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Gender Dynamics in Small Scale Irrigation Agriculture among Smallholder Farmers in Lume District in the Central Rift Valley of Ethiopia

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Abstract
Ethiopian economy predominantly depends on rain-fed agriculture. The sector is anticipated to support the whole economy and to change its structure. However, the country is highly affected by drought and millions of people are left without sustenance frequently. As an option, small scale irrigation schemes are important to reduce vulnerability and increase productivity. In this aspect, it is important to consider the implication of gender in irrigation crop farming under small scale scheme. This study was aimed to investigate irrigation agriculture among smallholder farmers and gender dynamics in Lume district in the Central Rift Valley of Ethiopia. Both quantitative and qualitative data collection was used and purposive sampling technique was implemented to select four peasant associations in the district. Households were stratified into male headed households and female headed households and simple random sampling was used to proportionally select 165 households from both groups (135 male headed households and 30 female headed households). Key informant interview, focus group discussions and household survey were also used to collect primary data. The data analysis was carried out by using descriptive statistics, one way ANOVA and chi-square tests. Results of the study showed that there was a significant difference in irrigation crop preference between male and female headed households. Male headed households mostly prefer high value crops such as onion, tomato and cabbage, while female headed household prefer easily manageable and low water demanding crops. Results on engagement in management practices revealed that female headed household mainly participate in planting, weeding, hoeing, harvesting, while male headed household are widely involved in land clearing, cultivation, crop watering, disease and pest control and transporting. The study has concluded that gender has significant roles and implications in small scale irrigation agriculture through its direct influence in participation, labor division and crop preference. Finally, the study suggests that improving the involvement of female headed households in irrigation agriculture, special consideration should be given by government and non-governmental organization.
Keywords: Crop preference, Female headed farmers, marketing agricultural crops, Vegetable production

INTRODUCTION

In Ethiopia, the agricultural sector creates employment for about 84% of the population and it accounts for 45-50% of the GDP of the country and makes the largest input to raw materials for agro-industries and food security (Teshome, 2006). Smallholder farms are pre-dominant and account for more than 90% of agricultural production and cover over 95% of the total area under cultivation (Tiruneh *et al.,* 2001; MoFED, 2010).

The country is dominated by small scale agriculture with rain fed dependant, traditional as well as subsistence farming with limited access to technology and institutional support service (Beyera, 2004). According to a report by FAO (2003), to overcome the dependency on rain-fed agriculture, it is crucial to shift and expand irrigation agriculture. Likewise, Awulachew *et al,* (2005) indicated that improving irrigation agriculture ensures food security, improved livelihood status and alleviates poverty.

Ethiopia has great irrigation potential, which is estimated as 5.3 million hectares of land of which 3.7million hectares can be developed using surface water sources and 1.6 million hectares using ground water and rain water management (MoFED, 2010; Awulachew and Ayana, 2011).

The average crop yields per hectare from irrigated land increases 2.3 times higher than the yield produced by rain fed agriculture (FAO, 2007). However, currently irrigated agriculture produces less than 3% of the total food production of the country (Atnafie, 2006). As a result, the productivity of the agricultural sector is very low and lags behind the rate of population growth and partially reinforcing food insecurity in the country (Awulachew *et al.,* 2010).

This is mainly due to poor water storage capacity and large spatial and temporal variations in rainfall, there is no sufficient water available for most small-holder farmers to produce more than one crop per year (Taffese, 2003; MoFED, 2006). This results in frequent crop failures followed by dry spells, occurrence of severe droughts and produce significant soil erosion which may reduce the potential productivity of farmlands (Awulachew *et al*., 2010).

On the other hand, the correlation of gender and agricultural productivity of irrigated crops is inversely

associated to each other. Mostly women's lack of independent access to and control over land and water threatens household food security (Sileshi *et al.,* 2011). In developing countries women are responsible for more than half of the food produced and they represent a large number of labor forces in the world (FAO, 2011). Women contributes 43% of global agricultural labor force, but this figure overlooks considerable variation across regions and within countries according to age and social class (FAO, 2010).

In general, the agricultural sector is under performing, in part because women, who represent a crucial resource in agriculture and the rural economy through their roles as farmers, laborers and entrepreneurs, almost everywhere, face more severe constraints than men in access to productive resources. Especially when we come to irrigation agriculture it is predominantly controlled by men who lead to the assumption that farm household resources and labor are effectively controlled and allocated by males only. Women constitute half of the rural farming community in Ethiopia; they contributing 49% of labor in over all agriculture and 70% of household food production (World Bank, 2010; Getahun Sileshi *et al*., 2011). They play a vital role in decision-making in agriculture and in the adoption of agricultural sector.

Small scale irrigation agriculture has many important implications for gender mainstreaming and gender relations. Since most of the time irrigation is undertaken on a small plot of land with intensive care, vegetables are traditionally placed in women's domain. It can be a major tool to increase women's empowerment both through greater access to and control over household income and improvements in quality of life (Van Koppen *et al.,* 2012). However, even if women are considered as key actors for irrigation agriculture, they are still benefiting little at the individual, household, community and national levels. Within productive resource control issues, access to small garden and irrigation farmland for women has remained an important component of household food supply. However, even though both men and women are participated in irrigation farming; irrigation farming has been categorized as men's work because women are not perceived as the direct stakeholders.

So, female headed farmers are lesser involved in irrigation agriculture than male headed farmers in the study area. Most of the time gender based constraints have been found to reduce women's efficiency as farmers and decision-makers of resources. In general, women's contributions often unrecognized, invisible, exacerbated by poor working conditions and fallback by limited opportunities for improvement.

On the other hand, the expansion of small scale irrigation agriculture is usually complicated by so many problems which include lack of improved technology, skilled man-power, access to market and market information, extension service and input supply. All these constraints are undermining the participation of female headed in irrigation agriculture. Thus, previous studies that were done on small scale irrigation schemes have mainly focused on men. No study was done on the role of gender in small scale irrigation among smallholder farmers in the study site. Women's level of participation in decision-making processes in small scale irrigation schemes remains to be one of the major challenges especially in relation to gender role. Therefore, the general objective of this study was to assess the relationship between gender and agricultural production activities in the context of irrigation management among smallholder farmers in Lume District. Specifically, to assess the major types of crops produced under small scale irrigated farmlands and to explore and describe the involvement of women in small scale irrigation agricultural management activities.

RESEARCH METHODOLOGY

Description of the Study Area

The study was conducted in Lume District, East Shewa Zone of Oromia region in the Central Rift Valley of Ethiopia. It is located 70 kilometers to the East of Addis Ababa, Capital City of Ethiopia. The district is geographically located between 8^0 24'- 8^0 51' N latitude and 39^0 1'-39^0 17'E longitudes (Ayele and Kideghesho, 2004). The total land area of the district is 75,220ha, which comprises a total of 35 Peasant associations (WIO, 2015). Lume is bordered in the South with Bora district, in the East Adama district, in the North Amhara region, in the West Ada'a Chukala district and in North-west with Gimbichu district (ibid.). The administrative center of the district is Modjo town. The other rapidly growing town in the neighbored is Koka-Negeho town.

RESEARCH DESIGN AND SAMPLING TECHNIQUES

The study was carried out in Lume district which comprises 35 rural PAs. Before selecting PAs to be included in the sample, the total PAs were stratified into small scale irrigation user and non-user areas. Based on this, 13 PAs are classified as the area participating in small scale irrigated agriculture, while the remaining 22 are in non-irrigated PAs. As the study has focused on small scale irrigation agriculture, attention was given to the irrigated PAs of the district and the samples were also selected from those PAs. Hence, four PAs namely, Koka-Negeho, Derara-Dembel, Ejersa-Jorro and Dungugi-Bekela were selected purposively by considering the irrigation potential and its representativeness in reflecting the realities of small scale irrigation users in the district. The number of sample size was determined using the formula developed by Israel (2012).

Formula used for sample size determination is:-

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

Where, n = № of sample size
N= total № of population
e = is the level of precision (3%, 5%, 7% and 10%), but 7% precision was used

Since the total number of HHs engaged in small scale irrigation agriculture in the 4 (four) sample PAs were 772, the sample size required (n) in the study was 165 HH were included. To meet the objectives of the study, heterogeneous type of households (HHs) were used in terms of sex and stratified into male and female headed households. These led to the classification of two sex categories (MHH and FHH) in each sample PAs in order to create opportunity of entering both FHH and MHH into the sample. Accordingly, the total number of sample households was proportionally divided between male headed and female headed households. Therefore, 165 households consisting of 135 male and 30 irrigation users female were selected using simple random sampling technique from the specified peasant associations.

Method of Data Collection and data Analysis

For the purpose of this study, both quantitative and qualitative data were collected. In addition to this, secondary data sources were used to supplement the primary data. Primary data was collected from KIs, FGDs and HH survey. Unlike primary data, secondary data was obtained from relevant published and unpublished data sources. Qualitative data was used to capture information pertaining to local perception and opinions on the gender and irrigation issue using key informant interview and FGD.

The collected data was analyzed by using appropriate statistical tools like one way ANOVA and chi-square test. In addition, descriptive statistics (mean, frequency and percentage) analysis was used to analyze the collected data using SPSS version 16. The qualitative data were analyzed and described through opinion interpretations after being organized and categorized. Means that exhibited significant differences were compared using Tukey's honest significance difference (HSD) at 95% interval.

RESULT AND DISCUSSION

Demographic characteristics

The total sample of the study is composed of 81.8% MHHs while the remaining 18.2% is small scale irrigation agriculture participant FHHs.

Table 1: Demographic characteristics of the Respondents

	Households (n=165)				
Age of HHs	MHH (n=135)	FHH (n=30)	Average	χ^2	P value
20-30	20	13.3	18.7		
31-55	65.2	70	66		
>55	14.8	16.7	15.3		
Total	100	100	100	7.4	0.69NS
Respondents	**Family size**				
	Minimum	Maximum	Mean	Std. Error	F-value
MHH (n=135)	2	13	5.94	0.23	
FHH (n=30)	3	7	4.46	0.23	
Average	2	13	5.67	0.199	8.51 (0.04)**
Marital status	MHH (n=135)	FHH (n=30)	Average	χ^2	P-value
Married	98.5	0	80.5		
Widowed	1.5	63.3	12.72		
Divorced	0	36.7	6.67		
Total	100	100	100	15.28	0.000*

Note: - * *significant at P<0.1and* ** *significant P<0.05*

The mean age of the sampled households is 41 with minimum and maximum age of 21 and 70 respectively. More than half of MHHs and FHHs are in "middle age" group (31-55) and the proportion of younger household heads is higher for MHH groups (Table 2).

The average family size for both MHH and FHH was 5.67 in the study area which is smaller than the national average family size of 6.4 people per household.

Concerning the marital status, t 98.5% of MHHs are married while the remaining 1.5% are widower. In contrast, 63.3% of FHH are widowed while 36.7% of them are divorced. The chi-square test result shows that the presence of significant difference (P<0.1) between MHH and FHH in marital status (Table 2).

Socio-economic Characteristics of the Respondents

Table 2: Socio-economic characteristics of the respondents

	Respondents(n=165)				
Educational Status	MHH(n=135)	FHH(n=30)	Average	χ2	P value
Uneducated	31.9	66.7	38.2		
Read and Write (1-4)	42.2	26.7	39.4		
Elementary School (5-8)	22.2	3.3	18.8		
High School (9-12)	3.7	3.3	3.6		
Total	100	100	100	13.97	0.007**

Wealth Status*	MHH(n=135)	FHH(n=30)	Average	χ2	P- Value
Poor	14	60	22.3		
Medium	44.7	36.7	43.9		
Rich	41.3	3.3	33.8		
Total	100	100	100	33.7	0.000**
*Local Wealth Classification Criteria is used					
Wealth class	Land holding size	Livestock ownership (TLU)			
Poor	≤ 1ha	≤ 5			
Medium	1.25-3ha	10-Jun			
Rich	>3 ha	>10			

TLU	MHH(n=135)	FHH(n=30)	Average	χ2	P value
≤ 5	5.2	10	6.1		
	17	43.3	21.8		
>10	77.8	46.7	72.1		
Total	100	100	100	12.1	0.02**

Land holding size	MHH (n=135)	FHH (n=30)	Average	χ2	P value
≤ 1 hectare	14.1	60	22.4		
1.25-3 hectares	44.4	36.7	43.1		
>3 hectares	41.5	3.3	34.5		
Total	100	100	100	33.7	0.000**

*Note: - **significant P<0.05*

Education is an important factor that plays a main role on household decision in adopting new technology. It helps much in creating awareness on new technologies and its applications. The study showed that most of the sample respondents are found to be uneducated and remain at the level of read and write (1-4). The result also found that the number of FHH irrigation users that stay uneducated is twice larger as compared to uneducated MHHs (Table 3). From the total sample respondents only few households have completed their high school. In general, the result shows that, MHHs have better education opportunity than FHH ones. Furthermore, the statistical test indicates that, there is significant difference among sex of household heads in their educational achievement (P<0.05).

Large proportion of FHH is in the poor category as compared to MHH (Table 3). The result shows that statistically there are significant difference in wealth status between MHHs and FHHs (P<0.05). Therefore, in the study area MHH irrigation users are better in wealth status than FHH irrigation users.

The minimum and maximum TLU owned by the household heads was 4.3 and 37.6, respectively and on average 11.7 TLU. More than half of MHH irrigation users that constitute >10 TLU and only the rest 5.2% owned ≤ 5 TLU. On the other hand, about 46.7% of FHH irrigation users owned >10 TLU (Table 3).

The minimum and maximum size of land owned by the respondents is 0.25 and 10.75ha, respectively. On the contrary, the average landholding by MHH irrigation users is about 2.27ha whereas 1.4ha of land is owned by FHH irrigation users and of course this is higher than the country average landholding size which is less than 1ha per household (Dessalegn and Taye, 2006). In general, out of the total interviewed households, 41.5% of MHH respondents owned land size greater than 3ha while only 14.1% of them owned ≤ 1ha of land (Table 3).

In contrary, about 60% of FHH owned ≤ 1ha of land and only 36.7% of them owned 1.25-3ha of land. As indicated in Table 3, the rest of only 3.3% of FHH owned greater than 3ha of land. Moreover, there is significant difference between MHHs and FHHs with regard to landholding size (P<0.05). Therefore, FHHs seem to have smaller land size compared to MHHs.

Major Crops Produced Under Small Scale Irrigation Agriculture

According to the result from key informants, focus group discussion, and HH survey, the production in the study area is mainly dominated by irrigation crops such as, onion, tomato water melon, cabbage and kale. In addition, irrigation users also produce green pepper, carrot and beet root but these are limited in terms of area coverage. It is found that out of the major crop produced by irrigation users' onion and tomato are the dominant ones because of the existence of huge demand in the market.

Regarding the frequency of production, most of the irrigation users cultivate twice a year, while only some of them practice this activity three times per year by using supplementary irrigation. The purpose of production is different across the two groups (MHH and FHH). For instance, MHHs produce vegetables for generating income whereas FHHs covers their expense and utilize vegetables for household consumption. Similarly, in terms of area coverage, MHHs have more hectares of land as compared to FHHs.

The difference of crop preference and land size covered by irrigation crops between male and female headed irrigation users could be due to male headed irrigation user's opportunity to access motor pumps, larger cultivable land size, and access to labor force, opportunity to rent in land and adequate oxen to cultivate their land.

On the other hand, during FGD farmers noted that they do not grow perennial horticultural crops because it requires long time for maturity and production and this is not tolerable for subsistence farmers whose livelihood is highly dependent on fast growing seasonal crops. Therefore, only few farmers planted mango, avocado and papaya to a lesser extent around the garden. The volume of production is also very low so it is mostly consumed in the household.

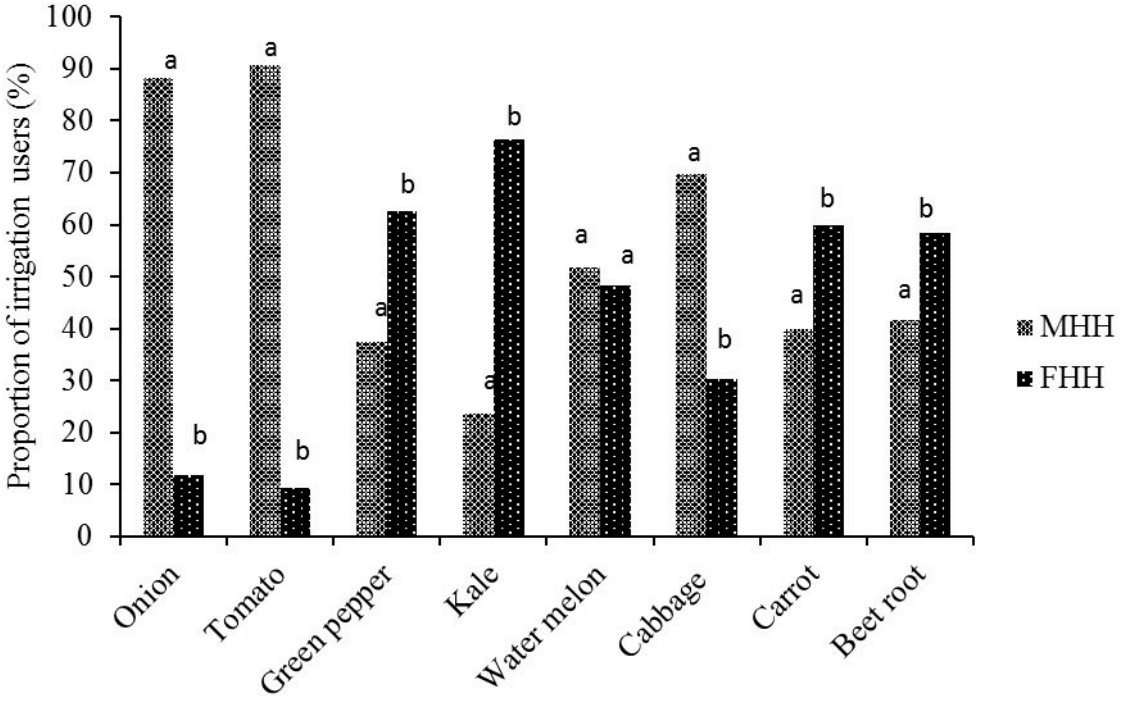

Figure 1: Major crops produced by household type

The HH survey result shows that the crop onion is produced by about 88.2% of MHH irrigation users as compared to only 11.8% of FHH irrigation users in the production of this crop (Figure 1). From the total 11.8% of FHH participants, mostly the women do not directly participate in onion production they simply allow their sons in this activity. The statistical result clearly indicates the existence of significant difference between the two groups with regard to onion production ($P<0.05$). The reason could be due to its much requirements of factor of production such as; high agricultural inputs, labor, high water and time. Onion is also produced by rich farmers and some of irrigation participants in summer since most of the time the price of onion are getting higher during this season. The result is contrary to Van Koppen *et al.* (2001) for the case of India which argued that majority of Indian FHH irrigation users produce onion crop because they have good demand for their onion crops on the market.

Similarly, majority of MHH (90.7%) and FHH (9.3%) of the small scale irrigation users do participate in production of tomato for fresh consumption (Figure 1). Like in the case of onion, the production of tomato is also dominated by percentage of MHH irrigation users. This is also confirmed by the result from chi-square test that shows the existence of significant difference between MHH and FHH irrigation participants in relation to tomato production ($P<0.05$). From the response at the time of FGD, even if the FHH irrigation users are aware of the high market price for onion and tomato, their participation is lower as compared to the MHH small scale

irrigation participants. The lower percentage of female headed households participation in the production of onion and tomato is abundantly associated with the input, labor and capital requirements. This is because the production of onion and tomato needs high initial capital, labor, high water requirement and inputs which is economically not feasible for FHHs. In addition to this, the production of these two high-value crops needs technical knowledge and management skill which makes the production risky in relation to the uncertain market. According to the response from participants getting profit from onion and tomato is highly based on chance because of the variability and difficulties in forecasting the future market prices. This problem is severe in the production of onion and tomato as compared to other small scale irrigation agriculture products. For instance, in the case of other irrigable crops even if loss occurs, the level of risk is completely different and better than the associated risk from producing onion and tomato.

Findings of the survey from figure 1 revealed that 62.5% of the FHH and 37.5% of the MHH are participating in the production of green pepper. This clearly shows that there was significant difference between the two groups (MHH and FHH) with regard to green pepper production ($P<0.05$). Green pepper is disease resistance crop and once planted; yield could be harvested 3 to 5 times and usually FHH irrigation users prefer to produce green pepper. However, the area coverage of green pepper is smaller than other vegetables as a result of its lower price in the market. The result is in line with Tsehaye (2014) who stated that pepper was less commonly produced in Tigray because of the agro-climatic condition of the area is not highly suitable for green pepper.

The result from figure 1 also shows that, a total of 76.3% of FHH irrigation users and 23.7% of MHH irrigation users produce kale. This implies that there was significant difference between MHH and FHH irrigation users in the production of kale ($P<0.05$). Kale is usually preferable by female irrigation users and relatively its area coverage is larger than other vegetables produced by FHH irrigation users. Most of the FHH in the study area are busy with the production of leafy vegetables and earn better profit from it in addition to their home consumption. In addition, women may be expected to show higher concern for feeding the family and thus grow subsistence crops while men may show higher interest to generating cash income and to this end they grow cash crops. The result is similar with Njuki *et al.,* (2014) reported that crop preference between male and female headed households differ; most of the time female irrigation users preferred leafy vegetables for household consumption in rural Tanzania. Similarly, the result agrees to Abera *et al.,* 2006; Gebremichael, 2009 and Mrunalini and Snehalatha, 2010).

The other type of crop produced by both FHH and MHH irrigation participants is water melon. The result shows, about 51.7% of MHH and 48.3% of FHH irrigation users produced water melon. This indicated that almost both groups are participating equally in water melon crop production and there was insignificant difference between MHHs and FHHs with regard to water melon production ($P>0.05$) since this product require less water, labor, inputs and not easily perishable.

On the other hand, 69.7% of MHH followed by 30.3% of FHH produced cabbage and statistically there was visible difference between MHH and FHH cabbage producer ($P<0.05$) (Figure 1). This shows that, majority of MHH irrigation users produce cabbage crop than FHH irrigation users. The participation of FHH in the production of cabbage is lower since cabbage needs high water requirement and its susceptibility to pests and diseases just like the production of onion and tomato.

Other vegetables greatly produced by FHH irrigation users in the study area, is carrot and beet root. These two root crops are mostly preferable by FHH and statistically there was significant difference between male and female headed households with regard to carrot and beetroot production ($P<0.05$) (Figure 1). The possible reason is that, usually carrot and beet root crops are planted at gardens so FHH easily manage it along with their domestic responsibilities. In addition to this, these two root crops requires short time (2 month) to harvest, they take up little space and are frost and disease resistance. Nevertheless, carrot and beet root crops production covers small plots compared to other vegetable crops produced in the study area. Moreover, the demand of these root crops is small and usually FHH use the income for domestic expenses. The result is in line with Njuki *et al.,* (2014) which indicated that vegetables preferred by MHH and FHH irrigation users differ; mostly MHH irrigation users prefer kale, tomatoes, cabbage, cucumber and butternut squash whereas female irrigation users choose root crops such as carrot and beet root in Tanzania.

Gender Participation in Small Scale Irrigation Management Practice

Participation in irrigation management practices is very crucial to improve the productivity of small scale irrigation agriculture. The main irrigation management practice carried out in the study area includes; land clearing, cultivation, planting, crop watering, removing weeds, hoeing, agro-chemical application, harvesting and transport (Loading and unloading). Labor is one of the important inputs used in the stated management practices. According to the key informants, FGD and household survey both male and female household heads are involved in management activities but there are divisions of tasks between them. For example, male heads are responsible for heavy and risky tasks such as land clearing, cultivation, crop watering, chemical applications and loading and unloading while tasks like planting, removing weeds, hoeing and harvesting are carried out usually by female heads. Each of these findings has been presented in this part.

Table 3: Labor division by household heads type

	Proportion of HHs participating in SSI management practices									
Mgt activities	MHH (n=135)				FHH (n=30)					
	Participants		Non-participants		Participants		Non-participants		χ^2	P value
	No.	%	No.	%	No.	%	No.	%		
Land clearing	135	100	0	0	0	0	30	100	-	-
Cultivation	135	100	0	0	0	0	30	100	-	-
Planting	11	8.1	124	91.9	28	93.3	2	6.7	98.68	0.000**
Crop watering	129	95.6	6	4.4	6	20	24	80	94.19	0.000**
Removing weed	8	5.9	127	94.1	27	90	3	10	10.38	0.000**
Hoeing	7	5.2	128	94.8	29	96.7	1	3.3	12	0.000**
Chemical apply	135	100	0	0	0	0	30	100	-	-
Harvesting	26	19.3	109	80.7	29	96.7	1	3.3	66.18	0.000**
Transporting	88	65.2	47	34.8	13	43.3	17	56.7	4.5	0.02**

*Note: ** significant at P<0.05*

Land clearing is one of the most labor intensive irrigation management practices in the study area. It was identified that the male heads are involved 100% in land clearing management activity whereas female heads are totally absent (Table 4). A study in Nigeria also indicated that gender participation in some agricultural field activities differ in relations to task involved. Male heads participated in activities which demand more physical forces such as land clearing and tilling more often, while female heads favored planting and marketing (Mohammed and Abdulquadri, 2012). However, another study elsewhere in Nigeria to the contrary confirmed that female heads participate mainly in land clearing and other agricultural management practices (Fabiyi *et al.,* (2007).

With regard to division of labor in cultivation activity, the result shows that there is a distinct gender difference. Cultivation is clearly a task performed only by men while female heads have to use either adult male members in the family or hire labor. Therefore, it is found that all female headed irrigation users do not have any direct activity related to land cultivation. As indicated under the sub-title gender participation in small scale irrigation management practice, the main reason for the complete absence of women participants is mainly due to cultural barrier that the land cultivation activity is supposed to be men's duty. This is similar to the finding by Gebremichael (2009), who concluded that female headed households were involved in vegetable and spice value chain activities except land cultivation which is culturally considered as men's duty in Ethiopia. In addition to this Tiruneh *et al.,* (2001) reported that no female headed farmers engaged in land preparation in Ethiopia.

Majority of female heads (93.3%) and the remaining 8.1% of male heads involved in planting activity and also statistically significant difference in seedling planting between male and female heads were observed (P<0.05) (Table 4). This shows that high number of female heads respondent participate in planting activity. On the other hand, most of the male heads respondents indicated that they mainly leave this task for female members in the house or hire daily laborer. The reason is that, seedling planting activity requires great care since most irrigable crops are affected due to the planting method involved. FGD responded that a few decades ago, irrigation practice had not been widely practiced in the study area. Thus, skilled women migrated from upper Awash area for seedling planting and weeding activities shared the experience for local irrigation users. As a result, women became strong enough to perform these management practices. Therefore, women are more preferable for seedling planting activity, since they can plant carefully a large plot of land within a short period of time. In contrary, men are less interested to involve in this management activity and they might damage seedlings by stepping over them during planting and the root might not appropriately get in to the soil during planting. In general, now a day women are better experienced in seedling planting activity in the area. Unfortunately the daily wage payment amount of women is smaller than men for similar kind of work. Women receive 60 birr per day while men take 80-100 birr per day. The existing gender disparity between MHH and FHH in labor payment is due to the misleading perception that women are less capable of doing farm activities. The finding is similar to (CDPA, 1996) reported that, women's productive work is typically less visible and lower paid than men's, most of the time women earn less than men in the same job.

A plant requires water for growing and periodic watering for irrigable crops is indispensable. In view of that, higher proportion of respondents has taken in crop watering activity. About 95.6% of male heads respondents participate in crop watering activity while only 20% of female heads respondents participate in the same activity (Table 4). Therefore, most of female heads respondents have to get labor contribution from adult male members in the household or hire labor from outside for this activity. The chi-square test result indicated that, there was significant difference among male heads and female heads in crop watering (P<0.05). According to FGD with FHH and elder lies, some female headed households have water harvesting structure (individual pond) so they grow carrot and beet root around the homestead and thus they are involve in watering of their

crops. Timely crop watering is one of the most important management practices in order to get quality product. Thus, irrigation users often apply crop watering in early morning hours and at night, this could be done to prevent high evaporation rate during day associated with woyin-adega nature of the area. As a result, early morning and late at night watering is not convenient for women. Even when watering took place, farmers are careful in controlling the amount to keep away from applying excessive water and small amount of water as much as possible otherwise the production quality and quantity might be reduced.

In addition, majority of irrigation users applied watering by motor pump since technically pump operation is difficult for women. Therefore, even in this limited involvement of women (20%), they might directly participate in carrot and beet root watering. This result is contrary to Gemechu *et al.,* (2009) finding which stated that the participation of women in crop watering activity is higher compared to men in Ethiopia.

Table 4 also gives the details on the participation of farmers in removing weeds activity. Accordingly, the majority of female heads (90%) followed by 5.9% of concerning male heads respondents participate in removing weeds. The statistical test shows that there was significant difference between two groups with regard to removing weeds activity ($P<0.05$). This implies that most of the remaining male heads respondents indicate that they apply this management activity for women members in the house or hired labor. This is because most of the time irrigation crops weeding are carried out by hand in order to avoid the nutrient competition between seedling and weed. Similar finding reported by Abate and Tafesse (2015) who suggested that FHH spend more time in seed bed preparation, weeding and harvesting activities. These activities may be done either individually or through groups.

As far as hoeing is considered, 96.7% of female heads respondents and only 5.2% of male heads respondents participate directly in hoeing activity (Table 4). The remaining male heads respondents indicate that they employ women daily laborers for hoeing. This showed that the participation of female heads is particularly higher in this activity. Usually hoeing is applied to keep away from soil compaction around the seedling root. Thus, timely hoeing is one of the crucial irrigation management practices. Onion needs 2-3 hoeing cycle in one growing period. The first hoeing cycle should be carried out 15 days after transplanted, while the second hoeing after 30 days and the final after 50 days of transplanting to reduce the soil compaction around the root zone (MoARD, 2005).

Irrigation crop protection is the most important management practice. Irrigation users use different chemicals to control diseases and pests. The application of chemicals is exercised from the knowledge they gained through experience or occasional trainings. Accordingly, all male heads irrigation users participate in chemical application while none of female heads irrigation users applies chemicals (Table 4). All female heads respondents apply agro-chemicals with the support of adult male members of the household or they hire labor. FGD revealed that, the absence of female heads participation is due to the nature of the activity which requires technical skill and labor since it is often difficult for women to hold and operate the sprayer. Besides, female heads suspect chemical has terrible smell which might influence the reproductive organs of women. On the other hand, irrigation users (especially women) are less capable to identify the symptom of pests and diseases so they applied chemical during mornings and night by speculation. Therefore, female heads do not want to take such risk in management activity. This result agrees with the findings of Beshir (2004) who argued that FHH members are involved in most of the activities other than pesticide application of small scale irrigation horticultural production management. And also this result is similar with the result of the study concluded by Fabiyi *et al.,* (2007) and Adebiyi *et al.,* (2009) who concluded that FHH who were participated in almost all agricultural management practices except felling the tree and spraying agro-chemicals in Nigeria because chemical application also requires much strength which could only be provided by MHH.

The survey result revealed that, 96.7% and 19.3% of female heads and male heads, respectively, are involved in crop harvesting. This shows that majority of female heads are involve in this activity. The statistical analysis showed that there was significant difference between male heads and female heads with regard to crop harvesting activity ($P<0.05$). The result agrees with Aregu *et al*, (2010) who stated that in food production male headed households may clear the land at the outset of a cultivation cycle and female headed households frequently do the harvesting and processing of food crops with little or no intervention from male headed households.

Out of the total sampled households, about 65.2% of male heads respondents and 43.3% of female heads respondents participate in loading and unloading activity (Table 4). The chi-square test result showed that, there was significant difference ($P<0.05$) between the two groups with regard to loading and unloading activity. Majority of male headed irrigation users sell their product at farm gate. The packing and transportation facilities are mainly arranged by traders or brokers. However, when the product is lesser in quality and in lower quantity, farmers transported their product to local market with donkey cart. This increases the level of damage caused during transportation. Storage facilities are not available in the area since farmers transport immediately after harvesting to the market. This finding is contrary to Ochieng *et al.,* (2014) who stated that male irrigation users play the leading role in land preparation and plowing while women irrigation users often provide the bulk of the

labor for transporting and processing in Congo and it is also contrary to Gemechu *et al.,* (2009), reported that female headed households play a more significant role than male headed households in threshing and transportation of farm products in Ethiopia.

CONCLUSION AND RECOMMENDATIONS

This study revealed that participation in small scale irrigation agriculture in Lume district shows gender patterns are significantly related to some key socio-economic and gender related characteristics of the household head. It appears that households with female heads have relatively small family labor source, small farmland size, poor economic status, low or no education level, better decision-making power and produce easily managed and low cost irrigation crops such as kale, green pepper, water melon, carrot and beet root. On the other hand, the fact that male headed irrigation users have better wealth status, possess large farmlands, more family labor, and better education level enable them to produce high value crops such as onion, tomato and cabbage. Moreover, such differentiation in the types of major irrigation crops produced by male and female headed are likely originate from gender-based social and cultural biases that influence the allocation of responsibilities in the small scale irrigation agricultural activities. Most of the time, female headed irrigation users are more involved in management activities such as planting, removing weeds, hoeing and harvesting while male headed participate in heavy and risky tasks such as land clearing, cultivation, crop watering, chemical spray and transport products. To sum up, the study has shown that gender has significant roles and implications in small scale irrigation agriculture through its direct influence in participation, labor division and crop preference.

Based on the above findings, the following recommendation can be drawn for further consideration and improvement of gender sensitive irrigation crop production in the study area.

FHH irrigation users are often engaged in low value crops for various reasons. High value crops such as onion, tomato and cabbage require higher capital inputs and demand more water application thus becoming high risk crops for women groups. Therefore, in relation to future strategies the study has recommended that government and NGOs should provide supports to facilitate the production of such high value crops. In relation to this, special attention should be given by government and NGOs on the constraints such as credit access specially to encourage FHHs on the production of resource demanding crops.

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