gerba(.85km).

Natural Capital Variables	Mean/SD
Distance from residence to the nearest market in km	5.2834(3.7082)
Distance from residence to the nearest paved road in km	.892(1.1674)
Distance from residence to the nearest water bodies (lake/pond/river)	.6944(.8701)
Have access to livestock grazing land	.2361(.4253)
Have access to cropping land	.9917(.091)
Size of total land holding in ha	1.3505(.7048)
Size of private grazing land in ha	.0346(.0898)
Size of communal grazing land ha	.2306(.952)
Size of cropping land in ha	1.5538(.7419)
Total field area cultivated on main season in ha	1.6489(.7196)
Observations	360

Table 7 - Summary of Natural Capital Variables

Land size

Land is one of the natural capital variables that builds the capacity of those having access to it. Especially, in rural Ethiopia land is a scarce resource and the main agricultural input. Ownership of a large area of land is considered as an indicator of wealth and better life. The average size of total land holding of the respondents is 1.35 hectare of land. This is a large number as compared to the average national land holding (between 0.5 to 1ha). During 2017 main agricultural season, a household on average cultivated 1.65 hectare of land (Table 7). There is a statistical difference among male headed and female headed households on the area of land cultivated during 2017 main agricultural season. A female headed cultivated 1.3ha whereas male headed cultivated 1.67 ha of land (Table 8). This shows a relatively lower level of capital among female household heads. Average land holding and total field area cultivated during 2017 main season is slightly bigger for the residents of Gerba and Jihur.

Natural capital variables – per gender (mean for categorical var and T-test for continuous var)	Male Headed (SD) (SE for ttset)	Female Headed (SD) (SE for ttest)	Mean difference (SE) (Female-Male)
Distance from residence to the nearest market in km	5.2329(.2013)	6.1895(.8027)	0.9565 (.8738)

Distance from residence to the nearest paved road in km	.8979(.0629)	.7863(.2934)	-.1116(.2754)
Distance from residence to the nearest water bodies (lake/pond/river)	.6832(.0476)	.8958(.1472)	.2126(.0458)
Have access to livestock grazing land	.2287(.4206)	.3684(.4956)	
Have access to cropping land	.9912(.0935)	1(0)	
Size of total land holding in ha	1.358(.0385)	1.2153(.1258)	-.1427(.1661)
Size of private grazing land in ha	.0342(.0048)	.0421(.0190)	.0079(.0211)
Size of communal grazing land ha	.2229(.0509)	.3684(.2672)	.1455(.2245)
Size of cropping land in ha	1.5682(.0406)	1.2947(.1118)	-.2735(.1745)
Total field area cultivated on main season in ha	1.6668(.7254)	1.3284(.5244)	-.3435(.1689)**
Observations	341	19	

Table 8 - Summary of natural capital variables - per gender of Head

Livestock

North Shoa is well known for livestock. However, the study area is mainly involved in crop production. On average only 24% of the household heads reported that they have access to grazing land. It is interesting to note that 83% and 91% of the household heads reported as they do not have access to private and communal grazing land. Farmers commonly cut and carry feed than grazing their animals. As shown on Table 7 almost 100% of the household heads reported that they have cropping land.

Human capital variables per Kebele	Gerba	Jihur	Mangudo	Kussay
Distance from residence to the nearest market in km	2.3148(2.0976)	2.2289(2.1719)	8.6124(2.2012)	8.2471(1.7419)
Distance from residence to the nearest paved road in km	.9547(.987)	.5764(.8888)	1.6062(1.5708)	.429(.6648)
Distance from residence to the nearest water bodies (lake/pond/river)	.8545(.9494)	.5218(.8571)	.5819(.6747)	.8226(.935)
Have access to livestock grazing land	.0652(.2483)	.1413(.3502)	.4944(.5028)	.2529(.4372)
Have access to cropping land	.9891(.1043)	1(0)	1(0)	.977(.1507)
Size of total land holding in ha	1.5521(.7695)	1.2104(.5564)	1.4225(.7748)	1.2118(.6447)

Size of private grazing land in ha	.0079(.0354)	.0241(.0669)	.0947(.1391)	.0124(.0516)
Size of communal grazing land ha	.0217(.2085)	.0054(.0521)	.7303(1.7759)	.1782(.3811)
Size of cropping land in ha	1.8491(.904)	1.4055(.5881)	1.5965(.684)	1.3546(.6551)
Total field area cultivated on main season in ha	1.961(.8737)	1.4495(.578)	1.7449(.6479)	1.4291(.6035)
Observations	92	92	89	87

Table 9 - Summary of natural capital variables - per kebele

Physical Capital

Physical capital variables such as availability of equipment plays a great role in livelihood analysis. Data on availability of equipment per household has been captured by the number of equipment a household has. In this study, domestic equipment include mobile phone, solar panel, water tank, radio, diesel and electric grain mill. It was found that a household at least has 3 domestic equipment. Male headed household on average have 3 domestic equipment but female have 2. This shows a statistically significant difference among ownership of domestic equipment between male and female heads as shown on Table 10. Under transport equipment there is only bicycle. Only 2 households have bicycle. The first group of farm equipment includes ox-plough, set of tillage equipment, hoes, spades/shovel, sprayer, diesel and manual water pumps. Farmers on average have 5 farm equipment. Female household heads have significantly lower farm equipment than male heads (Table 11). In general, in all equipment types, as shown on Table 11, female has lower number of them even if the statistic doesn't show significant difference. Location wise comparison shows that residents of Mangudo Kebele found to have more number of equipment than those living in other Kebeles.

Physical Capital Variables	Mean/SD
No of domestic equip a hh has	2.9361(1.7675)
No of transport equip a hh has	.0056(.0744)
No of farm equip1 a hh has	4.9583(1.8796)
No of farm equip2 a hh has	.7667(2.7979)
No of bee hives a hh has	.1306(.7019)
No of bullock ploughing hh have now	1.0917(1.0234)
Tropical Livestock Unit	5.9139(2.8471)
Observations	360

Table 10 - Summary of physical capital variables

There is a big disparity on access and control of resources among male and female or household head and spouse among respondents. For example, about 91% of the household heads reported that they have mobile phone. On average per household there are about 1 mobile phone. As shown on Figure 7 and 8

there is a big difference among access and control between household head and spouse. Spouse herewith refer mostly for female. On the other hand, it is encouraging to note that female/spouse has access and control over the equipment mentioned together with the male/head and also under a group of all household member.

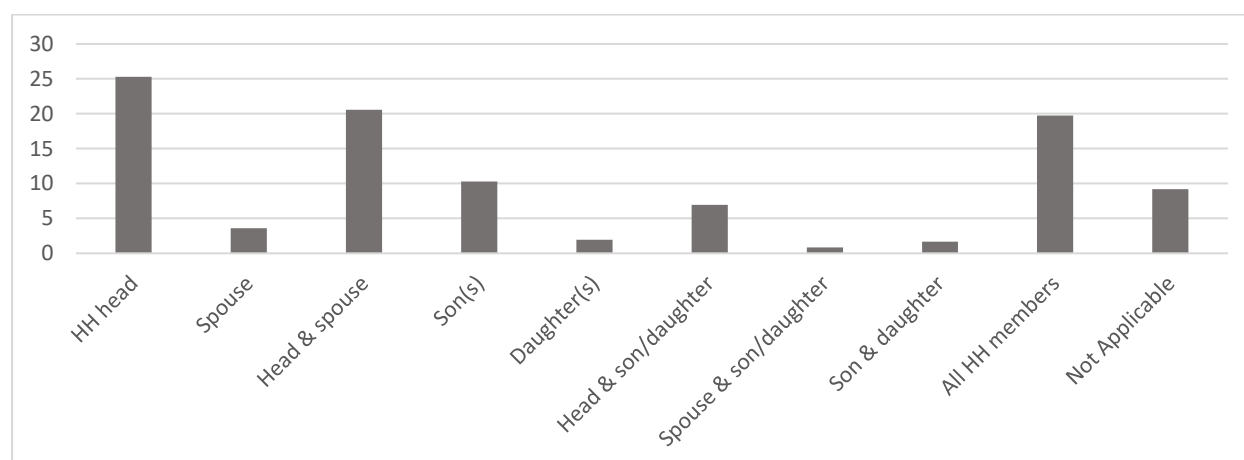


Figure 6 -Access to mobile phone

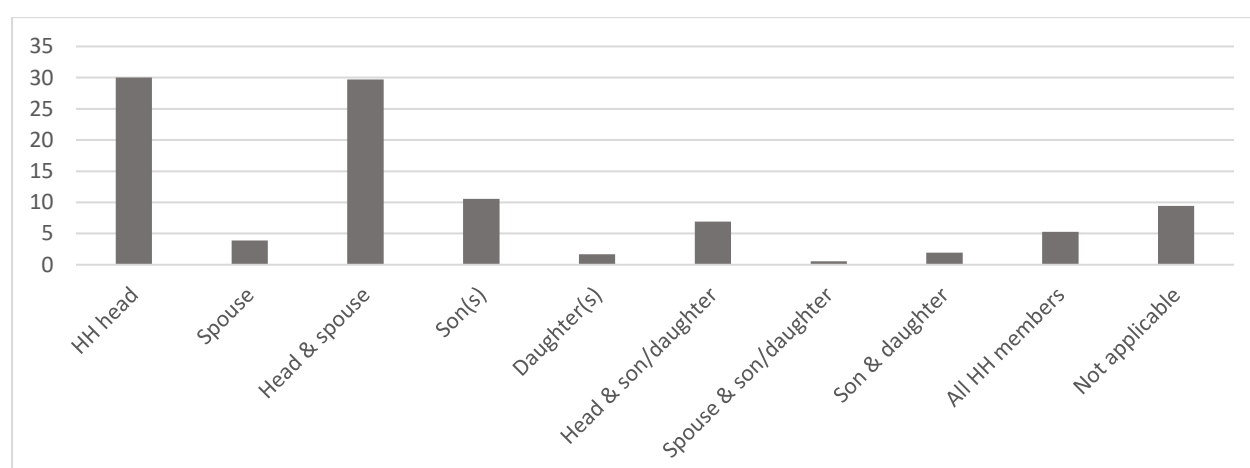


Figure 7 - Control over mobile phone

If we look access and control of the most common equipment such as radio within a male-headed households only the probability of getting spouse alone is nil even if we found access and control over the equipment by household head (male) alone (Figure 9 and 10).

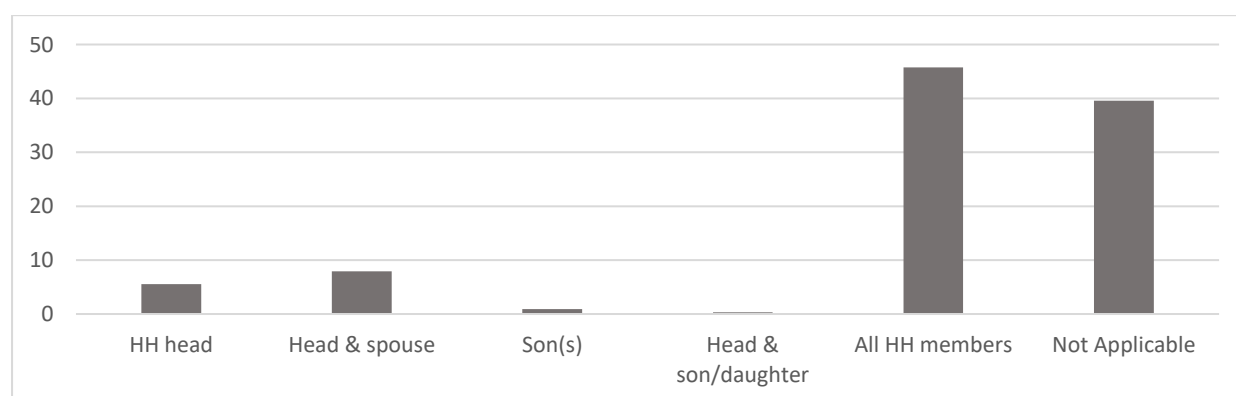


Figure 8 – Access to radio

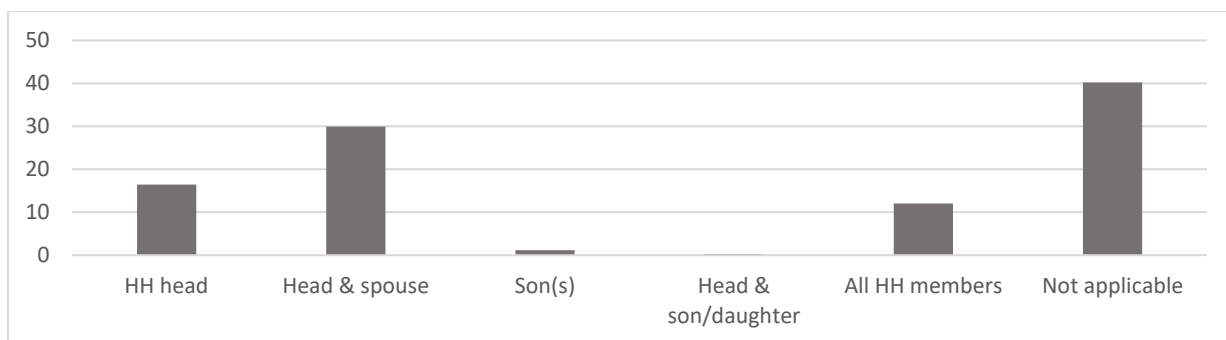


Figure 9 - control over radio

This could explain a relatively lower capital of physical asset among females as compared to male even for common household type as reported by the respondents. An example using one agricultural equipment – the hoe – is presented below. Access and control over equipment is often linked to agricultural roles. The unequitable access and control of such equipment will thus be correlated to reported roles in the second phase of the study.

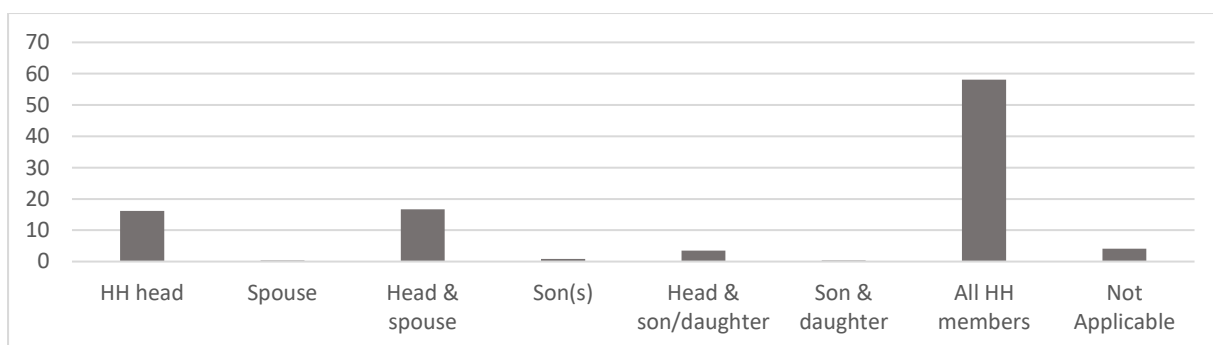


Figure 10 - Access to agricultural equipment - hoe

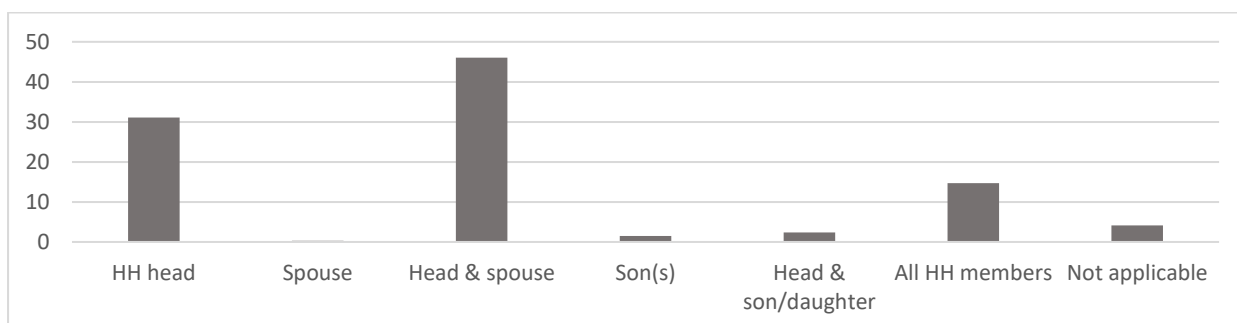


Figure 11 - Control over agricultural equipment - hoe

Hoe is an equipment can be handled also by female. The summary of results on Figure 11 and 12 shows that in a couple households' men could have a possibility of better access and control for a simple agricultural equipment relative to women. But it is to be noted that women have access and control over the equipment – not by herself alone but together with her husband and with a power equal to all household members. The Figures depict that as far as control is concerned power is concentrated under the household head and household head and spouse together. This shows even if a wife has a power on equipment it is together with the husband but don't have a separate power.

Physical capital variables – per gender (mean for categorical var and T-test for continuous var)	Male Headed (SD) (SE for ttset)	Female Headed (SD) (SE for ttest)	Mean difference (SE) (Female-Male)
No of domestic equip a hh has	2.9824(.0961)	2.1053(.3234)	-.8771(.4146)**
No of transport equip a hh has	.0059(.0041)	0(0)	-.0058(.0175)
No of farm equip1 a hh has	5.0059(.1019)	4.1053(.3815)	-.9006(.4411)**
No of farm equip2 a hh has	.7947(.1552)	.2632(.1682)	-.5315(.6598)
No of bee hives a hh has	.1378(.0369)	0(0)	-.1378(.1655)
No of bullock ploughing hh have now	1.1056(.0557)	.8421(.2060)	-.2634(.2411)
Tropical livestock Unit	5.9787(.1522)	4.7505(.7549)	-1.2282(.6689)*
Observations	341	19	

Table 11 - Summary of physical capital variables - ttest per gender of head

A household found to have on average 6 TLU (Total livestock Unit) (Table 12). On average a household has 3 cattle with a maximum of 12 per household, 4 sheep with a maximum of 31 per household, 2 equines with a maximum of 11, and 4 poultry with a maximum of 100. As presented on Table 13 below, female headed households have lower TLU than male heads. The difference is also statistically significant. This could explain lower level of physical capital among females than male heads.

Physical capital variables per Kebele	Gerba	Jihur	Mangudo	Kussay
No of domestic equip a hh has	2.7609(1.4629)	2.9348(1.5249)	3.2697(2.3634)	2.7816(1.5584)
No of transport equip a hh has	.0109(.1043)	.0109(.1043)	0(0)	0(0)
No of farm equip1 a hh has	5(2.3157)	4.5761(1.5845)	5.3596(1.854)	4.908(1.604)
No of farm equip2 a hh has	.7391(1.2655)	.4457(.9874)	1.427(5.2654)	.4598(.9621)
No of bee hives a hh has	.087(.3824)	.0652(.2892)	.2921(1.2721)	.0805(.3484)
No of bullock ploughing hh have now	1.1522(.9714)	1.087(.9568)	1.2697(1.1752)	.8506(.9466)
Tropical livestock Unit	5.6737(2.5794)	5.5886(2.6128)	7.3345(3.2718)	5.0587(2.3702)
Observations	92	92	89	87

Table 12 - Summary of physical capital variables - per Kebele

As a summary female found to have access and control over domestic as well as agricultural equipment together with her husband and family member. There is less chance for women to have access and control over the equipment as a husband has. Besides, women found to have less physical capital measured through TLU as compared to male household head. This is also interesting as more women than men are involved in processing and marketing of animal products.

Financial Capital

Financial capital refers to the financial resources that people use to achieve their livelihood objectives. It includes flows such as stocks, consumption as well as production, transfer of money (UNDP, 2017). In this study, a household's status on financial capital is captured by a variable that examines the household's involvement in credit association, receipt of remittance, and income generated. It was found that about 59% of the households have at least one member of credit association (Table 13). Figure 12 depicts age and sex groups that are a member of the credit association.

Financial Capital Variables	Mean/SD
Household has member of credit association	.5889(.4927)
Household receiving remittance	.0444(.2064)
Yearly total income from activities	47406.23(29468.3)
Observations	360

Table 13 - Summary of financial capital variables

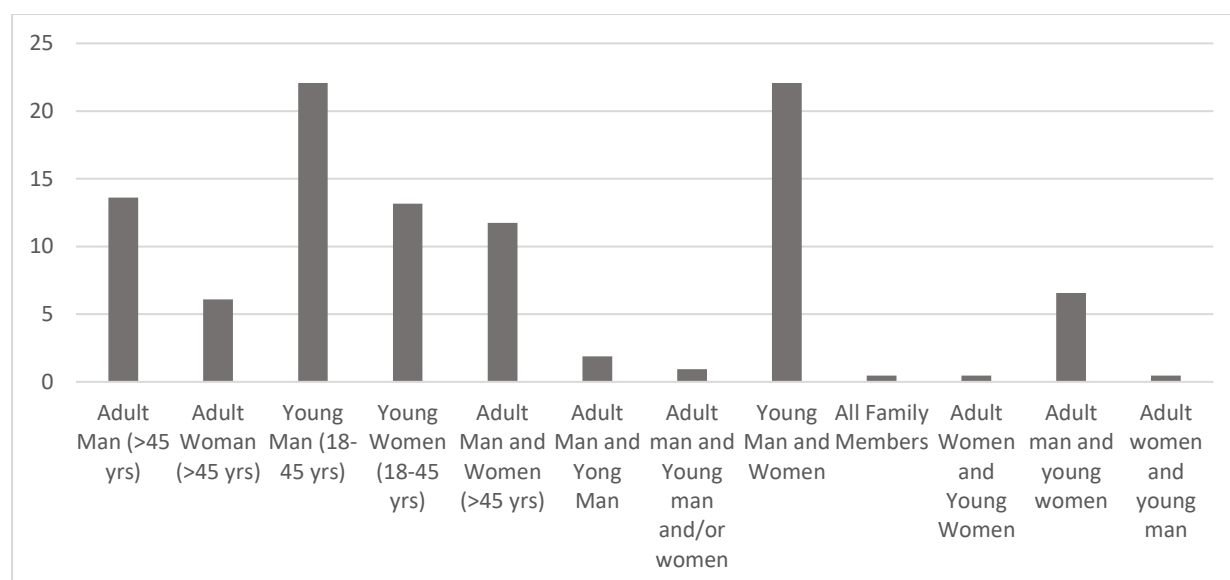


Figure 12 - Who is a member of credit association?

It shows that the highest groups that are member of the credit association are young men and women, followed by young man. From Figure 13 it can be easily recognized that among adult man and woman which are greater than 45 years of age; more adult men became a member of the credit association. Between young men and young women which are between 18 to 45 years of age, similarly young men have more access to credit association. However, it was reported that men and woman to have equal opportunity and ability to become a member of credit association group.

Financial capital variables – per gender (mean for categorical var and T-test for continuous var)	Male Headed (SD) (SE for ttest)	Female Headed (SD) (SE for ttest)	Mean difference (SE) (Female-Male)
Household has member of credit association	.5982(.491)	.4211(.5073)	
Household receiving remittance	.044(.2054)	.0526(.2294)	
Yearly total income from activities	47492.2(1588.75)	45863.16(7463.63)	-1629.045(6955.44)
Observations	341	19	

Table 14 - Summary of financial capital variables - ttest per gender of heads

Table 13 presented mean of participation on variables related to financial capital and comparison of the means. It was found that male headed participated more on credit institutions than female headed households with a percentage of 60% versus 42%. Residents of Jihur have participated more than other kebeles (Table 15).

Financial capital variables per Kebele	Gerba	Jihur	Mangudo	Kussay
Household has member of credit association	.5217(.5023)	.6739(.4713)	.6404(.4826)	.5172(.5026)
Household receiving remittance	.0326(.1786)	.0543(.2279)	.0674(.2522)	.023(.1507)
Yearly total income from activities	49882.54 (32991.69)	43691.96 (26279.72)	52283.95 (33613.56)	43725.47 (22949.55)
Observations	92	92	89	87

Table 15 - Summary of financial capital variables - per Kebele

It is not usual for a household living in the study area to get income from remittance. Only 4% of households on average receive remittance (Table 13). It is interesting to note that female headed households receive remittance than male headed households (Table 14). Average yearly income is also relatively lower among female headed households as compared to male but the result on Table 14 shows that the difference is not statistically significant. Table 15 also shows total yearly income is higher for those living in Mangudo and Gerba Kebeles. This demonstrates residents of these Kebeles might have more financial capital.

Overall, female might have relatively less chance to be a member of credit association, they have access from remittance income than male headed and those living in Mangudo and Gerba are getting relatively more income from income generating activities.

Social Capital

It refers to the social resources which individuals rely on in order to achieve certain objectives relating to livelihoods such as network and connection, participation on formal and informal groups and relations of trust, reciprocity and exchange that facilitate co-operation(UNDP, 2017).

Social Capital Variables	Mean/SD
Respondent participate in social activity	.4194(.4942)
Household has member of farmer association	.8778(.328)
Observations	360

Table 16 - Summary of social capital variables

Respondents were asked if they participated in social activity. On average 42% of the respondents confirmed their participation in social activities (Table 16). However, the percentage of participants who joined social activities were highly lower if the respondents are female (Table 17). It is good to know that 88% of the households have members in farming association. Again, as shown on Table 17 the percentage of households that have members in farming association is lower for female-headed households (73% vs 89%).

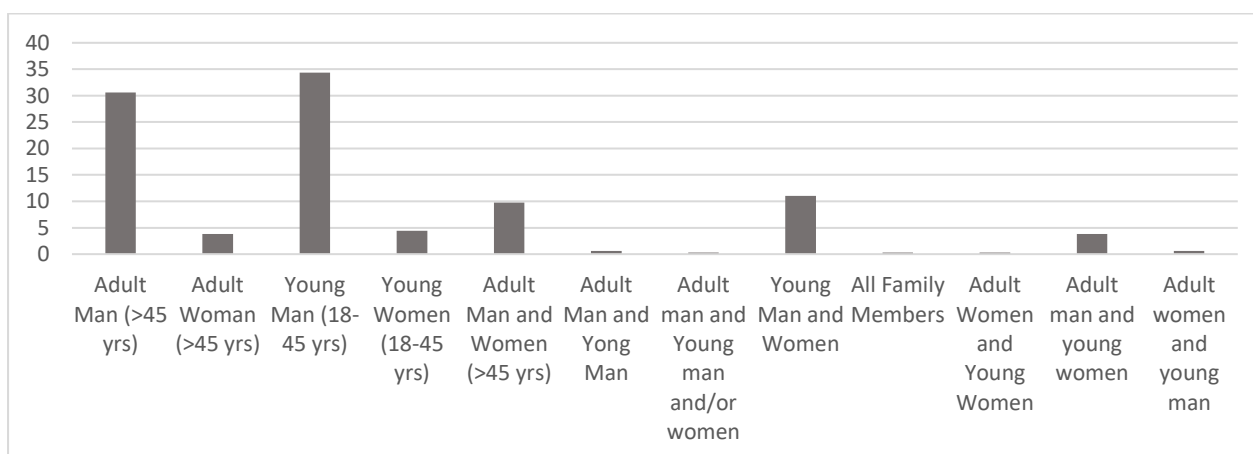


Figure 13 - Who are member of farmer association?

Like the membership composition of credit associations, adult man older than 45 years have more chance to participate than their counterpart adult women who are older than 45 years. Moreover, among young men and women between 18 and 45 years old, 34% of young men are member of agricultural association whereas only 4% of young women are member of agricultural association. This shows that there is a great difference on level of social capital between men and women farmers in the study area on which women became disadvantaged.

Social capital variables – per gender (mean for categorical var and T-test for continuous var)	Male Headed (SD) (SE for ttset)	Female Headed (SD) (SE for ttset)	Mean difference (SE) (Female-Male)
Respondent participate in social activity	.4282(.4955)	.2632(.4524)	
Household has member of farmer association	.8856(.3187)	.7368(.4524)	
Observations	341	19	

Table 17 - Summary of social capital variables - ttest per gender of heads

In Ethiopia, extension service plays a great role on information dissemination and improving adoption of agricultural technology. As explained on Figure 15 about 80% of farmers reported that they are getting extension service on crop, and livestock, but only 65% are getting information on marketing related activities.



Figure 14 - If the household is getting extension service

Social capital variables per Kebele	Gerba	Jihur	Mangudo	Kussay
Respondent participate in social activity	.46(.50)	.42(.50)	.38(.49)	.41(.50)
Household has member of farmer association	.82(.39)	.86(.35)	.89(.32)	.95(.21)
Observations	92	92	89	87

Table 18 - Summary of social capital variables - per Kebele

As shown on Figure 16 among households that are male headed; the household head or the husband has frequent contact with extension service on crop, livestock as well as marketing. This demonstrates how females are disadvantage in accessing information regarding agricultural activities in the study area.

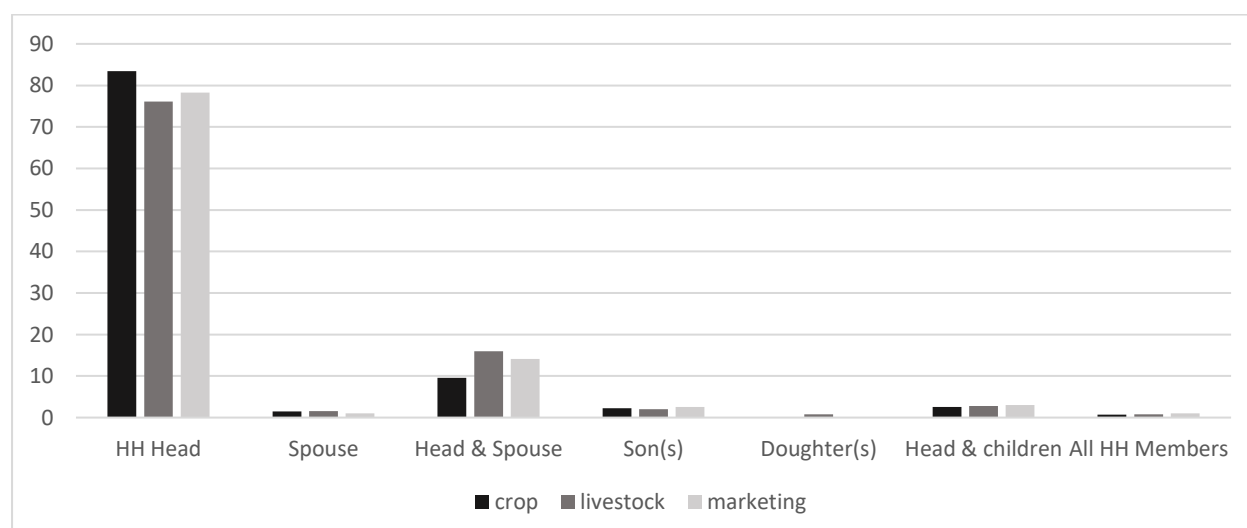


Figure 15 - Who has direct contact with extension agent?

Conclusion

Several cereals and pulses including long maturing crops of wheat, teff, sorghum, lentil, chickpea, fababean, and mung bean are grown in the Amhara region under rainfed agriculture. However, most of the cereal production is used for home consumption, saved as seed, and a small proportion is sold in local markets. Pulses, on the other hand, contribute to income generation as do livestock.

Preliminary analysis of the household data collected in the study area of Moretina Jiru Woreda (District), revealed that there was no significant difference on the average age of men and women heads of household and that heads are on average literate. However, several differences were noted between male- and female-headed households in terms of their human, natural, physical, financial, and social capital endowments in relation to adoption and use of improved agricultural practices. Some of the highlights of the findings are presented below.

- There is a statistically significant gap on area of land cultivated between male (1.67ha) and female (1.3ha) headed household in 2017 main season. This shows a relatively lower level of natural capital among female household heads.
- Female-headed households have lower number of members, as well as lower number of adults. The difference in household size is statistically significant. This means lower human capital than male headed households as household in the area only use hired labor during harvesting and rarely use child labor to meet labor i.e. most of the labor demand is met by the adults in the household.
- Female household heads were relatively more engaged in non-farm activities as compared to male heads (21% vs 12%). However, the findings show that women's participation was mainly in non-farm activity that do not generate substantial income such as selling of firewood, processing and marketing food and drinks that help cover their day-to-day expenses but do not make substantial change in their livelihoods.
- Female-headed households were found to play predominant role in processing animal products
- Analysis of collected data indicate that men predominantly engage in ploughing, planting, and fertilizer application; while both men and women focus on weeding, harvesting, packaging, marketing, and feeding; and women played predominant roles in processing animal products.
- Substantial difference was noted between male and female-headed households on access to water bodies such as lakes, ponds or rivers; as well as proximity to paved roads. It was found that male headed households had better access to these resources – though the differences were not statistically significant.
- Female-headed households have lower Total Livestock Unit (TLU) than male heads, and the difference is statistically significant.
- While it was reported that men and woman to have equal opportunity and ability to become a member of credit association group - It was found that male headed participated more on credit institutions than female headed households with a percentage of 60% versus 42%.
- There is less chance for women to have access and control over agricultural equipment as compared to their male counterparts.
- Average yearly income was relatively lower among female headed households as compared to male though the difference is not statistically significant.
- Differences were also noted in membership in agricultural associations among young men and women between 18 and 45 years old. It was found that 34% of young men are member of agricultural association whereas only 4% of young women are member of agricultural association.
- Female-headed households' access to or direct contact with extension agents for information on crop, livestock and marketing was substantially lower than male-headed households

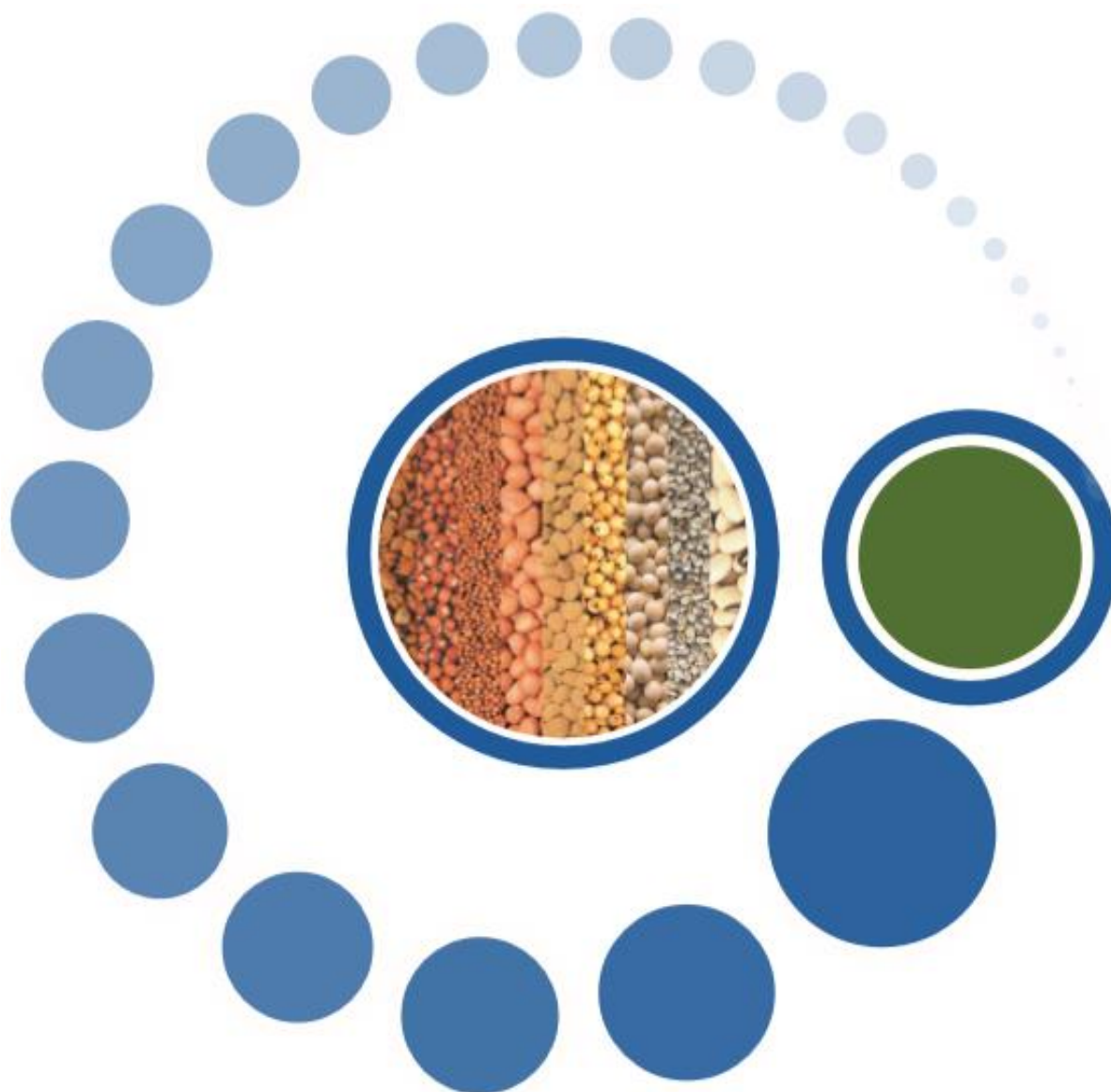
The differences between male- and female-headed households in endowments and opportunities is expected to have a direct implication on the types and extent of adoption of improved agricultural

practices. The findings will be used to guide further exploration of the implications of these differences when juxtaposed on other relevant variables including *age, wealth, and location* to determine potential interventions for equitable promotion and adoption of recommended practices.

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