



Research article

# Challenges in women-managed small scale irrigation practices: the case of Lume District, Central Rift Valley of Ethiopia

Kalkidan Fikirie<sup>1</sup>, Ephrem Tesema<sup>2</sup> and Yemiru Tesfaye<sup>3</sup>

<sup>1</sup>Ethiopian Institute of Agricultural Research, Jimma Agricultural Research center, P.O. Box 192, Jimma, Ethiopia.

<sup>2</sup>International Livestock Research Institute (ILRI), P.O. box 5689, Addis Ababa, Ethiopia.

<sup>3</sup>Hawasa University Wondo Genet College of Forestry and Natural Resource, Hawasa, Ethiopia.

This study investigated challenges related to gender and small scale irrigation practice in the study area. Structured questionnaires were used to collect the data from 165 respondents to achieve the set goal. The data collected were analyzed with descriptive statistic and chi-square test. The result shows male headed households have got better training, access to extension service and access to improved seeds than female headed households. In addition, both male headed households and female headed households encountered market problem for different crops produced in irrigation. Furthermore, there was no significant difference ( $P>0.05$ ) between male headed households and female headed households in fertilizer and chemical application. With regard to cash income generation from small scale irrigation, the study revealed that male headed households were mainly involved in seed production particularly the high value onion seeds while female headed households were widely participate in selling of seedlings. In addition, there was no significant difference ( $P>0.05$ ) between male headed and female headed households in involvement in cash income generating activities. The study finally suggests that both male headed and female headed households have many problems related to technology and market such as disease and pest identification problem, amount of chemical and fertilizer application etc. Thus, to overcome these problems continuous training and extension services are very essential.

**Key words:** Descriptive statistics, extension service, gender, small scale irrigation

## INTRODUCTION

In Ethiopia, rural women represent a tremendous productive resource in the agricultural sector (Mwangi, 2001). They are major contributors to the agricultural workforce, either as family members or in their own right as women household heads (FAO, 2011). In developing countries, women are both producers and providers of food (Elder and Schmid, 2004). Apart from participating in a wide range of productive activities, they are also carrying out full responsibility not only in bearing and caring for children but also in developing and breast-feeding them after birth (Nahusenay and Tesfaye, 2015). Gender roles and relationships influence the division of work, the use of resources and sharing of the benefits of production and income between women and men (Bryceson, 2002). The

introduction of new technologies and practices underpinned by improved service provision, often disregards the gendered consequences of market oriented growth and many benefits bypassing women since benefits over agricultural production varies between men and women (Lemlem *et al.*, 2010).

**\*Corresponding Author:** Kalkidan Fikirie, Ethiopian Institute of Agricultural Research, Jimma Agricultural Research center, P.O. Box 192, Jimma, Ethiopia. Email: kalkidanfikire@gmail.com, Tel: +251912758580, Fax +251471111999

Most of the time, women tend to sell irrigated crop production in local markets where they find demand for traditional varieties of crops. Men on the other hand, tend to sell uniform and exotic varieties in export markets (Koopman, 1993). These gender differences in market access vary by location as well. Local trade can improve rural women's and men's livelihoods by providing them with a source of income (Randriamaro, 2006). But, usually women face many challenges in accessing and benefiting from markets compared to men and they face illiteracy, lack of market information and transport to markets (Adams and Daniel, 2009). At global and national levels, unfair terms of trade still disadvantage poor farmers including women. Trade negotiations rarely consider women's and men's different knowledge and skills. They often neglect the use of assets in determining their livelihoods and they overlook the various potential impacts of their provisions on poor rural women and men (Randriamaro, 2006).

Different studies addressed constraints and opportunities related to irrigation practice in the country. Nevertheless this study focus on constraints related to gender and small scale irrigation practices. Therefore, the objectives of this study was to assess major constraints faced by male and female headed irrigation users and to assess income generating activities related to small scale irrigation practice in the study area.

## RESEARCH METHODOLOGY

### Study Area

The study area is located in Lume District of East Shewa Zone in Oromia region, which is located 70km from Addis Ababa. The total area of the district is 75,220ha and the topography comprises rolling plains with undulating hills found in a few places. The altitude ranges from 1500 to 2300m above sea level, having annual rain fall of 750 to 1100mm with a temperature of 11°C and 29°C (Kassahun, 2008). The agro-ecological zone of the study area comprises sub-tropical. The district is divided into 35 rural and 2 urban peasant associations. The total population of the study area is estimated to be 147,481 out of which 75,189 (50.98%) are male and 72,292 (49.01%) are female (CSA, 2013). Most of the population 93,156 (63.16%) is living in rural areas while the remaining 54,325 (36.83%) is located in urban areas. The main occupation of the population is mixed farming (WIO, 2015).

### Sampling design and methods of data collection

Three stages of sampling procedure were used to identify the respondents to be included in the sample. In the first stage, the study area was selected from ten districts, because it has high number of irrigation users. In the second stage, farmers were stratified in to two groups as small scale irrigation users and non-users.

Finally, in the third stage, to get representative sample respondents according to gender in the area, small scale irrigation user groups were stratified as male headed and female headed irrigation users. Therefore, 165 respondents consisting of 135 male and 30 female irrigation users were selected from four sample peasant associations.

The primary and secondary data sources were used to collect information which was relevant to address the research objectives. Hence, quantitative and qualitative approaches of data collection were employed on this study. Primary data were collected by using key informant interviews, focus group discussion and household survey. The data collected were used to generate data on the demographic and socio-economic characteristics of the respondents. Furthermore, major constraints and income generating activities of the sample households was collected. The interviews were undertaken by the development agents (DAs) and researcher herself and questionnaire was pre-tested.

Key informant interviews were conducted with development agents; PA administrative and district irrigation experts. The focus group discussions were held with representative small scale irrigation users from the male and female group to have access to useful and detailed information about the small scale irrigation scheme.

Secondary sources of data were collected from institutions involved in the development of small scale irrigation schemes such as International Livestock Research Institute (ILRI), Bureau of Agriculture, Bureau of Water Resource, District Agricultural Office and District Irrigation Office.

### Method of data Analysis

#### Quantitative data analysis

The quantitative data collected from the household interviews was entered and analyzed using SPSS version 20. Descriptive statistics such as mean, percentage, frequencies, standard deviation and cross tabulation were used to summarize and categorize the data. Inferential statistics was also used to compare the two categories of the sample respondent who are male and female irrigation users. The statistical significance of the variables was tested using the appropriate test type according to the type of variables employed in the analysis.

#### Qualitative data analysis

The data collected using the qualitative approach were texts and narrative data which were categorized into research themes, coded and analyzed qualitatively through description or narrations. The quantitative results obtained in the analysis of descriptive statistics of household interviews were used to support the findings from the qualitative approach.

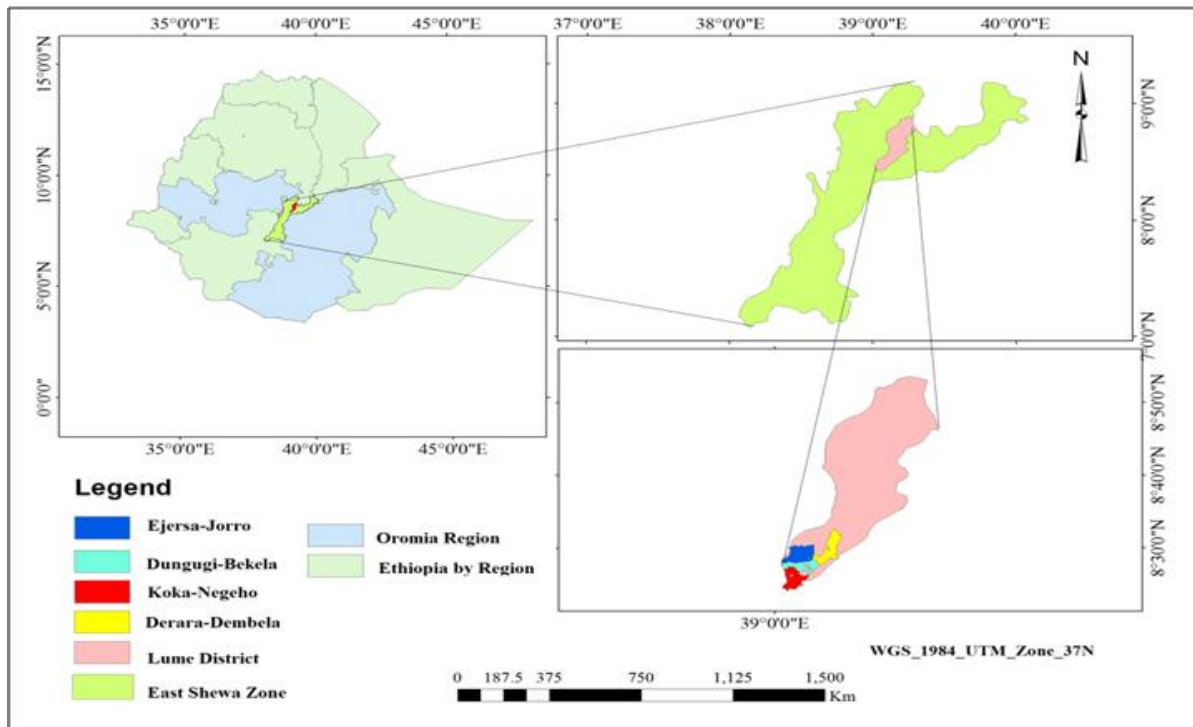


Figure 1. Map of the study area

## RESULT AND DISCUSSION

### Constraints in Small Scale Irrigation Faced by Irrigation Users

#### Input Supply and Utilization

The level of irrigation crop production is determined by factors such as input supply and utilization mechanisms. The household survey result indicated that 33.3% of the male headed households (MHH) respondents obtained improved variety of vegetables seeds whereas only 10% female headed households (FHH) have an access to this services (Table 1). The P-value shows that there was visible and significant difference between two groups (MHH and FHH) of irrigation users with regard to utilization of improved seed ( $P < 0.05$ ).

Even at country level, it has been estimated that the number of farmers adopting improved varieties of vegetables is smaller in number. Smallholder farmers are often regarded as laggards in adopting an improved technology, including improved seeds, which is mainly due to lack of information or scarcity of resources. This indicates that most irrigation users faced shortage of improved seed varieties. The problem of improved seed varieties was related to either non availability of good quality seeds or their high price. Most of the time, irrigation users did not trust the quality of seeds supplied by trader even if seeds might be branded or claimed to be of improved varieties. Although once invested in the expensive improved varieties, their performance is not assured. Some irrigation users responded that sometimes when they applied improved seeds, the quality and quantity of product is reduced due to lack of appropriate application of the required

management techniques for these new varieties. The finding from focus group discussion (FGD) also shows that most of the time irrigation users received information about new varieties of vegetable seed from seed traders. Unfortunately, some times this new vegetable seeds is not effective or is completely damaged since seed traders themselves are not well informed about the handling of such seeds. The result is similar with Ogato *et al.*, (2009) who reported that high price of agricultural inputs to be a major constraint to crop production and management practices in Ambo district.

Concerning chemical application, 97.8% of MHH and 90% of FHH irrigation users applied various agro-chemicals and the chi-square test shows that there was no significant difference between the two groups ( $P > 0.05$ ) (Table 1). However, MHH irrigation users applied chemical intensively for onion and tomato. Nevertheless, the lack of knowledge among irrigation users to identify diseases and pests at their earliest stages makes the effectiveness of agro-chemical low. In the same manner, irrigation users also face the risk of buying expired agro-chemicals (especially FHH) from private input suppliers. These could be due to the inefficiency of the supplier to provide the required quality and quantity of the product at the right time. Sometimes irrigation users applied agro-chemicals beyond the recommended level or they have been using non recommended chemicals which intensively damage the production of irrigated crops. They also applied chemicals simply with suspicion of disease when they looked some symptoms on the crops that actually are not related to diseases, which in turn did damage the production of the vegetables. Specifying the actual rate of application by producers was difficult

**Table 1.** Inputs applied by households for irrigation

Types of Inputs	Households (n=165)						$\chi^2$	P value
	MHH(n=135)		FHH (n=30)		Total			
	Yes	%	Yes	%	Yes	%		
Improved seed	45	33.3	3	10	48	29.1	6.4	0.013**
Agro-chemical	132	97.8	27	90	159	96.4	4.2	0.07NS
Fertilizer	122	90.4	26	86.7	148	89.7	36	0.51NS

Note: \*\* significant and NS= not significant at  $P<0.05$

**Table 2.** Provision of extension service, training and credit services in the study area

	Respondents (n=165)						$\chi^2$	P value
	MHH(n=135)		FHH (n=30)		Total			
	Yes	%	Yes	%	Yes	%		
Extensionservice	97	71.9	13	43.3	110	66.7	8.9	0.005**
Training	32	23.7	2	6.7	34	20.6	4.3	0.03**
Credit service	30	22.2	1	3.3	31	18.8	5.7	0.01**

Note: \*\* significant at  $P<0.05$

to this study because farmers used several unconventional/non standard measurements, the frequency differs, and different combinations are also applied together. Yet, there is a tendency of applying higher rate or dose than the specification. This is because sometimes chemical were intentionally applied in order to avoid anticipated pests. Whereas differentiating between pests and diseases is very important for correctly treating pests or diseases, such gross association of diseases and pests creates problem in proper disease and pest management. This problem contributes to low quality production and this has to be addressed in order to produce a reasonable yield that could bring high income. Sometimes lack of chemical supply occurs in the market because farmers produced the same types of vegetable crops with similar input requirements which result in high demand more than the available supply.

Regarding fertilizer, majority of irrigation users (90.4%) of MHH and 86.7% of FHH applied fertilizer (Di ammonium phosphate and urea) for their crops (Table 1). Also there was no significant differences on MHH and FHH respondents with regard to fertilizer application ( $P>0.05$ ). This implies that fertility management of the farmer's irrigation plot was mainly performed through fertilizer application and animal manure to a lesser extent. Nevertheless, the application of fertilizer was relatively intensive on onion, tomato and water melon since these crops are considered as better cash income sources. High price of fertilizer was,

however, a discouraging factor to effectively utilize it while lack of good awareness about the recommended rate was another challenge. The result is contrary to Catherina *et al.*, (2013) who reported that plots of MHHs were more likely to be applied with chemical fertilizer, while plots of FHHs were more likely to be applied with manure. The rate of fertilizer use was significantly greater in plots managed by MHHs than those by FHHs.

### Extension Services

The household survey result shows that, 71.9% and 43.3% of MHH and FHH irrigation users got better extension service, respectively. In addition, there was strong evidence that shows significant difference between MHH and FHH through a chi-square test ( $P<0.05$ ) (Table 2). Thus, MHH irrigation users have more access to extension services than the FHH counterparts.

The importance of extension service is to initiate changes that bring about sound agricultural development especially on the part of small-holder farmers as it offers them technical advice on necessary inputs and services. Therefore, agricultural extension service is fundamental for the development of small scale irrigation scheme through adapting and introducing improved agricultural technologies, providing training, accessing the supply of inputs timely and providing market information. Moreover, it represent farmers' frequency of contact with DAs and

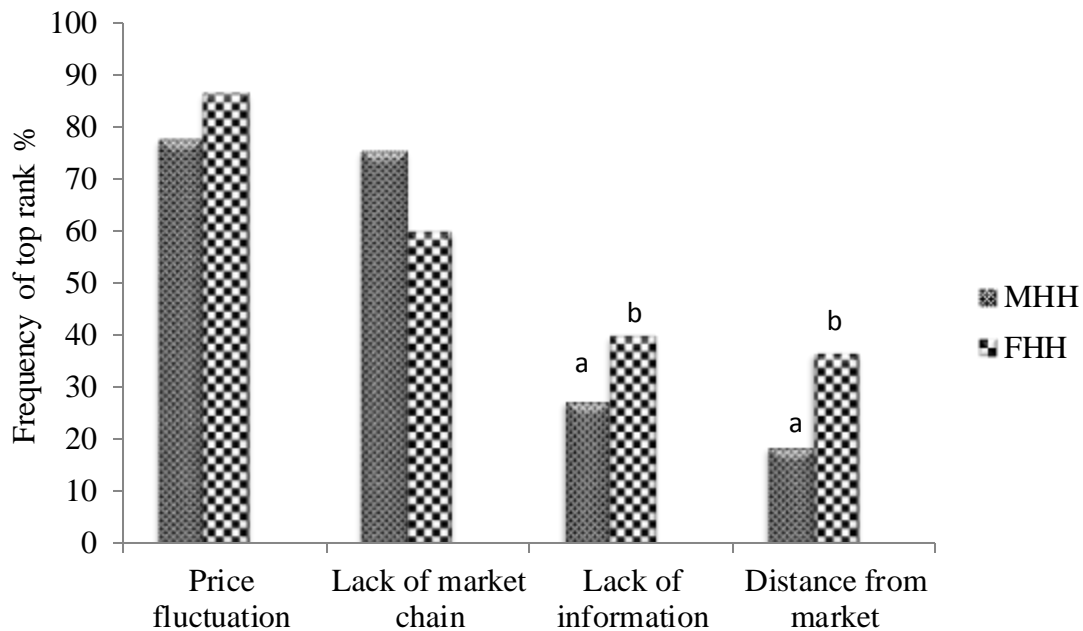


Figure 1. Major market problems in the study area

frequency of participation in extension planning, training, field day, on-farm trial and demonstration regarding agriculture and livestock production. Hence, extension service has positive impact on enhancing production and productivity.

As indicated in the FGD, frequent contact of extension worker is also related to the socio-economic status of irrigation users. Most of the time extension workers might prefer to visit farmers with more farmland or those who have already adopted improved technology all of which happened to be linked with gender. Therefore, FHH irrigation users are less likely to get extension services through various channels and less likely to access better services than their MHH counterparts. This result is also in line with *Almazet et al., 2014* and *Ofuoku and Albert, 2014*.

### Training

Training on small scale irrigation scheme is one of the important factors that influence production. Accordingly, about 23.3% MHH and only 6.7% FHH irrigation users have access to training (Table 2). The statistical result confirmed that there was a negative and significant relationship between MHH and FHH with regard to participation in irrigation training ( $P < 0.05$ ) with FHHs having low participation. The more the farmers get training on small scale irrigation, the more likely that they acquire the relevant information along with the technical knowhow about irrigation technology. Training creates awareness and helps the farmers to bring innovation and invention in small scale irrigation agriculture. Hence, training was the fundamental element to change the perception of farmers in order to adopt and expand new agricultural technologies.

Unfortunately, the number of FHH irrigation users participating in training was very low due to lack of information and being tied up with domestic responsibilities. Even if they participate, due to cultural

barrier they can't express their specific concerns during training. Similar result is also indicated in *Nahusenay and Tesfaye (2015)* who suggested that most of the time women have limited access of agricultural products, credit facilities, training and information in Ethiopia. In many communities due to their cultural norms, women are not allowed to sit on the same stages as men and they are expected to keep silent in front of men (*Godbole, 2012*).

### Access to Credit

Credit either in the form of cash or non-monitory form from government or non-governmental organization, is an important service to help poor farmers to participate in small scale irrigation scheme for input purchase and ultimately to adopt advanced agricultural technologies. In the study area, about 22.2% of MHH and only 3.3% FHH had access to credit service (Table 2). The chi-square test shows that there was significant difference between MHH and FHH in credit access ( $P < 0.05$ ). Mostly, those irrigation users get credit access from informal financial institutions (friends, neighbors). This is because the stated informal lenders should be easy access to the overall situation and information about their borrowers with whom they have tight social bondage. Since irrigation practice is seasonal, seasonal changes such as drought, pest and insect damage negatively influence the amount of output expected. Thus, to achieve higher productivity, well-timed access to short-term finance for inputs was fundamental.

Credit access can be used to enhance farm productivity and to ensure sustainable food production. Irrigation users who have access to credit can overcome their financial constraints and can purchase all necessary inputs for their farm production. But, farmers have no access to credit service; it is difficult to them to produce capital intensive crops.

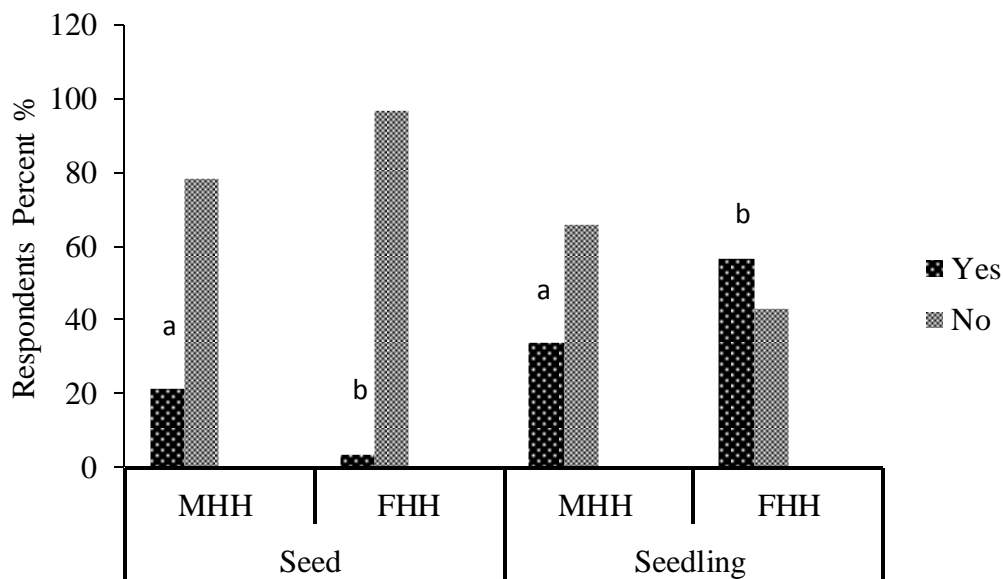


Figure 2. Onion seed and seedling production by household type

**Market Problem**

Market problem such as frequent low price at peak supply periods, lack of marketing chain, information gap and distance from local market are the major market problems in the study area though more FHHs appear to face such problems (Figure 2). Market problems are the result of variations in supply and demand which is to be expected for crops that are not subject to price controls. Volatility and fluctuation in the market price is therefore a reflection of market risk. In most cases, however, low price at peak supply periods is based not only on the real supply and demand interaction but also on the information complicity and team between buying participation. Moreover, market problem might be the major challenge due to different factors affecting the timely delivery of irrigation products to markets and quality of product (e.g. as a result of non-existence of storage, lack of transportation facilities, bulkiness and perishable nature of the product). Irrigation crops prices fluctuate from time to time, season to season, year to year due to lack of crop diversification, producer cooperatives and weak market chain. Majority of irrigation users produced almost the same types of vegetables. Hence, such kind of tendency makes irrigation crop production potentially profitable but a venture business. As a result, often success depends on marketing condition and obtaining good marketing process rather than production capability.

FGD participants responded that, some irrigation users, mainly MHH, who took the option of taking their product to other alternative markets earned better profit. Unfortunately, often the reverse happens in such a way that farmers will be forced to sell for a price reflecting the interest of the buyers. This could be due to the strong network and information exchange between brokers and buyers that discourage new farmers not to bring their product to the market. They did this to control the market price based on their own interests and to get high commission. Therefore, every buyer was telling the same and unfair price and at last

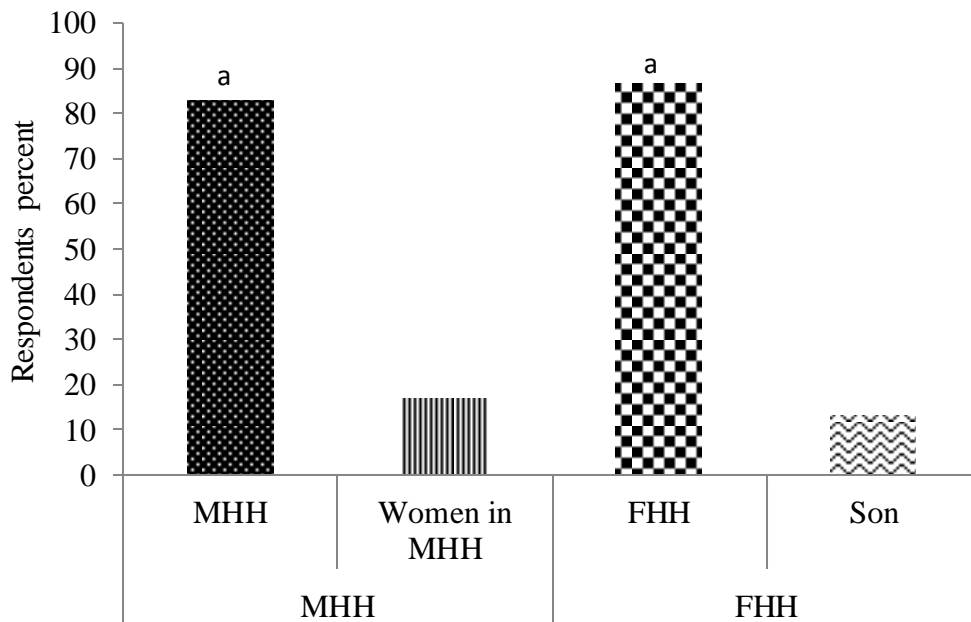
farmers were left with no option than selling it with the low price or feed their product for their livestock for fear of coming back without any profit or with high loss. In doing so, farmers would be discouraged and were forced to sell their products at their on-farms at lower price to avoid such kind of risks, even though they believe that they deserve better price than the price they are earning now. This is in line with previous studies in Ethiopia that confirmed vegetable producers lack coordination to increase their bargaining power on vegetable price and there was no marketing institution to safeguard farmer's interest and right over their marketable produces (Abay, 2007)

**Income Generating Activities Related to Irrigation Scheme**

Basically, the main objective of any irrigation practice is originated to improve the level of natural production by increasing the marginal productivity of available land. Therefore, the availability and access to irrigation highly determines the amount of income and asset creation of participants. Income is defined as the amount earned from activities related to irrigation crops either in-terms of cash or in-kind. The market value of all irrigation crops produced within a study area is valued at existing market prices regardless of their uses. Based on this, the study indicated that most respondents had derived 'their higher income mostly from tomato and onion. Like other parts of the country, the irrigation participants are selling their crops in three different market channels namely on-farm gate, local market and road side.

**Seed and Seedling Production**

Among the sampled respondents who participated in onion seed production, MHH irrigation users and FHH irrigation users are accounted 21.5% and 3.3%, respectively (Figure 3). Moreover, the chi-square test showed that there was significant difference between MHHs and FHHs with regard to onion seed production



**Figure 3.** Market participation of irrigation products by household members

( $P < 0.05$ ). Even though onion seed production is the most important income generating activity, but the involvement of FHH irrigation users was too small. FGD result indicated that, onion seed production process takes more time, high inputs, labor as well as more favorable weather condition. Therefore, women irrigation users are not motivated to produce onion seed even in the presence of alternative financial source or remittance for this activity. Similar finding by Adhikari, (2011) who found lower revenues generation by women as a result operating a business beyond initial capital is a serious challenge for all women especially in developing countries. On the other hand, 56.7% of FHH irrigation users and 34.1% of MHH users grow onion seedling and there was significant difference between the two groups in seedling growing activity ( $P < 0.05$ ) (Figure 3). Most FHH irrigation users grow onion seedling around garden and easily manage it along with domestic responsibilities. Therefore, they are benefitted from small plots.

### Selling Irrigation Products

The household survey result shows, 83% of MHH and 86.7% of FHH irrigation users are involved in selling while 17% of women in MHHs and 13.3% of son in FHHs participated in selling (Figure 4). The statistical result showed that there was insignificant difference between two groups in selling activity ( $P > 0.05$ ). Women in MHH might be involved in selling low quality product which is harvested from a small plot of land (0.125ha). However, in a few cases MHHs involved in bulky production selling at on-farm, simultaneously wives produce leafy vegetable in a small plots and vend at local market and along the roadside. Roadside vending is direct selling system where a grower establishes a selling stall near a roadside and sells product directly to consumers. The product sold in a roadside place may be grown by irrigation users or purchased from other

irrigators. This type of vending system may be operational only during harvest periods or throughout the year, depending on produce supply sources, production patterns and the type of the product. FGD result showed that, there are two types of selling system; on-farm and local market. Usually, bulky and high quality product sell at farm level while, low quality and small plot product sell at local market and road side. In on-farm selling taking place, irrigation users especially FHH challenged by brokers on crop price due to lack of knowledge and bargaining power, and market information. Consequently FHH irrigation users are not benefiting significantly compared to MHH irrigation users.

### CONCLUSION AND RECOMMENDATIONS

The study result showed that both male headed and female headed household irrigation users are challenged by constraints like access to credit services, training, extension service and access to improved seed varieties. Female headed irrigation users are dominantly constrained with access to credit services, training and improved seed varieties. Although there were no differences between male headed and female headed households in access to fertilizer and chemical applications, both male headed and female headed households encounter market problem for their products. With regard to income generating activities related to small scale irrigation, onion seeds and seedlings production are the most common types of practices for cash income generation. Onion seed production is dominated by male headed irrigation users whereas seedling growing is mainly practiced by female headed irrigation users. However, when we come to selling irrigation crop produce, female headed irrigation users have better access to selling their products whereas male headed irrigation users

participate in selling when the product are bulky and high quality unless their wives are vending at local market and roadside. 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.

Female headed household 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 and extension specially to encourage female headed households on the production of resource demanding crops.

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