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Impact of Fentale Large Scale Irrigation Scheme on Poverty: Case of Karayu Agro Pastoralist Society of Upper Awash, Oromia National Regional State, Ethiopia

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Abstract: The study was conducted in Fentale district of upper Awash, to understand the effectiveness of Fentale large-scale irrigation in reducing the poverty of study Karayu agro pastoralist community. The study employed household survey data, which collected from 120sampled households (60 irrigated and 60 none irrigated). The data were analyzed by using both descriptive statistics and econometric binary logit model. The study result revealed that, the incidence, depth and severity of poverty were significantly lower among irrigated sampled households. The estimated logit regression result revealed that, holding other covariates constant, in addition to access to large-scale irrigation, farm income, active family labor, family size in adult equivalence, farmland size, total livestock, livestock incomes and access to agricultural extension service were significantly influence the likelihoods of household being poor in the study area.

Key words: large-scale irrigation, poverty, logit model, Karayu agro pastoralist community

Background

As mentioned by Hanjra, et.al (2009) and Lawrence et al (2004), the main problems of sub Saharan African countries, to maintain the long been persistent problem of poverty and food insecurity were not the scarcity of water for irrigation, rather, the incapability of building irrigation infrastructures for efficient utilization of water for irrigation. Beside the persistent climate variability, drought prone impact and the poor capacity of controlling the variation has been the main ground for long life of poverty and food insecurity in the region. Moreover, the economy of most sub-Saharan African countries has been depends on traditional agricultural system. However, their agricultural production and productivities has easily exposed to unexpected persistent seasonal rainfall and climate variability. Hence, the inhabitants in the region long been exposed to poverty and food insecurity (Ward et.al, 2007).

Ethiopia is one of the least developed land locked sub Saharan east African countries. The approximated land area of the country has about 1.13 million $km^{2.}$. The country 1.12 million Km^2 has

covered by land and about 0.01 million km^2 has covered by water. Geographically the country has located in between the latitudes of 5° N and 15° N and longitudes of 35° E and 45° E (Hajii, 2013). The mean annual rainfall of the country has 812 mm, and its range has 2031 mm. The western highland of the country has received the highest ranges, which constituted from (1600mm - 2122mm) per annul. While the eastern low land area of the country received lower share of annual rainfall, which comprised from (91mm -600 mm). Beside the mean temperature of the country has ranges between 4-5^{0}c in the high land area and 31^{0}c in the low land areas (Gebrehawaria et al, 2009 H). The country has bordered by six neighbor countries of Eritrea in the North, Djibouti and Somalia in the East, Kenya and Somalia in the South and Sudan and South Sudan in the West (Yazew, 2005).

According to Mengistu (2013) and CSA (2017), the economy of Ethiopia has more dominated by agriculture, which contributes, 85% of employment and 95 % of agricultural production has produced by15 million small farmers. In addition, the sector has contributes 90 % of export, and share about 45% of national GDP. However, the agriculture in Ethiopia has long been depends on traditional farming system. Moreover, the system has affected by recurrent rainfall variability and frequent drought, with poor exploiting of water resources for irrigation. Beside, the long stayed frequent climate variability, the recurrent drought and seasonal variability of rainfall has negatively affected agricultural production and productivity. Furthermore, the long live civil war in the country, and the persistent political instability for the past two regimes of imperial and military regime including the current regime was the historical evils for the country. Hence, this is the fundamental challenges for Ethiopian government to produce adequate food production to feed about 100 millions of the national populations, despite the country rich with water and land resources (Getaneh, 2011).

Moreover, the frustrated existence of climate vulnerability and the persistent drought prone has affecting the agricultural production repeatedly for decades. *For example,* the drought impact in 1984, 1994, 2004 and 2014 G.C within ten-year interval has been regularly damaged pastureland, causes land degradation and leads for the relentless failures of crop grown in the country. This continual natural disasters have been affects the livelihoods of millions of peoples and causes for the death of thousands. Thus, persistence dependence in rain fed traditional farming system and the incapability and poor exploitation of irrigation water, and its poor effectiveness has a ground for the long stay of food insecurity and poverty in the country (Dawit and Balta 2015). In Ethiopia, irrigation development has long aged, where traditional irrigation has evolved before a century (Awulachew et al. 2007; Bekele et.al, 2012; Mheret et al. 2011; Sulas et al. 2009). However, modern irrigation has evolved in the early 1950's with the main objectives of private commercial farm production, and with poor concern of developing irrigation at household level, to resolve the long aged poverty and food insecurity problems (Desta and Almaz, 2015; Bekele et.al, 2012 ; MoA ,2011; lakew, 2004). In addition, during the military regime the focus of irrigation development was for state farms, with feeding of some portion

of the nations. Nevertheless as indicated by Haji (2013), the current government gives main concern for developing irrigation at household level to resolve the long stayed livelihood problems of small farm households. However, the focus given to the pastoralist and agro pastoralist area has very low. Nevertheless, despite different polices has designed by different regime, and though the country has water rich of east African countries with 122 billion m^3 surface water, and 2.65-13 billion m^3 of ground water potential, the none effectiveness of the existing irrigation schemes has one of the main ground for poverty prevalence and food insecurity (CSA, 2017). To understand the effectiveness of investment on irrigation, in resolving the long been livelihood problems of small farmers and agro pastoralist community, various studies has conducted. *For example,* the studies by Agrie (2013); Bacha.et.al (2011); Etefa (2015); Gebregzbher et al. (2009); Getaneh (2011); Hajii (2013); Hailu (2014); Ketema (2013) and Zewelde (2015) were some of the studies conducted regarding, irrigation and livelihood linkages in Ethiopia. However, their studies were not give focus on irrigation and low land agro- pastoralist livelihoods linkage. Moreover, the study *Fentale* irrigation project is the first and the model national large-scale irrigation project at household level. Besides, its design has unique and closed pipe operation systems, which is new technology for study agro- pastoralist communities. Therefore, this study fills the above mentioned research gaps and provide a clue to understand the effectiveness or failures of study *Fentale* large scale irrigation project, in achieving the policy objectives of reducing poverty of study agro pastoralist community in *Fentale* district of upper Awash.

DATA AND METHODOLOGY

Descriptions of Study Area

The study area Fentale district is located in the eastern Ethiopia of Awash rift valley of upper Awsh in Oromia regional state. The district has 195 km far distant from the main capital city of Addis Ababa to the east. The inhabitants in the study area have *karayu* and *Etu* Oromo ethnicity. The total population of the district was 82,225, which constitute 43510 male and 38715 female populations where, (75%) of the populations has inhabitant of rural areas. The agro climatic ecology of the area has exhibits typical characteristics of arid and semi-arid environments. The yearly maximum temperature ranges from 32 to 42 degree centigrade, while the minimum temperature ranges from 9.6 to 22 degree centigrade. The rainfall in the district has erratic occurring two or three times yearly with mean annual rainfall is about 553 mm. The main rainfall season, which accounts for the largest total rainfall of the year occurs from July to September, and this season is locally termed as *Ganna* (which means main rainy season in *Afaan* Oromo). The other rainfall regime, called *Afrasa*, occurs from February to April, which is important for the study inhabitants in particular, since it comes at the point when herds and humans are exhausted by the long dry season. The main livelihoods of the study populations have long been depend on livestock production and on partial traditional farming system for their subsistence. The land area in the study district has 133965ha where, the largest percentage has used for communal grazing lands (OWWSDE, 2008).

Fentale Large-Scale Irrigation project

The project is located in the upper Awash valley of the great east African rift valley. The physical characteristics of the project area is extensive plain land, which is located along the Awash River, where, Awash River is the main and the largest water body in this arid and semi-arid area with 1200km long. The construction of Fentale irrigation project was began in 2008G.C with planed total investment cost of **743,987,328.51** million (ETB) which funded by Oromia National regional Government, and yet its construction is ongoing. The project has a total gross area of 18,000ha and designed net area of 15,736ha, with planned beneficiaries of 11,116 HHs (OWWCE, 2009).

Sample Design and Methods of Data Collection

The study employed three stage stratified simple random sampling, by purposively selecting the study scheme to classify the study villages into different strata's. Finally, the study selected 120 sampled households from both irrigated and none irrigated households by using proportionate simple random sampling from the same villages to avoid the heterogeneity problems. The study employed both primary and secondary data. For primary data collection, the study utilized structured interview questioners, Key Informant Interview (KII), Focus Group Discussion (FGD) and personal field observation methods. In addition, before primary data collection, field visit has made with irrigation scheme engineers and irrigation experts who live at the base comp of study irrigation project. Following the field visit, before primary data collection has ongoing, the interview questionnaires has pre tested, checked, and a sort of error correction has made on the overall structures and on the contents of the questionnaires. While secondary data has collected from different national and international institutions and from past review of literature.

Method of Data Analysis :

To achieve the study objectives the study utilized both descriptive statistics and econometric methods. The descriptive methods was used to compare the demographic and socio economic characteristics of both irrigated and none irrigated sampled households, and to compare the incidence, depth, and severity of poverty between irrigated and none irrigated sampled households. Beside to determine the effect of access to irrigation and other covariates on household poverty, the study employed the econometric binary logit model.

Determining the cut of poverty line

Identifying of poverty line have a fundamental role to classify the study sampled households in to poor and none poor based on cutoff income per capita or expenditure per capita which satisfies minimum daily calorie intakes of 2200kcal/day/adult of energy requirements (WHO, 1985). Accordingly this study utilized the national absolute poverty line, 3781 ETB (Ethiopian currency) which is the minimum consumption expenditure on food and none food /adult/year which satisfied the 2200kcal/adult/day of energy requirements which determined by world health organization (Getaneh, 2011, CSA, 2014).

FGT Poverty Index

Under the condition of measuring poverty index, by using head count and poverty gap index, there are failures of indicating the distributional sensitivity and severity or harshness of the level of poverty among poor. Therefore, to overcome the problem, this study employed the familiar poverty gap index, Foster and Greer Thorbecke (FGT) index to verify the poverty severity (which is the income /consumption per capita gap among sample households fall below the cut of poverty line (Foster *et al*., 1984). Hence, the severity index clearly mentions how much the average income of poor far from each other for both irrigated and none irrigated sampled households which has given as below:-.

$$P\alpha = 1/N \sum_{i=1}^{H} (Ys - Yi/Ys)\alpha$$

Where; - Yi = indicates the i^{th} of poor sampled households,

Ys = is the cut of poverty line

N = indicates the number of sample households.

However, ($P\alpha$), have different values depending on the value assigned to α. If the value of the parameter α = 0, the value of numerator is equals to (H) thus, we get the head count fraction. If the value of α = 1 we get the value of poverty gap index and if the value of α= 2 it measures the squared shortfall of the poorest of poor, therefore, we get severity index (Todaro and Smith, 2011)

Econometric Logit Model Specification

The objective of this study is to assess the impacts of access to irrigation on the level of household poverty. Thus, level of poverty is dependent and binary which assigned (1) = if households are classified as being poor and (0) = otherwise. Thus, accordingly following Wijerathna and Hussain (2004); Gebregzabher et.al (2009) ; Gbenga et al (2014) given the liner probability model (*LPM*) the model has specified as below:-

$Pi = E(Yi = 1/Xi) = \alpha + \beta 1Xi$ .....(1)

Where: - Y = (1) if household are classified as being poor and (Y) = (0) otherwise and (X) represents covariates included in the model. However following (Gujarat, 2004) the logistic model given as:-

$$Pi = E(Yi = 1/Xi) = \frac{1}{1+e-\alpha+\beta 1Xi} \ldots\ldots(2)$$

By rearranging the above equations (2),

$Pi = 1/1 + e^{-Zi} = e^{Zi}/1 + e^{Zi}$.....(3)

Where: Zi; represents $\alpha + \beta 1Xi$.... ....., βnXn. Thus, if (*Pi)* is the probability of being poor then (*1 – Pi)* has none poor, which given as:-

$1- Pi = 1/1 + e^{Zi}$ .....(4)

Thus by rearranging the above equation (4)

$Pi/1-pi = 1 + e^{Zi}/1 + e^{-Zi} = e^{Zi}$.....(5)

Therefore, to establish the liner relationship between probabilities (*Pi)* with the unknown population parameters estimator, using natural logarithms;-

$Li = \ln(pi/1 - pi) = Zi$.....(6)

Where, $Zi = \alpha + \beta 1xi \ldots \beta nxn$

Table: I Definitions of Dependent and Independent Variables

Variable indication	*Description of variables*	*Expected sign*
Y	Level of household poverty (1 = if being poor, 0 = otherwise)	Depend variable
	Farm income measured in (ETB)	-
X1	Irrigation access(1= if irrigated = 0 if none irrigated)	-
X2	Gender of household head (1 = if female 0 = if male)	-
X3	Household head age (measured in number)	-
X4	Household head level of education (0= illiterate 1=literate 2= elementary complete 3= junior complete 4= college and above)	-
X5	Size of household family (in adult equivalence)	-
X6	Family labor	-
X7	Farm land size measured in (ha)	-
X8	Family Dependency ratio	+
X9	Number of livestock holding measured in (TLU)	-
X10	Farm asset measured in (ETB)	-
X14	Distance from the irrigation land measured in (kilometer)	+
X15	Access to extension service (1 = if access to service = 0 otherwise)	-
X16	Access to farm input (1 = if access to input = 0 otherwise)	-
X17	Access to credit (1 = if access to credit and 0 = otherwise)	-

Result and Discussion

Demographic and socio economic characteristics

The statistical descriptive results have presented in table (I) and (II) below. The result mentioned that, there is statistical mean difference between most of the demographics of irrigated and none irrigated sampled households. As the statistical t- test result showed in table (I), the mean value of age, dependency ratio, active family labor and family size in adult equivalence was significantly different between irrigated and none irrigated sampled households, where the mean age of none irrigated households are higher than irrigated sampled households by (2.9). However, the mean active family labor and family size in (AE) is higher in irrigated households, which constituted about (2.15) and (0.7) over, none irrigated sampled household. Thus, the large active family labor and family size in (AE) may have a crucial role in reducing labor cost and improving the productivity of irrigation farm, hence irrigation farm demands large family labor. On the other hand, the female-headed households in the irrigated sampled households are significantly lower than none irrigated households; this implies that, the female participants in irrigation farm were lower in the study area. Beside the education levels of irrigated households are significantly higher relative to none irrigated, thus, this contributes for easily utilizing of the

new farm technology like irrigation and other complimentary farm inputs to improve their farm productions for irrigated sampled households.

Land Productivity and Resource Endowments

In the study area the mean farm income and the mean value of farm asset which is measured in ETB (Ethiopian currency) was significantly higher in irrigated sampled households, relatives to none irrigated households. The statistical t-test result showed that, the mean farm and asset income of irrigated sampled households was significantly higher by *26762 and 868 ETB* over none irrigated. Thus, this implies that, access to irrigation improves irrigation users income and to hold more farm asset. However, the mean livestock holding, livestock income and none farm income was significantly higher in none irrigated sampled household's relatives to irrigation users. Thus, this indicates that, lack of access to irrigation farm influences none irrigated households to participate in livestock production and none farm activities to improve their family livelihoods (see II,). On the other hand, the mean farmland size was significantly higher in none irrigated sampled households compared to irrigated households in the study area. Therefore, this implies that, in the study area the land distributions for irrigators has based on regional law of irrigation land distribution, which is 0.75ha for married and 0.5ha for youth. However, the case of none irrigated sampled households the farmland distributions was traditional and have no clear figures hence, farmers were holds farm lands based on traditional farm holding systems.

Table (II): Descriptions of Continuous Variables & Mean Comparison t-test Values

Variables	Irrigated	None irrigated	Mean difference	t- test
Age	44.15	47.0	2.9	2.9**
Dependency ratio	0.58	0.73	0.15	1.77
Active family labor	4.23	2.0	2.15	6.72***
Family size in(AE)	3.52	2.8	0.7	3.28**
Farm income in (ETB)	44236	17473.7	26762.3	9.45***
Asset income in (ETB)	3666.81	2797.9	868.85	5.12**
Livestock income in (ETB)	8897.5	12830.75	3933.2	2.85*
None farm income in (ETB)	2692	6281	3589	3.00*
Total livestock in (TLU)	7.49	8.5	1.0	2.19*
Farm land size in (ha)	0.82	0.47	0.4	5.82***
Farm land Share in (ha)	0.18	0.25	0.075	6.94***
Farm land Share out in(ha)	0.25	0.1520833	0.10	4.73**

** ** *** Significant at 1%, 5% and 10% level of significances*

Table (II) Descriptions of categorical variables

Variables	Categories	Irrigated (%)	None irrigated (%)	χ^2 -test for d/f
Gender of household head	0 = Male 1= Female	89 11	77 23	7.9**
House hold education	0 = Illiterate 1 = Elementary(1-4) 2 = Junior (5-8) 3 = high school (9-12) 4 = higher education	24.3 35.6 20.5 17.6 1.8	47.8 21 19 12.2 0.0	31.9***

** ** ***Significant at 1%, 5% and 10% level of significances*

Evaluating Household Poverty

Based on the daily-recommended calorie intakes which is 2200kcl/day/adult, the minimum national expenditure 3781 ETB/adult /year was used as cut off poverty line. Based on the cut of line, in the study area, estimates of about (68%) of sampled households were below the cut of poverty line, where (41%) has none irrigated and (27%) were from irrigated households. In addition, the poverty gap index (that measures, the average short fall of expenditure per capita of poor from the cut of poverty line) was (11%) and (23%) for irrigated and none irrigated sampled households. This implies that, to bring out none irrigated sampled households from below cut off poverty line, it demands improving of their expenditure per capita by (23%), which is higher than the irrigated households by (12%). Beside the severity index (the square of poverty gap index for irrigated and none irrigated households were constituted (4%) and (7%) for irrigated and none irrigated sampled households. Thus, this implies that, the expenditure per capita gap among poor irrigated households were lower relatives to none irrigated households, which was 4%. Thus this indicated that, access to large-scale irrigation improves the livelihoods of users over none users holding other variables which affects level of household poverty constant in the study area.

Econometric Binary Logit Model Estimation Result

The study was employed binary logit model to estimate the covariates that affects the probability of sampled households being poor. Accordingly, the binary logit regression results of the study result revealed that, the overall estimates of covariates, that determines the probability of being poor was good and best feet the data. Hence, the likelihoods of the value of small (P) from the (LR) test is less than 0.00001. Beside the measure of the overall significances of the covariate chi-square ($\chi 2$) distributions of the model is (98.37) for the logit model, with degree of freedoms (14) and significant. In addition, the Pseudo R^2 value of the binary logit regression result was found to be 0.76 for the model to estimates the likelihoods of poverty between irrigated and none irrigated sampled households. Thus, this implied

that, the model outcome of Pseudo $R^{2,}$ explains that, about (76%) of the variations of the explained variables which is level of household poverty were because of the variations of the covariates included in the model.

Table: III Logit Estimate Regression Result

Variables	Coef.	Std. Err.	| z |	Dy/dx	P>|z|
Farm income in (ETB)	-0.0008046	0.0003304	2.44	-0.06400	0.015***
Age	-0.0208999	0.0691631	0.30	0.0001	0.763
Dependence ratio	0.229921	1.487427	0.83	-0.001046	0.408
Gender	-0.5888249	1.599967	0.37	-0.000501	0.713
Active family labor	-0.763141	2.074645	2.78	-0.04899	0.005***
Education	-0.7499409	1.237093	0.61	-0.0638	0.544
Family size in (A.E)	-0.490749	1.476324	1.69	-0.02117	0.092*
Asset	-0.0000859	0.0005764	0.15	-0.0031	0.881
Access irrigation	-0.473474	2.097025	2.13	-0.07864	0.033**
Farm land size in (ha)	-0.07308	4.931763	2.25	-0.09413	0.025**
Total livestock in (TLU)	-0.3686245	0.2578969	1.43	-0.0313	0.153*
Agr. extension service	-0.36709	8.01294	2.42	0.0999810	0.016***
Access market	-0.761378	3213.387	0.00	0.5562232	0.998
Livestock income in (ETB)	-0.0004458	0.0002241	1.99	-0.03.790	0.047**
_cons	3.272419	3.907789	0.84		0.402
Number of observation	120				
LR $chi^2(14)$	98.37				
Prob > chi2	0.0000				
Pseudo R^2	0.7688				

** ** *** significant at 1%, 5% and 10% level of significances*

More over as indicated in the above table(III), the logit regression result revealed the, parameter estimated of the dummy variable access to irrigation, with the log odd of likelihoods of being poor over none poor was negatively related to the probability of being poor and statistically significant at (1%, 5% and 10%). The studies by Bacha et al (2011) and Hajii (2013) were confirmed the finding of this study. Hence, this indicates that, in the study area access to large-scale irrigation affects the household poverty prevalence negatively and reduces the probability of being poor holding the other covariate constant. Thus, this is because of access to irrigation improves cropping intensity and even creates conditions for irrigation users to produce during absence of rainfalls. Holding other covariates constant, the other covariate farm income has negatively correlated with the likelihoods of the odd of household being poor and statistically significant at (1%, 5%, and 10%) level of significances. Hajii

(2013); Sinyolo et al (2012) and Gbenga et al (2014) also reported similar result. Thus, this point out that, farm income has capable of the individual households to purchase the food crops and other none food crops even during the unexpected crop failures to cope up the problem of family food insecurity in the study area. On the other hand, holding other covariate constant, the variable active family labor has negatively related with the likelihoods of the odd of household being poor and statistically significant at (1%, 5%, and 10%). The studies by Bacha et al (2011); Stephen (2011) and Zewelde et al (2015) have also confirmed this result. Therefore, this implied that, active family labor have a fundamental role in improving agricultural production and productivity in rural area, especially in irrigation farming hence, irrigation farm demands more family labor supply. The other variable family size also negatively correlated with the probability of the odd of household being poor and statistically significant. However, the study by Etefa, (2016) and Getaneh (2011) reported, the controversy of this result, by evidencing, as family size increase; it increases the dependent families, which contribute more for consumption rather than supplying family labor. In addition, as the logit model result showed, the covariate size of farmland has negatively related to the likelihoods of the odd of household being poor and statistically significant at (5% and 10%) level of significances. Thus, this indicates that, as rural farmers holds more farm lands, the probability of its productivity is increases, which further reduced the likelihoods' of being poor. The other covariate total livestock, which measured by (TLU) was correlated negatively with the likelihoods' of the odd of household being poor in the study area and statistically significant at (10%) level of significance. The studies by Washun (2013) and Zewelde et al (2015) also reported similar results. Thus, these signify that, in rural area total livestock have crucial role being it used for multidimensional farming activities, hence it improve agricultural production and productivity and reduce the probability of household being poor. Agricultural extension service have fundamental role in improving the capacity of rural farmers, which is a ground for increasing farm production and productivity, and reduce the probability of being poor. Thus as logit model result revealed it is negatively correlated with the likelihoods of the odd of household being poor and statistically significant at (1%,5% and 10%) level of significances. Livestock income is the income generated from sale of livestock which is measured in (ETB) in the study area. As the model result revealed, livestock income correlated negatively with the likelihoods of the odd of household being poor. The studies by Bacha et al (2011); Getaneh (2011) and Ketema (2013) also confirmed the finding of this study. Therefore, this point out that, livestock income has contributed for purchase of food crops in rural area under the conditions of unexpected crop failures to cope up the problem of family food insecurity; hence, it reduces the probability of household being poor in the study area.

Marginal Effect after Logit Model (dy/dx)

The marginal effect result of the logit model indicates that, the percentage change of the likelihoods' of being poor because of one additional unit changes of the covariates included in the model. Accordingly, as the marginal effect of

logit model revealed, in the study area the one additional unit increase in irrigation farm which is measured in (ha) reduces, the probability of the odd of household being poor of irrigation users by (8%) over the none irrigated sampled households. Thus, this indicates that, with no doubt, in the study area holding other covariate constant, access to large-scale irrigation improves the production and productivity of users over none users. On the other hand, the logit marginal effect result revealed that, the one additional unit increase in farm income and livestock income which is measured in (ETB) in the study area, were reduced the probability of the odd of household being poor by (6%) and (3.7%). Thus, this implied that, farm income and livestock incomes have a fundamental role in improving the livelihoods of study-sampled households in the study area. In addition the one additional unit increase in active family labor reduces the probability of the odd of household being poor by (5%,). Thus, this point out that, increase in active family labor has played essential role in supplying family labor in rural area which reduced labor cost and improve farm production and productivity. On the other hand, the marginal effect result of logit model revealed that, a one additional unit increase in farmland size, which has measured in (ha), reduces the likelihoods of the odd of household being poor in the study area by (9.4%). This implies that, holding other thing constant increase in size of farmlands contributes for increase in production and productivity, hence it reduces the probability of household being poor. In the study area access to extension service, have a fundamental role in capacity building, hence the livelihoods of study households long been depends on livestock production and traditional farming for subsistence. Accordingly, as the marginal effect of logit model revealed, access to agricultural extension service reduces the probability of the odd of being poor by (9.9%) .Thus, build up of the service have a crucial role in the study area.

Conclusion and policy Recommendation

This study revealed, the significant differences of level of household poverty between irrigated and none irrigated study-sampled households. Thus, access to large-scale irrigation plays a fundamental role in reducing user's level of poverty without any hesitation in the study area. Hence, irrigation increases cropping intensity and crop diversification. However large scale irrigation was not the only variables that reduce level of poverty, hence, in the study area (27%) of users were under cut of national poverty line. Thus, this implies that, there are other variables that influence the rural poverty in the study area and to be addressed. For example, other variables like, active family labor, farm asset, farm and livestock income, livestock holding, and extension service were some of the variables, which correlated with household poverty in the study area. Therefore, accesses to irrigations were not the only variables that reduced poverty in the study area. Therefore, the government should give attention in improving the complimentary farm inputs to improve irrigation farm outputs. *For example,* focus should be given for supplying of sufficient farm inputs, like; fertilizers, selected seed varieties and pesticides. Moreover, the regional government should work on developing of proper marketing infrastructures and in developing perfect

market structures for inputs and farm output markets. Besides, the regional and district level agricultural office, should work on facilitating agricultural extension training and service for farmers capacity building for further reduction of poverty in the study area.

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