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Determinants of Farmers' Willingness to Pay for Improved Irrigation Water Use: The Case of Woliso District, Ethiopia

Tadesse Tolera Ejeta[1]*, Belaineh Legesse[2], Mohammed Aman[3]

[1]Department of Agricultural Economics, Ambo University, Woliso Campus, Woliso, Ethiopia
[2,3]Department of Agricultural Economics, Haramaya University, Dire Dawa, Ethiopia

Abstract— *The main objective of this study was to identify the key determinants of farmers' willingness to pay for improved irrigation water use using the contingent valuation method. Cross sectional data were collected from 251 households using a two-stage sampling technique (purposive and random sampling techniques) from four kebeles of Woliso District through a semi-structured questionnaire. The result from the Tobit model revealed that education level, family size, irrigable land size, number of oxen owned, total annual income, experience in irrigated farming, dissatisfaction, credit utilization and cash crops have significant and positive effect on households' WTP for the improvement of the existing irrigation use whereas initial bid was found to have a negative and significant effect. Since these variables are identified as major determinants of willingness to pay for improved irrigation water use, policy makers and government should take into account in the designing of improved irrigation water supply system.*

Keywords— ***Contingent Valuation, Willingness to Pay, Irrigation, Tobit Model, Woliso.***

I. INTRODUCTION

Water is a finite and vulnerable resource for which irrigation water is generally regarded as non-market good, plays a vital role in economic development (Anteneh, 2016). However, the future use and quality of water resources is affected by the effective use, financing and management of water in addition to the most important factor of population size. As a result, one of the determining factors of water availability will be water users and, their willingness to pay for the financing of systems and the sustainable management of water resources (Aydogdu, 2012).

In many parts of the world including developed world, irrigation farming has been necessitated by the growing land shortage and the need to maximize on the limited land available to grow food (Moyo *et al*., 2015). Irrigation, being one of ameliorating measures, is certainly most successful way of fighting against drought because it controls soil water balance, which creates favorable conditions for high, stable and economically justified plant production (Kljajic *et al*., 2013). This also benefits the poor through higher production, higher yields, lower risk of crop failure, and higher and year-round farm and non-farm employment. Irrigation enables smallholders to adopt more diversified cropping patterns, and to switch from low value staple production to high-value market-oriented production. Increased production makes food available and affordable for the poor (Asayehegn *et al*., 2011).

Irrigation development in Ethiopia is in its infancy stage (Eneyew, 2014). There are some constraints regarding the development of irrigation systems in Ethiopia. The major constraints hindering irrigation developments are predominantly primitive nature of the overall existing production system, shortage of adequate agricultural inputs and limited improved irrigation technologies, limited trained human power, inadequate extension services, and heavy capital requirement (MoA, 2011). Besides, lack of regular maintenance and rehabilitation hampered proper implementation of the irrigation project and as a consequence, discouraged smallholder farmers in the country (Alemayehu, 2014). Ethiopia has yet developed not more than 5% of the irrigation potential. Much of this is owned and poorly managed by small holder farmers (Eneyew *et al*., 2014). Similarly, Dereje *et al*. (2011) reported that irrigated agriculture comprises only 3% of the total national food production. That is why; irrigated agriculture is far from satisfactory despite of public interest, and strategic support of the government.

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Because there is nonuse value attached to irrigation water, in practice, it is difficult to determine the monetary value of irrigation water using market price. Thus, user participation throughout the entire irrigation management process appears to be an important method to achieve better irrigation water management (Tang *et al*., 2013). Accordingly, water pricing can potentially raise an ownership feeling to the farmers, which will ultimately lead to better use of available water and increased crop production (Bongole, 2014). However, free or very low charge encourages overuse, reduces the incentive for farmers to cooperate or participate in irrigation originations, and may result in low system productivity and poor conservation. Therefore, more attention should be given by government and other stakeholders for the implementation of irrigation water management practices in order to supply reliable irrigation water to the farmers. Furthermore, government and policy makers should consider the significant variables which have an impact in determining households' WTP (Alemayehu, 2014).

Previously, a number of studies were conducted using CVM in the valuation of irrigation water improvement to identify only the probability of households' WTP (Assefa, 2012; Alhassan *et al*., 2013; Angella *et al*., 2014), but none has been focused in estimation of improved irrigation water use to analyze both the probability of WTP and amount of money the households could pay as a whole and particularly in Ethiopia. Therefore, the objective of this study is to analyze the determinants of households' willingness to pay for improved irrigation water use in Woliso District of Ethiopia.

II. RESEARCH METHODOLOGY

2.1. Description of the Study Area

The study was undertaken in Woliso District of South West Shoa Zone of Oromia National Regional State. Woliso District is located at a latitude and longitude of 8° 32′ 23.0″ N and 37° 58′ 16.3″ E in the Southern West part of the country along Finfinne to Jimma main road, extending from 90-140 km from the capital city of the country, Finfinne. It has an area of 1,511.501 km^2, and 37 rural *kebeles* and three urban centers including Woliso town. The district is bordered in South by the Regional State of Southern Peoples' Nations and Nationalities and Goro district, in the North by Dendi district of West Shoa and Dawo district, in North East by Becho district, in West by Amaya district, in North West by Wonchi district, in East by Saden Sodo of South West Shoa Zone. Agro-ecologically, it is classified into *weinadega* (70%) and *dega* (30%) zones. Chromic and Vertisol are the dominant soil types found in the district. The largest river in the district, Walga River that located at 8 km from Woliso town is a major source of irrigation water of the farmer (WWAdO, 2016).

The population of the district is projected at about 171,150 persons in 2014, of which 85,175 are male and 85,975 females. From the total population 3,622 are urban dwellers whereas 167,528 are rural people. It is the most densely populated district of the zone (CSA, 2013).

The district has a long history of traditional irrigation practices and indigenous knowledge. Hence, it is possible to grab the opportunities and capitalize on. Accordingly, the households of the district are used to produce mostly different crops. However, there is a low institutional support for both irrigation users and non-users (Beyera, 2004).

2.2. Data type, Sources and Methods of Data Collection

The primary data were collected from sample households in the study area through semi-structured questionnaire using face to face interview. Besides, the data were generated by interview of the District Irrigation Development Authority Offices workers and supplemented by Focus Group Discussion (FGD) to generate qualitative information on the pre-test. Secondary data were also collected from the District Irrigation Development Authority Office and other relevant sources.

2.3. Sampling Technique and Sample Size

The study used a two-stage sampling technique (both a purposive and random sampling techniques) in the selection of the study site and the sample households, respectively. In the first stage, four *kebeles* (namely Badessa-Koricha, Gute-Godeti, Ciracha-Wanberi, and Gurura-Baka) were purposively selected from 37 rural *kebeles* of Woliso District based on representativeness to the major irrigation users of the Woliso District, proximity to the source of water i.e. their irrigable farm land is close to the river that used as the major irrigation source, and personal experience in irrigated farm in the area. In second stage, irrigation water user farm households were selected randomly from each sample *kebele* using probability proportional to sample size. Accordingly, the desired sample size is equal to 251.

2.4. Methods of Data Analysis

Econometric Model Specification

Tobit model was used in this study for analyzing the determinants of WTP and the maximum amount of money

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that respondents are willing to pay for improved irrigation water use. This model has an advantage over other discrete models in that, it reveals both the probability of WTP and its maximum WTP for the households, simultaneously. From an empirical standpoint Logit and Probit typically yield similar estimates of the relevant derivatives for only between 0 and 1. The cumulative distribution functions for the two models differ slightly only in the tails of their respective distributions. This makes the choice of the model arbitrary, though Logit has advantage of simplicity and ease of interpretation. However, the Tobit model uses all of the information, including information on censoring, and provides consistent and efficient estimates than other discrete models, logit and probit (Patnaik and Sharma, 2013).

Following Maddala (1992) and Johnston and Dindaro (1997), the Tobit model can be defined as:

$$MWTP_i^* = X_i\beta + \varepsilon_i \quad i = 1,2,3 \ldots\ldots N \qquad (1)$$

$$MWTP_i = MWTP_i^*, \text{if } MWTP_i^* > 0$$

$$MWTP_i = 0, \text{if } MWTP_i^* \leq 0$$

Where, $MWTP_i$ = the observed dependent variable, in this case maximum willingness to pay of each household (i^{th} household).

$MWTP_i^*$ = is a latent variable which is not observed when it is less than or equal to 0, but is observed if it is greater than 0.

X_i = Vector of factors affecting WTP

β = Vector of unknown parameters

$\varepsilon_i =$ Error terms that are independently and normally distributed with mean zero and common variance σ^2.

The model parameters are estimated by maximizing the tobit likelihood function of the following form (Amamiya, 1985).

$$L = \prod_{MWTP_i^*>0} \frac{1}{\delta} f\left(\frac{MWTP_i - \beta' X}{\sigma}\right) \qquad (2)$$

Where: f and F are the density function and cumulative distribution function of Y_i^*, respectively. $\prod_{MWTP_i^* \leq 0}$ Means the product over those i for which $\prod_{MWTP_i^* \leq 0}$ and $\prod_{MWTP_i^*>0}$ Means the product over those i for which $\prod_{MWTP_i^*>0}$.

It may not be sensible to interpret coefficient of a Tobit in the same way as one interprets coefficients in a non censored linear model (Johnston and Dindaro, 1997). Hence, one has to compute the derivatives of the estimated Tobit model to predict the effects of changes in the exogenous variables.

$$\frac{\partial E(MWTP_i)}{\partial X_i} = f(t)\,\beta' \qquad (3)$$

Where, $\frac{\beta' X_i}{\sigma}$ is denoted by t.

The change in the probability of WTP as independent variable changes is:

$$\frac{\partial F(t)}{\partial X_i} = f(t)\,\frac{\beta'}{\sigma} \qquad (4)$$

The change in the amount of WTP with respect to a change in explanatory variable among individuals who are willing to pay is:

$$\partial E\left({}^{MWTP_i}/_{MWTP_i^* \neq 0}\right) = \beta'\left[1 - t\frac{f(t)}{F(t)} - \left(\frac{f(t)}{F(t)}\right)^2\right] \qquad (5)$$

Where, F(t) is the cumulative normal distribution of T, f(t) is the value of derivative of the normal curve at a given point (i.e., unit normal density), t is the T score for the area under normal curve, β' is the vector of tobit maximum likelihood estimate and σ is the standard error of the error term.

III. RESULTS AND DISCUSSIONS

3.1. Households' Characteristics

The survey results show that the average educational attainment of household was 6 class years with the minimum educational achievement of no attendance, and the maximum achievement was 12 class years. The student's t-test shows that there is a statistically significance difference in the mean class year between willing and non-willing households. In the study area, the households are varying according to the size of their family. Accordingly, the mean family size was 3.6 adult equivalents which vary between a minimum of 2 and a maximum of 7.4 adult equivalents. The mean experience of farm household in irrigation practice was 15.52 years which range from a minimum of 4 to a maximum of 33 years. Practical irrigation farming experience significantly varies between willing and non willing households, with average years of experience of 16.18 and 7.58, respectively.

The total number of household respondents, only about 12.75% were female headed while the remaining 87.25% were male headed households. From the total 232 willing households, 90.09% were male headed households and 9.91% were female headed households. The chi-square value shows that there is a statistically significant difference between male and female headed households with regards to their willingness to pay, showing that sex difference is systematically related to the status of willingness to pay for improved irrigation use in the study area.

3.2. Institutional Characteristics of Sample Households

The mean credit households obtained from different sources and utilized is about 2069.6 Birr which ranges from 0 to 6000 Birr in the last year crop season. The significant respective mean difference for both willing and non willing households is found to be 2228.8 and 124.6 Birr, respectively. About 72.11% of the credit was from micro financial institutions. The rest 26.09% of the credit has been received from friends and relatives, and only about 1.8% comes from *idir*. The purpose of the credit received by respondents was to purchase fertilizer, to buy oxen, to buy seed, for livestock rearing, to purchase irrigation facilities, for petty trade, for home consumption and house building, in descending.

3.3. Farm Characteristics and Resource Ownership of Sample Households

The irrigable land holding is the most important input of production for households of the study area. The mean irrigable land holding of sample households is 3.99 *timad* (0.99 ha). The survey result also indicated that a mean irrigable land ownership for the willing and non-willing households is 4.11 *timad* (1.03 ha) and 2.55 *timad* (0.64 ha) respectively, that was found to be statistically significant. Oxen are the sole draft power used for plowing, and used for other function such as threshing, in the study area. Hence, it is much needed by farm households to cultivate their land on time in crop season. The average number of oxen owned by farm households was 4 with a minimum of 0 and maximum of 8 oxen.

The observed average annual household income is about Birr 66,631.4. The income level ranges from a minimum of Birr 1700 to a maximum of Birr 160,223 per year. The mean income difference between willing and non-willing household is 69,939 and 26,243.79 Birr, respectively that is found to be statistically significant. From the total mean annual income of sample households, vegetable and perennial crops contribute the highest income followed by, income from livestock and its products, off/non-farm income, annual crop respectively. The mean distance of the household walk on foot from the water source of irrigation was 1.3 hours with the range of 0.3 to 2 hours.

From all sample households included in the study, about 75.3% responded that rainfed agricultural crop productivity decreased and the remaining 24.7% of the households responded that there was no decrease in rainfed agricultural crop productivity. As it was indicated by the majority of household heads, the variability in rainfall pattern, intensity and amount is the major cause for the decrease in productivity.

The survey results identified that about 98.01% of households are dissatisfied with the existing irrigation water use while only the remaining 1.99% households are satisfied with the existing irrigation water supply. This may be because of seasonality of irrigation water, imbalance between existing demand and supply, distance from water source, absence of canal, and conflict among them made to be dissatisfied with the existing water use.

Results also shows that of the total households surveyed, 96.02% were growing cash crops (such as *khat*, coffee, sugarcane) and 3.98% were not growing cash cops. In the study area most households grow cash crops on the major portion of their irrigable land, and they always worry about such crops whether or not to get the optimum amount of water supply for them.

3.4. Determinants of Willingness to Pay for Improved Irrigation Water Use

Before estimating the effect of the explanatory variables, the correlation matrix using survey data was generated, and shows that multicollinearity is not a serious problem. Besides, robust standard errors were used and estimated in this study to solve heteroscedasticity problem. The results of the Tobit model show that farmers' willingness to pay is influenced by 10 variables that found to be statistically significant out of 16 explanatory variables included in the model. The results of the Tobit model and its marginal effects are presented in Table 1 and 2, respectively.

Education Level of the Household Head (EDUC): Educational level, as expected was positively related to WTP and significant at 5% probability level. Keeping other factors constant, the marginal effect of the variable indicates that a class year increase in education level of the household increases the probability of WTP for improved irrigation water use by 0.024%. In the similar way, as the education level of household increased by a class year, the amount of cash a household is willing to pay for improved irrigation water use could increase by 10.87 Birr, ceteris paribus. That is, households with more class years are more willing to pay for improved irrigation water. One possible reason could be that more literate individuals are more concerned about water resource as education provides knowledge and makes the household get information, and the information creates awareness about the benefits obtained from improved irrigation water than less educated or illiterate ones. This

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was consistent with the findings of (Ayana *et al*., 2015; Birhane and Geta, 2016).

Family size (FAMSIZ): In agreement with a prior expectation, family size was found to be statistically significant at the 10% level with positive sign. Keeping the influence of other factors constant, an increase in the total family size by a single adult equivalent increases the probability of being willing to pay for improved irrigation water use by 0.024%. Similarly, when the family size of the household increases by one adult equivalent, the amount of cash a household is willing to pay for improved irrigation water use may increase by 10.94 Birr, keeping other factors constant. This may be because irrigation practices are labor intensive to utilize available water; hence households with large family size are willing to invest more in irrigation. Irrigation water can also support the large family households through increasing the production and ensuring the supply of enough food to them. This is consistent with the findings of (Mezgebo *et al*., 2013; Alemayehu, 2014).

Irrigable Land Size (LANDSIZ): Irrigable land size of the household is statistically significant at 1% and related positively to WTP for improved irrigation water use. Other factors remaining constant, if irrigable land size of a household increases by one *timad* (0.25ha), the probability of WTP for improved irrigation water use increases by about 0.05%. In another way, when irrigable land size of the household increases by one *timad* (0.25 ha), the amount of cash that the household could pay for improved irrigation water use increases by 22.67 Birr, holding other factors constant. It has been expected that as the irrigable land size of a household in *timad* increases, the opportunity of high income from crop production using irrigation water will be surge. Therefore, this would lead to a higher demand for improved irrigation water. The findings of (Syaukat *et al*., 2014; Anteneh, 2016) are in agreement with what has been found in the present study.

Number of Oxen Owned (OXEN): Total number of oxen has been found to relate to the probability of willingness to pay for improved irrigation water use positively and significantly at 1% significance level. The calculated marginal effect shows that for each additional increment of the number of oxen, the probability of households' willingness to pay for the improved irrigation water use will increase by 0.075%, keeping the other explanatory variables constant. Similarly, when the number of oxen owned by a household increases by one head, the amount of cash a household is willing to pay for improved irrigation water use may increase by 34.37 Birr, ceteris paribus. Number of oxen could have a lion's share in rising income and wealth of rural households for its direct role in agricultural productivity. Households with larger number of oxen are likely to participate in irrigation practice (Gebrehiwot *et al*., 2015), and also raise farm income for they can use other farm inputs more efficiently by bringing additional land into cultivation through either cash rent or share cropping basis (Asayehegn, 2012). When this holds true, the willingness to pay for improved irrigation will also increase.

Total Annual Income (INCOM): Households' total yearly income has a positive sign and it is statistically significant at 1% level of significance. The marginal effect shows that an increase in the total annual income of the household by a thousand Birr increases the likelihood of households' WTP for improved irrigation water supply by 0.0068%, keeping other factors constant. In similar way, when an income of a household increases by one thousand Birr, the amount of cash a household could pay for improved irrigation water use increases by 3.1 Birr, holding other factors constant. Higher income increases the ability of household to pay and contribute to the allocation of available water to the households. Besides, those households with higher income are willing to pay more for improved irrigation water than their counterparts with lower income. This result is consistent report of (Assefa, 2012; Tang *et al*., 2013).

Experience in Irrigated Farming (EXPER): The irrigation farming experience is found to be statistically significant at 1% level of significance with the expected positive sign. The results suggest that a one year increase in irrigation farming experience of a household head increases the probability of households' WTP for improved irrigation water use by 0.018%, holding other factors constant. When irrigated farming experience of a household increases by one year, the amount of cash that the households could pay for improved irrigation water use would increase by 8.1 Birr, ceteris paribus. A possible explanation is that households with longer irrigation farming experience can easily realize the benefit from it and hence are more likely to attach high value for irrigation water than those shorter years of irrigation farming experience. This result is consistent with the findings of (Assefa, 2012; Ayana *et al*., 2015).

Dissatisfaction (DISSAT): Dissatisfaction with the existing irrigation water supply system is found to be positively influencing households' WTP for improved irrigation water use at 1% level of significance. The marginal effect estimate shows that households who are not satisfied by the existing irrigation water use are 16.1% more likely to

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support its improvement than those households reported their satisfaction with the existing irrigation water use. Similarly, households who are dissatisfied with the existing irrigation water use would pay Birr 326.54 more than those expressed their satisfaction with the existing use. Comparing to other variables, this variable has more an immense effect on determining the WTP of the household for improved irrigation water use in the study area. Households who are dissatisfied with the existing irrigation water supply system are found to be willing to pay more if there is an improvement as compared to those who are currently satisfied with the existing irrigation water supply. This may be due to the prevailing problems with the existing irrigation water use such as water scarcity, poor distribution of water, imbalance between the supply and demand, and conflict among users. This result is consistent with the findings of (Anteneh, 2016).

Credit Utilization (CREDT): The variable credit utilization has a positive sign as expected and significant at 10% significance level. This indicates that utilization of cash credit has a positive influence on the price farmers' are willing to pay for the improved of irrigation water use. The result indicates that, keeping other factors constant, a one Birr increase in the households' credit utilization increases the probability of the households' willingness to pay for improved irrigation water use by 0.13%. Similarly, when the credit utilization of households increases by one Birr the amount of cash that the household could pay for improved irrigation water use also increases by Birr 50.6, holding the effect of factors constant. The better credit farmers utilize, the higher is the price that they are willing to pay, because credit enables cash constrained farmers to invest in complementary inputs to irrigation, thereby enhancing their output and income. This result is supported by the findings of (Omondi *et al*., 2014; Angella *et al*., 2014).

Table 1: The Tobit model results of the maximum willingness to pay

Variables	Coefficients	Robust Std.Err.	t-values
Distance from water source (Hour)	-4.883297	3.371691	-1.45
Distance from the market (Hour)	-23.03829	30.28418	-0.76
Education (Class Year)	10.99667**	4.766136	2.31
Family size (Adult Equivalent)	11.07262*	5.970248	1.85
Land size (*timad*)	22.9416***	8.3019	2.76
Oxen (Count)	34.78387***	6.57817	5.29
Income (Birr)	3.13863***	.523806	5.99
Age (Year)	-1.947455	1.364906	-1.43
Experience (Year)	8.166546***	2.086936	3.91
Sex (1=Male)	10.38187	35.49004	0.29
Trend(1=Decrease)	13.48568	28.93801	0.47
Dissatisfaction (1= Yes)	378.7321***	138.5536	2.73
Credit utilization (Birr)	51.29487*	27.23905	1.88
Cash crop growing(1=Grow)	190.7497**	84.03015	2.27
Labor shortage (1=Yes)	27.23397	24.11122	1.13
Initial bid (Birr)	-25.92072***	6.866233	-3.78
Constant	-488.9225	175.9271	-2.78

No. of observation: 251; Log likelihood = -1546.23; F (16, 235) = 27.15; Pro > F = 0.000;
Pseudo R^2 = 0.0987; Threshold value for the model: Lower = 0.0000 Upper = + infinity
***, **, *: significant at 1%, 5% and 10% significance level, respectively.
Source: Own computation

Table 2: Marginal effects of explanatory variables on the amount of willingness to pay

Variable	Change in the probability	Change among the water users(Birr)	Overall change

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Distance from water source (Hr)	0.0001052	-4.825382	-4.877585
Distance from the market (Hr)	0.0004963	-22.76505	-23.01134
Education (Class Year)	0.0002369	10.86625	10.98381
Family size (Adult Equivalent)	0.0002385	10.9413	11.05967
Land size (*timad*)	0.0004942	22.66951	22.91476
Oxen (Count)	0.0007493	34.37134	34.74318
Income (Birr)	0.0000676	3.101407	3.134959
Age (Year)	-0.000042	-1.924358	-1.945177
Experience (Year)	0.0001759	8.069691	8.156993
Sex (1=Male)	0.0002389	10.25126	10.36881
Trend(1=Decrease)	0.0003082	13.31708	13.46884
Dissatisfaction (1= Yes)	0.1609477	326.5385	363.3554
Credit utilization (Birr)	0.0012903	50.59861	51.22353
Cash crop growing(1=Grow)	0.0202417	181.9665	189.3812
Labor shortage (1=Yes)	0.000616	26.8969	27.20034
Initial bid (Birr)	0.0005584	-25.6133	-25.8904

Source: Own computation

Cash crops growing (CASHCRP): Growing cash crops are found to influence the willingness of the households to pay for improved irrigation water use positively at 5% significance level. The marginal effect of the variable indicates that, keeping other factors constant, farmers who grow cash crops had 2.02% more probability of paying for improved irrigation water use than those farmers who do not grow cash crops. Farmers who grow cash crops would also pay Birr 181.96 for improved irrigation water more than those who do not grow cash crops. This is because of the economic importance of cash crops, which means households' growing such crops earn significant amount of income, which in turn enable the household to purchase productive inputs on time, and access technologies. In the study area, there are some households who obtain the highest annual income from sales of cash crops specially, *khat*. Therefore, in the study area households are willing to increase the area under cash crops. The increase in the area under cash crops can help in increasing the household income levels (Ali, 2013). Accordingly, they need more improved irrigation water to sustain their source of income, and they are also more willing to pay for an improved provision of improved irrigation water.

Initial Bid (IBID): The coefficient of initial bid has the negative sign as expected, and significant at 1% level of significance, indicating that the higher the amount the lesser the probability of accepting the offered amount which is consistent with the economic theory. This suggests that a one hundred Birr increase in the offered initial bid will decrease the probability of the household's willingness to pay for improved irrigation water use in the study area by 0.056%, other factors held constant. In similar way, when the initial bid price increases by one hundred Birr, the amount of cash the farmer could pay for improved irrigation water use decrease by 25.61 Birr, ceteris paribus. Comparable effects have been reported by (Tang *et al*., 2013; Alemayehu, 2014).

IV. SUMMARY AND CONCLUSION

Water is an economic resource which is necessary in the development of irrigation and plays a vital role in economic development. Hence, the main objective of this study was to identify the determinants of farmers' willingness to pay for improved irrigation water using the contingent valuation method in Woliso District.

The contingent valuation method used a Tobit model to identify the key determinants of farmers' willingness to pay for improved irrigation water use. The important variables identified in this study to determine farmers' WTP for improved irrigation water are, education level of the household head, family size, irrigable land size, number of oxen, total annual income, experience in irrigated farming, dissatisfaction, credit utilization, cash crops growing, and initial bid. All these variables were found to positively and significantly influence the probability of WTP for improved irrigation water use, except the initial offered bid value that was negatively and significantly related to WTP of the farmers. In conclusion, policy makers and government should take into account these important variables in designing and implementing the improved irrigation water supply system for the users of the study area.

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