Journal of Equity in Science and Sustainable Development

Vol. 3(1):39-50
Article Number:JESSD21.4.2018
ISSN 2523-1901(Online)

URL: http://197.156.115.18/index.php/jessd
Email: jessd@mwu.edu.et

Full Length Research Paper

Utilization of Community Managed Irrigation Scheme in Bale Zone: The case of Agarfa Woreda, Oromia Regional State, South East Ethiopia

Abdissa Abe Neme[1*] and Erick Ndemo Okoyo[2]

[1]Madda Walabu University, Department of Rural Development and Agricultural Extension, Bale Robe, Ethiopia, E-mail abe.kufa789@gmail.com,
[2]Haramaya University, Department of Rural Development and Agricultural Extension, Haramaya, Ethiopia, Email: ndemoeric100@gmail.com, phone: +251910454348
Corresponding author: E-mail abe.kufa789@gmail.com, phone +251913 950869

Received 21 April, 2018; Accepted 06 September, 2018; Published January, 2019

Abstract

Despite the significant contributions of agriculture in the overall economy of Ethiopia, its productivity is very low. Many factors contribute to low productivity among them is the problem of moisture stress is a constrictions cited one. The responses to cope up with drought and hence to improve the status of productivity of the agriculture is to adopt some form of irrigation practice. However, developing large scale irrigation is a costly alternative, which may require large quantity of capital resources. Moreover, this is a difficult job to practice for the small scale resource poor Ethiopian farmers. The alternative, which may compromise the need for expanding irrigation and the capital shortage, is promoting community managed irrigation scheme. Therefore, the objective of this study was to assess the utilization of community managed irrigation scheme. The study was conducted in Agarfa district, Oromia National Regional State. A total of 118 farmers were conducted in the study area. The **chi-square** ***(x^2) and t-test was used to analyze the independent dummy and continuous variables respectively. A binary logit model was applied to investigate the factors affecting farmers' participation in community managed irrigation scheme. A total of 13 explanatory variables were used out of which 10 variables were positively significant and one variable was negatively significant affecting the farmers' participation in community managed irrigation scheme utilization but, two variables were not significant. The findings of this study indicate that any effort in promoting and utilizing community managed irrigation scheme should recognize the socio-economic, household, institutional, technological characteristics and others factors for better use of community managed irrigation scheme. Finally the authors was recommended that the concerned bodies were gives special to promote seed money for households and facilitating market information for their production and also helps policy makers to come up with projects that can win the hearts and minds of the farmers.***

Keywords: Communal irrigation, Utility, Farmer

Corresponding e-mail address: *abe.kufa789@gmail.com*

Introduction

To feed itself, Sub Saharan Africa currently depends on rain-fed agriculture with limited use of irrigation. Highly variable rainfall, frequent floods and droughts, and lack of means to store water in times of plenty place at risk of drought and chronic food shortages (MoRW, 2010). Rapid population growth and the consequent encroachment of food crop farming on environmentally sensitive areas have set in motion. A vicious cycle of declining fuel wood supplies,

increasing use of dung and crop residues for fuel instead of replenishing soil fertility, erosion, low crop yields, feed shortages, progressive land degradation, and reduction of areas under fallow and greater exploitation of marginal areas contributes for low production and food insecurity(IMWI, 2009).

With declining productivity in rain fed agriculture and the need to double food production over the next two decades, effective and efficient irrigation would be needed. The water lost is never available for irrigation in places and during times of water scarcity. Irrigation expansion has slowed down drastically over the past two decades and the worldwide emphasis has been on the rehabilitation and management improvement of existing schemes. The potential for irrigation is high, but its potential for negative impact, if mismanaged, is also apparent. Thus, irrigation expansion is needed with effective and efficient utilization (Plusqellec, 2009).

In Ethiopia, Relatively better-off households benefited more because they have more land, labour to work the farm and money to buy farm inputs, which allow them to exploit irrigation opportunities. Poor households are mostly smaller, hire out labour for vital income and cannot afford to hire in labour. They may also restrict irrigation use because of the cost of water, and when water shortages occur, they can rarely afford alternative supplies. Farms far from the water source usually receive less water than those close by, and lose out at times of water scarcity. This has a considerable effect on the production of tail-end farms (World Bank, 2006).

Households have different levels of knowledge about improved agricultural practices, and female-headed households in particular are often excluded from training. Farmers also have different attitudes to risk-taking, and some are unwilling to invest in new activities due to high risks in production and marketing. However, some farmers they have learned new skills by watching others or adopted new crops after seeing the benefits to their neighbors' which implies farmer to farmer learning is important (Bhattarai *et al*, 2009). Ethiopian government has allocated considerable amount of resources for the promotion and construction of communal irrigation scheme structures. In spite of the investments from the government in community managed irrigation scheme utilization, there is no a decision making factor on the farmers' side. The end users were not involved in verifying and evaluation of the performance of the community managed irrigation scheme utilization as well as to foster awareness and to reduce economical risk and undesirable consequences of wide application of the common pool resources (FDRE, 2009).

Designing appropriate intervention programs to address the continuing challenges of limited use of communal irrigation practices. Therefore, it requires an adequate understanding of the physical, technological, and cultural and socio- economic constraints associated with utilization of communal irrigation scheme. Thus, this study intends to assess the factors affecting the utilization of communal irrigation scheme in the study areas. Furthermore, consequently, the result of this research would be expected to fill a research gap on community managed utilization in Bale Zone.

Methodology

Description of the Study Area

Agarfa District falls between Latitude $7^0$17'N and Longitude $39^0$49'E. Agarfa district is specifically located around 453 km Southeast direction from Addis Ababa. It is located around the border of Arsi zone following the rugged and broken terrain of Wabe Gorge. It is found in the extreme North Western Corner of the Bale zone, which is bounded by Shirka district of Arsi zone in the North, West Arsi zone in South West, Dinsho in South, Sinana in South East and Gasera in North East. The total area of the district is 114,084ha, which ranked the district 15th largest districts among the zonal district. It accounts about 1.9 percent of the total areas of the zone (AWARDO, 2014). Physically, Agarfa district is bound by Genale river basin to the South, South East and South West, and Wabe Shabele river basin in North and North West. In addition, there are numerous tributaries of the two river basins. The lowest and highest altitude of the Agarfa district is extended from 1000m and 3000m above the sea level respectively. The lowest area occupies the North East part of the district (around the border of Arsi zone) where as the highest elevation is Hora mountain which is found around South Western part of the district. The mean annual temperature of the district is 17.5 ^{o}c. The minimum and maximum temperature is 10^{o}c and 25^{o}c respectively. The annual rain fall is 800ml where as 400ml and 1200ml is the minimum and maximum annual rain fall recorded in the district, respectively.

The total population of the district is 120,456 and total households size 20,322 (CSA, 2014), which is unevenly distributed in rural and urban areas. Since the majority of the population is engaged in agricultural activity, the rural population has 87 percent out of the total population in the district. Thus, there is high concentration of population in rural areas of the district than urban areas. The

urban population has only 13 percent of total population. This indicates the majority of the livelihood of Agarfa district population highly depends on Agricultural activity (CSA, 2014).

Agriculture is the backbone of the economy in the district. It provides means of occupation for almost all population of the district. In Agarfa district sedentary agriculture is dominantly practiced in the highland and semi highland areas of the district, where as animal rearing is in the lowland and boarder area (ABOFED, 2009). In Agarfa district there are numerous perennial and seasonal rivers which have significant importance for local people. Among this river the following are the major one, Weib, WabeMakala, Inzara, MalkaQori, Wuchuma, Tugummaa, and Zembaba are the perennial rivers and Chorino,Siso, Kale, and Menzerare are the seasonal river in the district(ABOFED, 2009).

Study Design

For the successful accomplishment of the study in Agarfa Districts with three kebeles such as Ambentu, Shanaka and Amigna kebeles, Cross-Sectional Research Design was implemented. Therefore, primary data regarding the utilization of community managed irrigation scheme were collected from the respondents to achieve the study objectives.

The Sample size and Techniques

The sampling procedure applied to this study was multi stage sampling procedure. In the beginning of the sampling, from the total 18 districts of Bale Zone, Agarfa District was purposively selected because, it is one of the areas that manifested with many problems concerning community-managed irrigation utilization, which impede the progress of addressing rural farmers in the zone. In the first stage, out of 19 rural kebeles and two town of Agarfa district, 3 kebeles were selected purposively based on their irrigation potential, large number of community managed irrigation utilization. In the second stage, households from selected kebeles were stratified in to two strata, community managed irrigation participants (1697HHs) and non-participants (973HHs). In the third stage, simple random sampling was used to select the 118. The sample size were determined by using the Yemane (1967) formula in drawing an adequate sample size from a given population at 91% confidence level, 0.09 degree of variability and 9% level of precision.

$$n = \frac{N}{1+N(e)^2}$$ Where; n = sample size

N = population size (total household),

e = level of precision

$$118 = \frac{2670}{1+2670(0.09)^2}$$ k1= 837 k2= 1108 k3=725

The 118 respondents were selected for each kebeles by using proportional methods. These were Amigna (37), ambentu (49) and shanakka (32) respondents were selected for the study. Finally 75 households from participants and 43 households were non participants used for the study.

Data Collection Methods

The researcher was employ of both primary and secondary sources of data in the process of the study. Primary data was collected from sample respondents through structured interview schedule using face to face interview, which was designed to generate data on social, institutional and economic aspects of the households. In addition, primary qualitative data were collected through focused group discussions from six groups of households from sampled respondents and the twelve key informants' information were selected and discussion were collected through a checklist. To supplement the primary data, personal observation of physical features, and kebele leaders, water user association, committee members, DA's and Woreda irrigation sectors bureau were made.

Secondary data were collected from published and unpublished documents, Bale Zone and Agarfa district Agricultural and Rural development Bureau, Books, Journals, Government reports and other relevant information sources.

Methods of Data Analysis

Descriptive statistics were employed to analyse the situation of demographic and socio-economic variables such as sample mean, sample standard deviation and percentage were applied to treat the data from the respondents. The collected and analyzed data were presented using tables. The qualitative data were analyzed through narrating and documenting. The inferential statistics like chi-squared and t-test were used for dummy and continuous variables respectively. They were used to determine the relationship, cause-effect,

significant differences between communities managed irrigation users, and non participants in the study area. Binary logit model was applied in this study to estimate the probability of farmer's participation on communal irrigation that has taken either of the two values participates or not.

Results and Discussion

Socio-economic Characteristics of the Households

Age of Households Heads

Age is one of the household heads characteristics important to describe households and can provide a clue as to age structure of the sample and the population too. The age can either generate or erode confidence in participating in communal irrigation scheme utilization. That is, with more experience a farmer can become more or less risk-averse when judging communal work. The t-value (t=-0.970) indicates that there is no significant difference between the mean age of farmers who .are participated in communal irrigation scheme and not.

Table1: Distribution of the respondents by age (N=118)

Age of HH Heads	N	Mean	Std. Deviation	Std. Error Mean	t-value
Participant	75	43.11	7.679	.896	0.970 NS (0.334)
Non participant	43	41.65	7.994	1.219	

Source: Survey result, 2017, Ns= not significant.

Sex composition

The sample households composed of both male and female household heads. The study revealed that among the total sampled household heads 72 percent were male and the remaining 28 percent were female. The proportion of male-headed households constituted 70.6percent for participants in communal irrigation scheme utilization and 29.4percent for farmers could not participant in the community managed irrigation scheme. The result revealed that the percent of male-headed households of users of the community managed irrigation scheme were higher than that of female-headed households. This could be attributed to various reasons, which could be the result of gender issue of female-headed households, including shortage of labour, limited access to resources, information and required inputs due to social position etc. The chi-square test of sex distribution between communal irrigation users and non-users were run and the difference was found to be significant (t-value =6.483) probability level.

Table2: Distribution of sampled households by sex (N=118)

	Respondent Categories			
Sex of Household	**Non-participants**	**Participants**	**Total**	**x^2-value**
Female Household Head	18	15	33	
	41.9%	20%	28%	
Male Household Head	25	60	85	6.483**
	58.1%	80%	72%	
Total	43	75	118	

*Source: Survey result, 2017, ** significant at 5 percent probability level*

Education level

Education has paramount importance to understand and interpret the information received from any sources. Similarly, education is crucial for effective communication with extension workers and to interpret the information transferred to them. From the total sampled households 33 percent were illiterate, 46 percent could read and write, 23 percent were primary school graduates, 10 and 6 percent completed secondary school and tertiary school respectively (Table 3). Among the category those who participated in communal irrigation scheme,

about 40 percent were illiterate, 37.5 percent were able to read and write, while 16 percent of them completed elementary school and the rest 6.7 percent completed secondary school. In the category of non participant in communal irrigation scheme utilization 7 percent were illiterate, 41 percent were able to read and write 25.6 percent completed elementary, 16.6 percent secondary school and 14 percent were tertiary. The x^2-test result indicated that there was statistical significance difference (x^2=23.380; P =0.000) between the farmers who participated communal irrigation utilization, and those who couldn't proceed in participating in the utilization of community managed irrigation scheme. The result shows that education affects the farmer's participation in communal irrigation scheme utilization at one percent of significance level.

Table 3: Distribution of sampled households by education and farm experience (N=118)

Educational Level	Respondent Categories		Total
	Non-participants	Participants	
Not educated	3	30	33
write and read	18	28	46
primary (1-8)	11	12	23
secondary (9-12)	5	5	10
tertiary and above	6	0	6
Total	43	75	118
X^2-Value (23.3)	p-value(0.000)		

*Source: Survey result, 2017, *** significant at 1% probability level*

Household's Size

Family size and composition affect the amount of labour available for the farm, off-farm and household activities. It also determines the demand for food. The survey results show that the average family size was 4.5 with the standard deviation of 1.9 for the sampled households during the survey year (Table 4). The maximum and minimum family size was 8 and 1 person, respectively. The t-test result indicated that there was statistical significance difference at 5% (t=2.157; P =0.033) between the farmers who continuously participated in communal irrigation scheme, and those who couldn't proceed in participating in the utilization of community managed irrigation scheme.

Table 4: Distribution of sampled households by household's size

Household Size	N	Mean	Std. Deviation	Std. Error Mean
Participant	75	5.40	1.882	0.217
Non participant	43	4.63	1.852	0.282
t- value (P-value) 2.157**(0.033)				

*Source: Survey result, 2017, ** significant at 5% probability level*

Dependency Ratio

This is the ratio of number of children below 15 years of age, disabled members and elders who are above 64 years of age against the number of those who are economically active in the same family (15-64 years of age). With an increase in dependency ratio the ability to meet subsistence needs of a family declines. The dependency ratio for the total sampled household head was 0.79 with standard deviation of 0.72. The t-test result indicated that there was statistically significance difference (t= -3.347; P = 0.001) between participant in communal irrigation scheme, and non-participant. The negative correlation is showed that as the dependency ratio increases, farmers participation communal irrigation scheme utilization become decrease.

Table 5: Distribution of sampled household by dependency ratio

Household Land Size	N	Mean	Std. Deviation	Std. Error Mean
Participant	75	2.66167	.716237	.082704
Non participant	43	2.33721	.514330	.078435
t- value (p- value) 2.608*** (0.010)				

*Source: Survey result, 2017, *** significant at 1% probability level*

Farm land size

Farm size is considered to be a factor to participant in the community managed irrigation scheme utilization such as the construction of the community managed irrigation structures requires a given size of land. The survey result showed that, participation in communal irrigation scheme and non participant in communal irrigation scheme possess different size of farm land. The land holding size varies from 1 to 4 ha with an average of 2.5 and 0.67 Standard deviation. The mean land holding of farmers engage in participation and non participant was 2.64 and 2.37 ha, respectively. Out of the total sampled household only 33% owned more than 3 ha of land. This showed how it would be hard to produce sufficient amount of food for the average family of 4.5. In order to test the relation between land holding and use of community managed irrigation scheme, t-test was conducted and the result indicated statistically significant difference in the size of landholdings (t=2.608; P=0.010). It can be concluded that farm household with relatively large farm size were the first in using communal irrigation scheme utilization. This was in line with the findings of Girmachew (2005).

Dependency Ratio	N	Mean	Std. Deviation	Std. Error Mean	t-value
Participant	75	.6269	.54935	.06343	-3.347***
Non Participant	43	1.067	.87921	.13408	(0.001)

Table 6: Total land holding and cultivated land in hectare among the respondents (N=118)
*Source: Survey result, 2017, *** significant at 1% probability level*

Annual Income of the household headed

In the context of this study, annual income of the household is defined as the cash earnings from sales of their agricultural produces, forest resources, wage earning, sales of livestock and remittances and do not include cash value of all the costs of related inputs. From the household survey and Focus Group Discussion, it was found that the sources of income in the study area include sales of food crops, cash crops such as pepper, onion, eucalyptus tree, wage, and sales of livestock including small ruminants. From the data analyzed as shown in Table 8, the cash income from the different sources in one year period (between two harvest seasons preceding this study) ranged between 10000 and 125600 ETB. From the data, it can be seen that households are earning from the diverse livelihood activities and can spend for all types of household's requirements and production activities. Hence, depending on the amount of cash earnings in one year by a household, which looks relatively lower income (Table 7), the decision to participant in communal irrigation scheme also low.

Table 7-: Amount of annual cash earnings of sampled households by source

Household Annual Income	N	Mean	Std. Deviation	Std. Error Mean	t- value (p-value)
Participant	75	6.85	30906.52	3568.77532	7.381***
Non participant	43	3.16	12324.28	1879.43482	(0.000)

*Source: Survey result, 2017, *** significant at 1% probability leve*

Institutional Factors

Access to Extension services

Availability of extension service for the farmers play important role in terms of creating knowledge and skill to use improved agricultural inputs. The government is the only agency which provides extension service in the study area. During the study time, there were three development agents assigned by government to provide extension services to the farmers in the area. Frequency of extension service was measured and the results are indicated in table 9. About 62.8 of households received extension advice but fail to participant in communal irrigation scheme utilization, whereas 37.2% received on extension advice and also continuously participant in communal irrigation scheme utilizing. Out of total sampled household headed only 52.5 % received extension advices and 47.5% of the sampled households do not received extension advices for their agriculture productions. The frequency in case of users and non-users of irrigation differs. One of the areas where extension service was given was in area of irrigation development where irrigation users benefit out of it.

It was hypothesized that households who were more frequently visited by the development agents develop a capacity to receive and analyze information which leads to make decision to apply new technologies better than those with less frequently visited households. Access to relevant agricultural information enhance farmers' awareness and contributes for better understanding of new technologies which resulted in change of behavior that leads to make decision to participant in community managed irrigation scheme or fail to participant in community managed irrigation scheme. In this regard, from the total sampled households 52.5 percent had got extension service. Concerning community who participant in communal irrigation scheme and fail to participant in communal irrigation schemes, about 61.3 percent and 37.2 percent were received extension service, respectively (Table 8). This indicated that users of communal irrigation scheme have got better extension service than the fail to participant in communal irrigation scheme (X^2= 6.379; P=0.012). This implies that frequent extension contact has contributed for users group to have access for community managed irrigation scheme utilization.

Table 8: Number of household headed access to extension services

Access to the Extension Service	**Non participant**	**Participant**	
No	27	29	56
Yes	16	46	62
Total	43	75	118
Pearson Chi-Square(χ^2)		6.379** 0. 012	

*Source: Survey result, 2017. **significant at 5% probability level*

Utilization of Credit

Most of the smallholder farmers could not afford the cost of recommended agricultural technologies due to shortage of capital. Likewise, access to credit is considered to be a determinant factor to participant in communal irrigation scheme continuously. Therefore, use of credit plays a significant role in influencing the use of communal irrigation scheme (Nigigi, 2003). Sambrook and Akhter (2001) also pointed out that access to credit and use of credit significantly related with the use of communal irrigation scheme water in Uganda. According to his findings, all users of credit were found to be users of communal irrigation scheme utilization, whereas households who have no access to credit were not able to use the community managed irrigation scheme. In this study, from the total (118) sampled households 74 (62.7%) were access to credit because they had faced with shortage of working capital for crop and livestock production (Table 9).

Shortage of working capital among the two categories was common problem as the chi-square test revealed insignificant difference (χ2=1.377; p=0.241). With regard to farmers who participant in community managed irrigation scheme and fail to participant continuously, 58.1 and 65.3 percent respectively has accesses to credit which is not significantly different (χ2=1.377; p=0.241). Moreover, respondents explained that the major constraining factor for credit was collateral. The repayment condition was appreciable in which all of the credit users paid the credit according to the schedule. However, as already mentioned, the costs of communal irrigation scheme structure construction were covered totally by the government and credit

could not be a determinant factor for this communal irrigation scheme at least at this time. Nevertheless, the level of credit coverage and repayment condition may be valuable for future planning and intervention concerning this issue.

Table 9: Utilization of credit by the sampled household headed

Household participation in communal irrigation scheme				χ^2-value (p-value)
Use of Credit	**Non participant**	**Participant**	**Total**	
No	18	26	44	1.377 NS
	41.9%	34.7%	37.3%	
Yes	25	49	74	(0.241)
	58.1%	65.3%	62.7%	
Total	43	75	118	

Source .Survey result, 2017: NS= not significant

Utilization of improved Agricultural inputs

This study also found out that there were no access to inputs such as fertilizers, improved seeds, improved breeds, pesticides and the like. Also Mahdi (2005) find out the same result with regard to the access to inputs positive relation with farmers who uses communal irrigation scheme. The input availability is related to both extension and formal credit services. The result of chi-square test revealed significant at one percent (χ^2=7.212; p=0.007). Out of the total respondents 71 (60.2%) had utilize improved agricultural inputs for their crops and vegetables. With regard to farmers who participant in community managed irrigation scheme and fail to participant continuously, 69.3 and 44.2 percent respectively had used improved agricultural inputs which is significantly different (χ^2=7.212; p=0.007).

Table 1: use of improved agricultural inputs

Household participation in communal irrigation scheme utilization				χ^2 value (P-value)
Access to the Technology Utilization	**Non participant**	**Participant**	**Total**	
No	24	23	47	
	55.8%	30.7%	39.8%	7.212***
Yes	19	52	71	
	44.2%	69.3%	60.2%	(p=0.007)
Total	43	75	118	

Source: Own survey result, 2017. *** Significant at 1% level

Market information

Market information has paramount importance to create awareness among farmers about current market price of the agricultural production. Access to relevant market information serves the farmers for better understanding and facilitates behavioral change that result in making decision. Various extension methods such as training, demonstration and other means are used for effective information transformation. The survey result indicated that 63 (53.4%) of the sampled households received information from various sources. Concerning the two categories, larger proportion (62.7%) of farmers who participant in communal irrigation scheme and (37.2%) of farmers who failed to participant got information from different sources (Table 11). Out of the total respondents 49 (33%) of them owned radio and used to listen about agricultural information whereas 101 (67%) have no radio. The statistical test revealed statistically significant difference (P=0.008) between farmers who use communal irrigation and not. As a result, it can be concluded that users of community managed irrigation utilization have better opportunities to receive agricultural information from various sources due to access to market information.

Access to Market Information	Non participant	participant		$x^2 value$ (p-value)
No	27	28	55	
Yes	62.8%	37.3%	46.6%	7.118***
	16	47	63	
	37.2%	62.7%	53.4%	
Total	43	75	118	(0.008)

Table 2: The market information about agricultural production by households
*Source: survey result, 2017, * significant at 1% probability level.*

Market Distance

Market accessibility is also another important factor for farmers to participant in communal irrigation scheme utilization. If farmers are closer and having access to market services, they can easily purchase improved agricultural inputs and sell their agricultural outputs by minimizing time and long distances. Many respondents have stated that market place is the main place to exchange any information. Farmers are also motivated to use improved agricultural technologies if they have access to attractive market with good price. In this study the respondent farmers were interviewed to provide their idea regarding the market accessibility. The maximum distance to reach at the nearest local market center is 20 km. On average, the sample households were expected to walk 5 km to arrive at the nearest local market center. Similarly, both farmers who were participant in communal irrigation scheme utilization continuously and fail to participant in communal irrigation scheme walk for 12.5 km in average. To check the association between the use of communal irrigation scheme and market distance from dwelling, chi-square was carried out and it showed positive relation between the variable and the use of communal irrigation scheme with significant difference at 5% level (χ^2=6.924). This indicates that distance of market place from dwelling may matter to use communal irrigation scheme (χ^2= 6.924, P= 0.074).

Table 12: Market distance from the farm homestead

Household participation in communal irrigation scheme utilization				χ^2-value
Market Distance	**Non participant**	**participant**	**Total**	**(P-Value)**
1-5 km	0	8	8	
	.0%	10.7%	6.8%	6.924**
6-10 km	13	16	29	(0.074)
	30.2%	21.3%	24.6%	
11-15 km	25	34	59	
	58.1%	45.3%	50.0%	
16-20 km	5	17	22	
	11.6%	22.7%	18.6%	
Total	43	75	118	

*Source: Survey result, 2017, ** significant at 10% probability level*

Disease and pest infestation

Crop pest and insects are damage huge amount of agricultural output from farmers during planting up to harvesting of output. In addition to lack of modern storage facilities, insect and pests causes a loss of more than 1/3 of the total agricultural output in Agarfa district. Hence, farmers should be taught and materially supported to apply insecticides and pesticides whenever necessary (AWARDO, 2014). In Agarfa district the common crop pests are; Army

Worm, Boll warm, Grass Hopper, Rust, Barley Shoot fly which highly affect cereals and pulses from flowering up to maturing stage crop and vegetable growth. From the data collected, about 68.6% of communal irrigation users reported the incidences of internal and external parasites on crop and vegetables with the season of frequently occurrence as presented in Table 13. Hence, according to Garforth*et al* (2005), their knowledge based on principles, facts and skills on parasite control are valuable assets in irrigation producers of the study area possess for expanded and intensified production.

The diseases and pest infestations are the predominant factors which affect the farmers in communal irrigation scheme influencing the two categories was common problem as the chi-square test revealed insignificant difference (χ^2=18.681; p=0.000). Out of the total respondents the major 81 (68.6%) had affected by the diseases and pest infestations of their crops, vegetables, fruits and livestock production. With regard to farmers who participant in community managed irrigation scheme and for those who did not participate, 54.67 and 93 percent respectively had affected by the diseases and pest infestation which is significantly different at one percent probability level. The farmers whose crops were affected had no point to proceed with the irrigation activity since they made loses from the yield. The source of pesticides and herbicide were the WARDO and local markets. This implies that the number of households who have opportunity to buy pesticides were limited. Moreover, the respondents explained that the major constraining factor for diseases and pest infestation were the climate change and chronic diseases occurred frequently.

Table 13: Diseases and pest infestation affected by the household

HH participation	Farmers who did no face diseases and pest infestation	Farmers face diseases and pest infestation	Total
Non participant	3	40	43
	8.1%	91.9%	36.4%
Participant	34	41	75
	45.4%	54.6%	63.6%
	x^2 value (p- value)	18.681***	(0.000)

*Source: Survey result, 2017, *** significant at 1% probability level*

Summary of BinaryLogit Model Results

Table 14: The Result of Binary Logit Model.

Variable	β	S.E.	p-value	Odd ratio
Constant	-7.245	3.674	.049**	.001
Education level	-.163	.498	.744	.850
Household size	.304	.290	.295	1.355
Dependency Ratio	-1.455	.778	.062*	.233
Annual income	.000	.000	.000***	1.000
Land size	.081	.824	.922	1.084
Extension Contacts	-1.273	.934	.173	.280
Market Distance	-.247	.637	.698	.781
Market information	2.421	1.128	.032**	11.252
Diseases and pests	-.345	1.724	.842	.709
Use of Technology	-.049	.836	.954	.953
Sex	.321	.846	.704	1.379
Pearson Chi- square		93.484***		
- 2 log likelihood		61.311%		

Source: Output of the Model,2017, significant at 1%,5% and 10% probability level

Empirical Results

The results of this study confirm a priority expectation in that the decision to participate continuously or dropout in communal irrigation scheme was influenced by the simultaneous interaction of several demographic, socio-economic, physical, technical and institutional factors. Out of eleven explanatory variables hypothesized to affect farmers' decision to use communal irrigation scheme, three were found to be statistically significant. These factors include dependency ratio, annual income and market information (Table 14).

Dependency ratio: The variable household dependency ratio was related negatively and significantly with use of community managed irrigation scheme utilization. The result was in line with the expectations. The negative sign implies that the as dependency ratio increases, the participation of the farmers in the community managed irrigation might decreases which shows dropout continuously. The odds ratio of 0.233 for dependency ratio indicates that, other things being constant, the odds ratio in favor of farmers' participation in communal irrigation scheme utilization increases by a factor of 0.233 as the dependency ratio decreases by one dependent person (inactive labour force). This could be because of high consumption in the household than high productive labour required and also irrigation required intensive labour force than any other activities. Similarly, this result was supported with the finding of Sambrook and Akhter (2001).

Annual income: The model result confirms that households with high annual income are more likely to participate in community managed irrigation scheme than households with low annual income. With the assumption of other factors constant, the odd ratio indicates that the probability of using community managed irrigation scheme irrigation increases by a factor of one as annual income increases by one unit. The result of this study was consistent with the finding of many other researches which were conducted in different parts of the world, as well as agrees with the ideas mentioned in the hypothesis part of this thesis.

Market information: In line with our expectation, the variable was found positively and significantly (at less than 5% probability level) affects the use of community managed irrigation scheme. The positive sign of the coefficients was as anticipated indicating that as the farmers' informed about market information well, farmers are full interested to participate in the communal irrigation scheme utilization, because of irrigation products like fruits and vegetables are perishable which can easily be damaged with little of time. With the assumption of other factors remaining constant, the odd ratio indicates that the probability of using community managed irrigation scheme irrigation increases by a factor of 11.252 as farmers' awareness increases about market information. The result of this study agrees with the finding of Molla (2005).

Conclusion and Recommendations

This study has tried to look into the socio-economic, institutional, and other related factors, which can affect farmers' participation in the community managed irrigation utilization. The descriptive and econometric analyses were used to analyze socioeconomic, institutional and other factors affecting participation of community managed irrigation scheme utilization. The evidences from the descriptive analysis indicate that most of the farmers who participate in communal irrigation users are male headed household with relatively higher farm size, have better education standards, have better access to credit and agricultural extension service, and have better annual income than those who non participants in communal irrigation scheme. The result of the binary logit indicated that the dependency ratio, market information and annual income were significant influence at less than 10%, 5% and 1% respectively probability level and has positive influence to affect farmers' participation in community managed irrigation scheme utilization.

Based on the main findings of the study, the following recommendations are forwarded:

- ✓ Decision of farmers to participate in communal irrigation scheme utilization was found to be influenced, among other things, by households' income position. This shows the need of initial capital to involve in communal irrigation scheme users. Therefore, giving special attention to provide credit to the poor, especially, FHHs has to be considered as a central and core component of any development intervention in the sector.

- ✓ Community managed irrigation scheme utilization involves the use of different practices which require knowledge and skill of application and management. Education was found to have a positive relation with farmers participating in the community managed irrigation scheme utilization, as it increases the probability of behavioral change of individuals and thus enhances ability to acquire and use

information required for production and marketing. Therefore, due emphasis has to be given towards amplification of education in rural area, so that overall livelihood of the farm households will be improved.

- ✓ Based on the result of the model and different group interview & focus group discussions, the major problem facing communal irrigation scheme users were absence of market information. Hence the concerned bodies should give emphasis to organize marketing cooperatives as well as giving recognitions to newly established cooperatives. Moreover, efforts should be made to create market linkages among communal irrigation users and potential market area, so that farmers will be able to sell their produces with fair price. In addition, storage technologies and processing activities such as production of canned and bottled vegetables should also be introduced; so that the bargaining power of farmers will be improved and as a result their income level and livelihood conditions will be improved.

- ✓ The author finally recommends further research to be done on examining the extent of farmers participation in community managed irrigation scheme utilization and the extent to which socio-economic (such as education, family size, dependency ratio, annual income, etc), institutional (such as credit service, land size, extension services, etc), and other factors affect the intensity of farmers' participation in community managed irrigation scheme utilization decision using time series data.

Conflict of interest

I declare that there is no conflict of interest among researchers and I ensure that I am responsible for any conflict may arise.

References

ABOFED (2009). Agarfa Bureau of Finance and Economic Development.

AWARDO (2014). Agarfa Woreda Agricultural and Rural Development Office.

Bhattarai, M., Sakthivadivel, R. and Hussein, I. (2009). Irrigation impacts on income inequality and poverty alleviation. Working Paper 39. Colombo, Sri Lanka.

CSA (Central statistics agency) (2014). Developing potential water source 2013 Addis Ababa.

FAO (2005). Food and Agricultural Organization.Irrigation in Africa infigures.AQUASTAT Survey – 2005.*Water Report* 29. Rome: FAO.

FDRE (2009). Federal Democratic Republic of Ethiopia. S*trategic Framework for Countrywide Water Centered Development Program*. Addis Ababa, Ethiopia.

Girmachew Siraw (2005). Determinants of adoption of soil and water conservation practices, The environ o Simen Mountains National Park Ethiopia. M.Sc. Thesis Presented to School of Graduate Studies of Haramaya University, Ethiopia

IWMI (2009). International Water Management Institute Ethiopia: Agricultural Water Management Policy Briefs. Issue 2007.Publishing AG and Co. KG Lap Lambert. Saarbrucken, Germany.

MahdiEgge (2005). Farmers' Evaluation, Adoptin and Sustainable Use of Improved Sorghum Varieties in Jijiga Woreda, Ethiopia MSc Thesis Submitted to School of Graduate studies, Haramaya University

Molla F (2006). Planning and Managing Water Resources at the River Basin Level:Emergence and Evolution of Concepts. Research Report.

MoWR (2010). Ministry of Water Resources.' Inter basin Water Transfer Proposals,' *Task Forceon Interlinking of Rivers,* GoI, New Delhi.

Ngigi, N., Stephen (2003). Rainwater Harvesting for Improved Food Security. Nairobi,

Plusqellec H.(2009). Modernization of large scale irrigation systems: Is it an achievable objective or a lost cause? Irrigation. Drainage. 58:104-120

Sambrook, B. and S. Akhter (2001). Social and Gender Analysis: Findings from theinception phase. Domestic Roofwater Harvesting Research Program, RN-RWH02.Hambantota,Srilanka. 34-36pp.

Taro Yamane (1967). Statistics : An Introductory Analysis. N.Y. Harper and Row p.886) Rome. Italy.

World Bank (2006). Managing Water Resources to Maximize Sustainable Growth.*A World Bank Water Resources Assistance by Strategy for Ethiopia*. Washington DC.