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Research Article

Determinants of Household Willingness to Pay for Improved Water Supply in Horo Woreda, Oromia National Regional State, Western Ethiopia

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Abstract

Water is a source of life and a natural resource that sustains life and our environment. Water supply and sanitation conditions in Ethiopia are not different from the general situation of developing countries as a whole. The study was conducted in Horo Woreda of the Horo Guduru Wollega zone, West Ethiopia. A total of 127 households surveyed in the study to generate the data used in the study. Therefore, this study was undertaken to estimate the households' willingness to pay for the improved water supply service and its sustainability in Horo woreda with objective of recognizing factors which affect household willingness to pay for improved water and estimating willingness to pay of households for improved water using contingency valuation method in the study area. Qualitative and quantitative data was collected analyzed using Descriptive statistical tools. The response of respondents on different source of water they use were significantly different in which almost all of them use natural spring. With respect to Distances of water sources from home of the respondent about 95 respondents said that the distance is far and only 3 respondents said that the distance is near to their home which represents about 74.2 and 2.4% respectively which were the highest and lowest percentage. Of the total respondents interviewed about 96.9% of them reported that as they are willing to pay for improved water if constructed. Whereas only 3 respondents were unwilling to pay for improved water if constructed which represents 3.1% of the total respondent. Contingency valuation method confirmed that the respondents did not behave strategically as tested by student t-test. Factors that affect household willingness to pay were also analyses using logit model. According to logit model household income, family size, educational level and distance of from water source were statistically significant. Therefore, sufficient operation and maintenance training has to be provided for experts of water, energy and mineral office to improve their knowhow on improved water supply to teach society of study area.

Keywords: Logit Model; Contingency Valuation Model; Improved Water Supply

Introduction

Water is a source of life and a natural resource that sustains life and our environment. It is one of the precious gifts to mankind and most basic human needs, used for drinking, cooking, hygiene, sanitation, gardening and other leisure uses. Water plays a great role in socio-economic development of human populations and also for human survival and economic development [1]. Development of this resource is receiving unprecedented attention, as demand continues to rise [2]. In many villages of developing countries, people have to rely on the water source used by both animals and humans. Even when there are surface water sources in close proximity, these water sources are frequently polluted with animal and human waste. Provision of water from these sources usually threatens human health and welfare, augments health costs, and lower workers' productivity and school enrolment [3].

Described as the water tower of Africa, Ethiopia has abundant water resources, including 12 major river basins and 22 natural and artificial lakes. It is estimated that per capita renewable fresh water resources total 1,924 m3 per year. The exact groundwater potential of the country is unknown, but it has been estimated to be approximately 2.6 billion m^3 [4]. Despite this abundance, many Ethiopians have been suffering from lack of access to safe drinking water for centuries. In 1990, for instance, only 19% of the country's population had access to a safe drinking water supply the figure had reached 68.5% [5].

Moreover, Ethiopia is off track to meet the MDG target of 70% of the total population, access to safe drinking water by 2015. With a MDG-7 target of 70%, an additional 38 million people need access by 2015 for success. Ethiopia therefore needs to increase its 1990-2005 rate of extending coverage (20.9%) by more than a double to reach the MDG-7 goals. The country's water problem is not only low coverage levels but also poor water quality. The majority of drinking water sources in rural Ethiopia are still rivers, streams, hand-dug wells, and intermittent springs, none of which are protected from flooding, livestock, wildlife, and human contamination. Both require urgent attention to reach the MDG-7 target, and to lessen associated health and social implications [6].

In the country, if improved water sources exist, they are often far from the majority of user households and are located at inconvenient locations. The topography of Ethiopia is characterized by

rugged terrain, and women often are forced to travel long distances, requiring several hours round-trip, walking up and down steep inclines while carrying large containers full of water on their backs. The duration of waiting time at the water sources to collect water is also overly lengthy [7]. This will ultimately lead to household water insecurity (less water available than is needed for drinking, cooking, and sanitation) in rural areas, especially for those households for which the demand is higher due to large family size [8].

To improve access to safe clean water, the government of Ethiopia has prepared a water and sanitation policy document as an integral part of the country's water management policy. This document clearly indicates the right of every Ethiopian to get access to adequate and quality water to satisfy their basic needs in order to achieve rapid socio economic development through better health care and productivity [9].

Despite the fact that the Ministry of Water and Energy (MoWE) along with the support of many international and local organizations is invest millions of capital every year to tackle the problem through implementation of potable water supply projects. However, this alone would not achieve all the intended objectives [5]. An African Development Fund [4] report shows that 33% of rural constructed water services in Ethiopia are non-functional due to lack of funds for operation and maintenance, inadequate community mobilization and commitment, as well as lack of spare parts.

Therefore, the implementation of the country's water supply policy should focus on the demand side. Besides, since pricing of water is the key component of an appropriate incentive for efficiency, sustainability and accountability, there is a need to research the demand for the service. This helps to understand the fundamental value that the consumer places on the improved water service so that the price that reflects willingness to pay of the households for the improved water services, as strategy for cost recovery, can be established. To develop better understanding of user perception and preference of the service option and prior to water investment in a particular region, assessment of the actual demand and willingness to pay is decisive.

In view of the stated problems that many study under taken aims at finding the extent of communities' potential capability for generating funds for potable water supply and to examine determinants of household's WTP for the service. Identifying factors that affect households WTP for potable water supply helps policy makers to focus on the major socio-economic, demographic characteristics and water use practices of the households that affect WTP which improves the sustainability and coverage of country improved water supply. This in turn brings about the improved livelihoods by decreasing diseases and illnesses due to water related diseases and the time and energy spent for collecting water from long distances. As Worldwide 1.2 billion people are without access to safe water; Consequently, water and sanitation related diseases are widespread. When human beings do not have access to potable water; they not only suffer physically and emotionally but also socio-economically [10].

The main health problems, especially in developing countries like Ethiopia, are results of poor access to potable water, poor hygiene, and sanitation practices [8]. In these cases, supplying safe drinking water is of critical importance. Ethiopia has the lowest safe water coverage in sub-Saharan Africa estimated at only 42% with a meager 31% rural coverage reported in 2008. Water supply and sanitation conditions in Ethiopia are not different from the general situation of developing countries as a whole. As of 2004, national water service coverage in Ethiopia was estimated at only 37% (24% rural coverage and 76% urban coverage) [4]. The rural areas share was only 6,698,000 people. The water supply in Horo District in both the per capita quantity and quality of supplied water. Services have decreased over years. Problems associated with inadequate water supply service in the area contribute to lack of improved water supply to households and damages to public health. Such problems also impose higher costs on producers, consumers and government.

Rivers, unprotected springs and wells are the major sources of drinking water in Horo district. It was indicated that only about 18% of the total population of the woreda had access to potable water, get their drinking water from taps. The remaining housing units receive drinking water from unprotected wells, springs, rivers, and ponds. What amazing is that the town of Horo is found near to Finca'a Reservoir (around 10 km) in spite of this, the society faced a serious of shortage of water supply that is, and they practice thirsty at least for a week even those considered as assessed. Despite the high coverage of the water supply system, there is shortage of water quantity supplied to the households. During this early period the estimated population of the town was 35,552 (18,738 females). From these total population 31286 was unable to meet the current demand. Hence, high leakage problem and high population growth aggravated the water Problem of the woreda (Horoworeda water and sewerage office, 2016).

To improve the water supply situation of the woreda we need new construction of turbine (the pumps and all the pipelines) from Finca'a lakes or construction of dam from Finca'a lake, which is obviously fulfill currently desired wants and ensure its sustainability. The construction of additional boreholes is also needed to fulfill the current demand. However, all these activities require high capital outlays. Beneficiaries are required to pay for the improved water services. However, this alone would not benefit the peoples for a long period of time unless levels of sustainability can be greatly improved. The issue of sustainability is critical when resource scarcity and equity matters are raised. Thus, to improve the water supply situation of the town demands side information is highly required. This demand side information enables policy makers to design appropriate water tariff that is consistent with government policy and sustainability of the service.

Therefore, the focus of this study is to estimate the households' willingness to pay for the improved water supply service and its sustainability by taking Horo Woreda three kebeles as a case study. The provision of an improved water supply is neither cost free nor sustainable unless the costs are recovered. If households are

willing to pay for the improved service then the welfare gain may be considerable, otherwise, it might indeed be a waste of public resource to improve the service. Therefore, study was to assess determinants of household willingness to pay for improved water supply in Oromia region Horo district of western Ethiopia through identifying factors which affect HH WTP for improved water in the study area, recognize attitude and perception of household's willingness to pay for improved water and estimate WTP of the farmers for improved water using CVM in the study area

Research Methodology

Description of the study area

Horo district is located, in Horo –Guduru Wollega Zone of Oromia National Regional State, at about 313 km west of Addis Ababa, capital city of Ethiopia, and under the Zonal town which is the administrative center of Horo –Guduru Wollega Zone. Geographically, it is situated between 9034'N latitudes and 370 06'E longitudes (EMA, 1988 cited in Feyera, 2010) bordered by Jarte Jardaga district in the North, Jimma Ganati district in the South and East South, and Abe Dongoro district in the West and Abayi Coman district in the east. The mean annual temperature is about 16.60C and the mean minimum temperature is 10.780C whereas the mean maximum temperature is 22.320C. The study area covers 77,997.7 hectares. The total population of Horo District was 76,162 of these 73,983 and 2,179 were rural and urban population respectively. Similarly, 38,256 are females and 37,906 are males in District. Like other parts of the highlands of the country, there are mixed cultivation of livestock rearing and crop production, in which subsistence agriculture is the main economy development of the community. Coffee and honey production is also practiced in the forest area. Based on the data obtained from the Major crops grown includes cereal crops (teff, wheat, maize, barely), pulses (peas and beans) and oil crops (noug and rape seed). The livestock populations in the district are 362,507 cattle, 118,389 sheep, 29,214 goats, 85,557 poultry, 38,523 horses, 4,007 mules and 18,545 donkeys [11].

Sources and methods of data collection

Types and sources of data

The research was designed to carry out at micro-level mainly at household level in three peasant association in which the type and source of data used for this research were primary and secondary.

- **Primary data sources:** Primary data are obtained through individual interviews, Focus Group Discussions (FGDs), key informant interviews and direct field observation and it was applied to collect detailed information on the determinants of household's willingness to pay for improved water in the study area.
- **Secondary data sources:** relevant data like remnant improved water coverage, distribution system, distance from the source, name of water body and climatic condition of the area was collected from published and unpublished material such as office records and reports, journals, books and files from Horo Woreda Water Mineral and Energy office. Collecting and considering both primary and secondary sources through qualitative and quantitative methods of data collection was complement and/or supplement the diverse data generate from different sources, which in turn use to make the data and the result of the research reliable.

Method of data collection

The qualitative methods was help to get the views, perceptions, and decision levels and the quality of extension services etc. whereas the quantitative methods was help to get quantitative data like population number, education status, household age and sex compositions, availability of ground water and surface water used in system etc. Four complementary data collection methods were used to address the terms of reference for this study. These includes,

Household survey

This is a formal survey method where a semi- structured interview scheduled was employed with closed and/or open-ended questions for eliciting information from respondents. On the base results obtained from the pre-test, necessary modification was made. Three trained technical assistants' were administering a structured interview. The interview was conducted within the respondent's territory and in interviewing atmosphere.

Focus group discussion (FGD)

Is one of the most commonly used qualitative data collection approaches, to complement the household survey, basic descriptive information were collected at the PA and village level in each survey site. This technique was help to acquire useful and detailed information, regarding extension service, problem farmer's face on adoption of the system, etc...This might be difficult to collect through the household survey. Discussions were made with randomly selected 2-3 individuals' respondent under the guidance of a moderator in each PA and a total of 6-9 as the study area. Checklists were prepared to guide topics for open-ended discussion with group of farmer.

Key informant interview

To complement the questionnaire and to have a detailed in sight in to willingness to pay for improved water practices in the areas in-depth interviews and discussion covering different topics like the major causes and extent of water pollution, perception of households towards access of improved water supply problems and the solution measures, consequences of access of improved water supply and, social, economic aspects, willingness to pay for improved water practices accepted, widely disseminated, and adopted by the society? Why? And what are the major factors that affecting house holds' WTP for safe drinking water and sanitation practices in the study area/district was also held with district Water Mineral and Energy office experts.

Direct observation

Is one of the other methods used to collect primary data. It was carried out through systematic watching, listening and recording of different data. This informal technique was help to generate ideas and to obtain useful and detailed information about biophysical factors, values of local people especially the "goods" and "bad" of the society and farmers awareness of WTP for improved water supply in the study area.

Sampling technique and sample size

Horo district were purposively selected because the area represents one of the highest case scenarios on the degree and rate of problem of pure water supply, high number of population, high soil fertility declined, low water and soil conservation measure practiced, high over dependence on spring water and at the same time low water quality. To determine the sample kebeles and households, two stage random sampling procedures was used. In the first stage, three kebeles out of twenty-two kebeles namely Akaji-Sebet, Doyo-Bariso and Rifent- Chabir were selected randomly.

In the second stage, 127 households were selected randomly by lottery method by taking into account probability proportional to the size of households from each sample kebeles. The sample size was determined based on the following formula given by Cochran, 1977 as cited in Bartlett *et al*., 2001.

$$no = \frac{Z^2 * (P)(1-q)}{d^2} \quad \text{-----(1)}$$

$$n_1 = \frac{no}{(1 + no/N)} \quad \text{-----(2)}$$

Where

n_o: Desired sample size Cochran's (1977) when population greater than 10000

n_1: Finite population correction factors (Cochran formula, 1977) less than10000

Z: Standard normal deviation (1.96 for 95% confidence level)

P: 0.1 (proportion of population to be included in sample i.e. 10%)

q: Is 1-P i.e. (0.9)

N: Is total number of population

d: Is degree of accuracy desired (0.05).

Method of data analysis

Descriptive statistical analysis including frequency, percentage and ranking were used. The analytical technique was applied including independent t-test to detect differences in the mean of variable between two groups of respondents. Chi square-test was applied to detect any systematic association between the dependent variable of interest and specific household characteristics. The data were analyzed using Statistical Package for Social Science (SPSS) software.

Contingent valuation method

Contingent Valuation Method (CVM) is a standard approach for valuing non-market resources such as recreation, wild life and Improved water supply [12]. It enables economic values to be estimated for a wide range of commodities not traded in a market.

Compensating variation (increment in the level of provision of a good or improvement in the quality of an environment in compensation for WTP) is an appropriate measure when the person must purchase the good, such as improvement in improved water supply. Accordingly, willingness to pay (WTP) is defined as the amount that must be taken away from the person's income while keeping his utility constant. Following is the compensating variation when a person purchases an improvement in Improved water supply can be specified as:

$$U(Y - WTP, P, Q1; Z) = U(Y, P, Q0; Z) \quad \text{------(3)}$$

Where

U: Denote the indirect utility function,

Y: Income

P: Vector of prices faced by the individual

Q0, Q1: Alternative levels of the good or quality indexes (Q1 > Q0, indicating that Q1 refers to improved supply quality and Q0unimproved one).

WTP: Willingness to pay

Z: Respondents characteristics (such as age, education, wealth, etc.)

Payment vehicle and valuation techniques are two central elements that need to be defined in CVM. Various methods can be used. For example, expense per trip in recreational outings, higher taxes for environmental protection, etc. Two criteria in choosing the payment vehicle are realism (actual means of payment) and neutrality (free of bias). To the extent possible, the payment vehicle must reflect the actual means of payment and it should not be associated with emotional reaction of the respondent.

Analytical model

Farmers' decision to adopt WTP for improved water supply at any time influenced by combined effect of socioeconomic, personal attributes, demographic, biophysical, and institutional factors, which related to their objectives and constraints. It is a complex, one involving two stages, one is whether to WTP or not WTP.

Factors influencing willingness to pay by household

To identify factors influencing willingness to pay for improved water supply by households the household responses to the WTP question were regressed against the prices the households were WTP and other socioeconomic characteristics of the household The regression logit model is specified as

$$P_i = F(Z_i) = F(\alpha + \sum \beta_i X_i) = \frac{1}{1 + e^{-Zi}} \quad \text{-------(4)}$$

P_i is the probability of individual certain choice given X_i; e denotes the base of natural logarithms, X_i is the i_{th} explanatory variables; and α and β_i are parameters to be estimated. More specifically,

$$Z = ß_0 + ß_1 X_1 + ß_2 X_2 + \ldots\ldots\ldots\ldots + ß_7 X_7 \text{---(5)}$$

Z: Willingness to Pay; X_1: Age (yrs); X_2: Educational level; X_3: Marital status; Dummy variable (married =1, single=0), X_4: Sex of Household; X_5: Family size; X_6: Income of Household; X_7: Distance from water source.

Result and Discussion

This chapter, being the core of the thesis work, consists of the overall findings of the study to be present in different sections to address the objective of the research. The results of descriptive statistics and I think Logit model result has been used to for the last objective the analysis was made in the objectives of the study. Section 4.1 Deals with descriptive analysis, 4.2. Up to 4.3 present

the result of objective of the study and section 4.4 presents the results of the econometric analysis.

Socio economic profile of the respondents

Of the total respondent taken for this research about 81.2% of them were male whereas the remaining 18.8% of them were female. There was significant difference between the number of male and female household table 1. From all respondent taken for this study about 43.31% of them were illiterate whereas about 56.69% of them were literate. The more educated the respondents, the more likely they would be willing to adopt improved water services from private enterprise having the knowledge of the consequences of shortage in water supply significant 0.045 levels.

S/N	Variable	Willing to pay IWC		Frequency	Percent	P. value
		Yes	No			
1	Sex					
	Female	22	1	23	18.11	0.488
	Male	102	2	104	81.89	
	Total	124	3	127	100	
2	Marital status					
	Single	2	0	2	1.57	0.280
	married	115	2	117	92.13	
	Divorced	7	1	8	6.3	
	Total	124	3	127	100	
3	Educational Level					
	Illiterate	52	3	55	43.31	0.045**
	Literate	72	0	72	56.69	
	Total	124	3	127	100	

Table 1: Socioeconomic attribute of the respondents

A bout 92.13 percent of the respondents are married and this increase the water consumption pattern of each household. Also, the household size of the respondents as shown by the results indicate that 46.9% had been 6-8 household members, 29.7 percent had been 9-11 member, 14.1% have been above 11 household members, 3.1% had been 2-5 members while 2.% had been 1 and 2 households members. The average household size was about 7 while the minimum and maximum household sizes are 1 and 11 respectively. The relative average sizes may be attributed to the level of education.

With regard to age range of the respondents the result of the study revealed that about 43 percent was between 36 and 45 years, 29.7 percent were between 31 and 35 years, 19 percent have been above 51 years, 4.7 percent was between 46 and 50 years while 3.1 percent accounted for those that were between 21 and 30 years of age. The average age was 30 years. Minimum and maximum ages were 21 and 51 years respectively. The result showed that a good proportion of the sampled respondents are in their independent years (working age) hence, they are more likely to be willing to pay for improved water services.

S/N	House Hold Family Size Range	Frequency	Percent
1	<2	3	2.3
2	2-5	4	3.1
3	6-8	60	46.9
4	9-11	38	29.7
5	>11	18	14.1

Table 2: Family size of the respondents.

S/N	Age Range of the Respondent	Frequency	Percent
1	21-30	4	3.1
2	31-35	38	29.7
3	36-45	55	43.0
4	46-50	6	4.7
5	>51	24	19
	Total	127	100

Table 3: Age category of the respondents.

Source: Own survey, 2016.

The primary sources of income of the respondent where crop production and mixed farming in which 93.8% of the respondent were engaged on mixed farming. With respect to Education level of households' head of the total respondent taken for interview 72 of them have education whereas 55 of them have no education which represents 56.2 and 43.8% respectively. With regard to marital status of the respondents 92.8% of there were married and 1.6% of them were single which represents the highest and lowest percentage table 4.

S/N	Primary sources of income	Frequency	Percent
1	Crop production	8	6.2
2	Mixed farming	119	93.8
	Total	127	100
	Education level of house hold head		
1	Illiterate	55	43.8
2	literate 1-4	72	56.2
	Total	127	100
	Marital status of the respondents		
1	Single	2	1.6
2	Married	118	92.8
	Divorced	7	5.6
	Total	127	100

Table 4: Source of income and educational level of the respondents.

Source: Own study, 2016.

Type of water sources

Of the total respondents interviewed about 99.2% of them reported that as the use natural spring as source of water whereas only 0.8% of them reported that they usehand dug well as source of water. The response of respondents on different source of water

they use were significantly different in which almost all of them use natural spring table 5 with respect to Distances of water sources from home of the respondent about 95 respondents said that the distance is far and only 3 respondents said that the distance is near to their home which represents about 74.2 and 2.4% respectively which were the highest and lowest percentage table 5.

S/N	Type of Water Sources	Frequency	Percent
1	Hand Dug Well	1	0.8
2	Natural Spring	126	99.2
	Total	127	100
	Distances of water sources from home		
1	Near	3	2.4
2	Medium	30	23.4
3	Far	95	74.2
	Total	127	100

Table 5: Types of the water sources in the study area.

Source: Own survey, 2016.

Of all respondents about 75% of them said no water sources they use for winter and summer whereas 25% of them react as the use some water sources for winter and summer figure 1 with regard to Responsibility of fetching water all house hold members were take part but most Responsibility were undertaken by wife and child table 6.

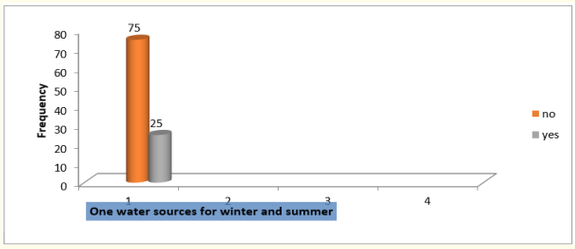

Figure 1: Source of water in the summer and winter season the study area.

S/N	Members responsible	Frequency	Percent
	Wife	14	11.7
	Child	1	0.8
	husband + wife	2	1.6
	wife+ child	110	85.9
	Total	127	100

Table 6: The responsibility of fetching water in the household members.

Source: Own survey, 2016.

On time they consume while they fetch water, of all respondents 113 of them react as they need 1 hour which represents about 88.3% of the respondent whereas only 1 person says as he use 15 min to fetch water table 7 all respondent put the reason why they not use improved water as there were lack of income to construct the facilities.

S/N	Time, They Need to Fetch Water	Frequency	Percent
	15min	1	.8
	30min	12	9.4
	1hrs	113	88.3
	2hrs	1	.8
	Total	127	100

Table 7: The distance of household from water fetching.

Source: Own survey, 2016.

Willing to pay for improved water if constructed

Of the total respondents interviewed about 96.9% of them reported that as they are willing to pay for improved water if constructed. Whereas only 3 respondents were unwilling to pay for improved water if constructed which represents 3.1% of the total respondent table 8.

S/N	Response of HH	Frequency	Percent
	Yes	124	96.9
	No	3	3.1
	Total	127	100

Table 8: Household responsibility of improved water construction.

Source: Own survey, 2016.

Variable	Willing to pay IWC		Total	t. value
	Yes	No		
	Mean (SD)	Mean (SD)	Mean (SD)	
Age	43.821 (10.9199)	70.484(1)	42.	-4.378
Sex	0.8225806 (0.3835)	0.6666 (0.5773)	0.8188976 (0.38662)	0.6887
Educational level	1.5806 (0.4954)	1(0)	1.5669 (0.49746)	2.0220
Family size	6.177 (2.2633)	8.333 (3.055)	6.228 (2.2928)	-1.6196
Household Income	2.8709 (0.4933)	3(0)	2.8740 (0.4878)	-0.4513

Table 9: Summary statistics on continues variable.

Source: Own survey, 2016.

Determinants of willingness to pay for improved water supply

Table presents the logit analysis of the factors that determine the willingness to pay for improved water services.

The maximum likelihood estimate of the logistic regression model shows that out of the seven variables hypothesized to determine willingness of farmers' to participate in improved water supply, three variables were statistically significant at less than 1% probability level and 1 were significant at 5% probability level. More specifically, the coefficients of education level of the household head, distance from water source and primary income were significant at less than 1% probability level.

Variables	Coefficients	Odds Ratio	Sig	Exp(B)
Family size	-1.178	0.559	0.042**	0.837
SEX	1.250	1.763	0.502	3.489
AGE	0.217	0.134	2.614	1.243
Primary income	7.019	4.375	0.000***	1.118
Education	-15.658	3.877	0.000***	0.000
MSR	3.384	3.804	0.792	29.503
DWS	16.094	4.340	0.000***	9.762
Constant	-79.207	1.889	0.000	0.000
Likelihood	40.571			
Restricted Log Likelihood	10.240			
Chi-square	18.162			
Degree of Freedom	7			
Significant level	0.000			
*** significant at	1%			
**significant at	5%			

Table 10: Willing to pay for improved water supply logit model.

Family size was significant at 5% probability level. Of the 7 explanatory variables hypothesized to influence willingness of farmers to participate in improved water supply practices, 3 variables (marital status, Age and sex) were no role in explaining farmers' willingness to participate in improved water supply practice, as their coefficients were insignificant even at 10% level of significance. Therefore, in this study, only those variables, whose coefficients were statistically significant at less than or equal to 5% probability levels, were discussed and recommendation as well as policy implications were made based on these variables.

The contingent valuation survey results

The main objective of this section is to evaluate the sample households' willingness to pay (WTP) in cash or in labor for improved water supply. This section presents results of the survey on the respondents' willingness to pay for improved water supply.

Testing the contingent valuation method

A common concern of researchers, who use the contingent valuation method as well as those who are end-users of the results of the method, is the validity of the research outcome. This issue of validity refers to the degree to which valuation outcomes from the CVM indicate the true value of the asset being investigated. In this regard, the literature identifies few categories of methodological issues, which could in fact reduce the validity of CVM results. One of these is the loss of validity arising from biased results generated by the CVM. Two major potential sources of biases are identified here. The first one is the consideration whether WTP responses derived from a contingent valuation study could somehow be influenced by respondents' strategic behavior. The second one arises when the WTP responses are influenced by the starting bid values.

Test for strategic bias

Although a well-designed questionnaire coupled with an appropriate questionnaire administration can present the desired hypothetical market to the potential buyers, households may not reveal their true valuation of the service in the expectation of getting the service for lower price than they actually think it is worth. Alternatively, households could overestimate their valuation if they think the provision of the proposed service would not materialize unless they offer higher WTP. To assess for the possible existence of such biases in the WTP responses, the hypothetical market scenario used during the study was presented in two formats. The basic difference between the two is that the first was intended to capture any strategic behavior.

The second one, on the other hand, includes a statement, which was specifically designed to discourage respondents from incorporating any strategic element in their valuation of the service. The latter explicitly states that, respondents' answers to the WTP question will not affect the water supply plan in the area. These two scenarios were distributed randomly among the questionnaires and hence 52 questionnaires carried the scenario, which was designed to capture strategic behavior and 48 questionnaires carried a scenario, which was designed to discourage strategic behavior. Then after a test was conducted to determine whether there is a significant difference between the average WTP values (Table 11). Observations under scenario one represents the sub-sample of respondents who were presented with a statement discouraging strategic behavior. The mean WTP of this group was birr 0.41 per week in the case of cash contribution and 0.85 days per week in the case of labor contribution. On the other hand, under scenario two, respondents were confronted with a situation, which was open for potential strategic manipulation and resulting in an average contribution of birr 0.48 per week and 0.78 days per week. Table 11 shows that the statements have resulted in some difference in the mean WTP in birr per week and days per week. The two means, however, were not significantly different for both cash and labor as revealed by the t-test showing that respondents did not behave strategically.

Var	WTP Money (per week)		WTP Labor (days/week)	
	Scenario 1	Scenario 2	Scenario 1	Scenario 2
Observation in each group	52	48	52	48
Mean WTP	0.4133	0.4883	0.8506	0.7813
Standard dev	0.7415	1.0760	0.9656	0.8181
t-vest	0.35		0.44	

Table 11: Mean WTP values for two scenarios.

Source: Own survey, 2016.

Conclusion

The study reveals issues related with willingness to pay water supply in the study area. Indeed it will give a brief understanding about household water supply, consumption, perception of water quality of improved and unimproved sources, perception quality results, level of water sources status such as its functional. In addition to that it was tried to identify the determinants of households

reluctant to use improved water sources than unimproved sources.

The major responsible bodies for water collection were women and children besides the work load of women doing the home activities even field works with men. It was good extension observed that the use of plastic pot that is jericans which reduces the heavy load and contamination. Because women's travel long up and down slope and far distances with heavy clay pot materials but it was better to replace by jericans. In contrast queuing time and income were the main factors resulting household unwillingness to collect water from improved sources in the study area.

Although many efforts have been applied to achieve this goal for the people it is still a problem to reach the target objective. Among the many reasons such as quality of the scheme, dependency of the people on unimproved sources, nonfunctioning of sources and others the focus given for the term access by itself has misleading. As a result of that there were two ideas while about access coverage for the district. One is standards based which took the capacity of the scheme while the second was actual access coverage implies the district has 50% and 27% access coverage respectively. Consequently this difference leads to stop the development endeavors after a while when the 100% recorded from the standard based report which is recommended by the regional office.

The households have a better awareness about their source potential and the problem as well. As a result many of the people were willing to pay for the improved sources. But very limited sources about 31% currently pay for the source especially most are for the salary of the guard. But there was still a need to create awareness why the water use committees selected and up to what range they had the potential to do activities alone.

Furthermore due to vast coverage of the area the district experts did not reach to the site immediately when the schemes stop working. This forces the household to depend on unimproved sources. To resolve such technical problems even though training was given for the selected water use committees but they complain that they couldn't do that because of the minor training was given without technical equipment's. To sum up with the households preference for pay for quantity of water was more important than quality of water.

Recommendation

The nature of determinants of household willingness to pay for improved water supply identified in the study varies in their complexity and severity. Majority of the problems can be solved by the collaborative effort of support institutions and other stakeholders. The major recommendations that I suggest to reduce harshness of the determinant factors that affects the household willingness to pay for improved water supply is described as follows.

- The improved water supply support program should have to be based on the identified factors. major problems like Distance from water source, primary income of the household, education level of the household head and others that the three kebeles of Horro District face need to be addressed by prioritizing them in accordance of their severity as well as the availability of resources to run the operation.
- Improved water resource agency and Horro Woreda should undertake detailed study on the suitability of the location and the sufficiency of improved water project before constructing the project because majority of the water projects in the woreda is simply constructed but not on the function.
- Sufficient operation and maintenance skill has to be provided for experts of water, energy and mineral office to improve their knowhow on improved water supply to teach society of study area.
- Efficient programs that stimulate jobless to undertake improved water supply project activities that could be a pillar of economic development in the study area.

Author's Contribution

The authors contributed different contributions like data collection, analyzing, interpreting and writing for the completion of the paper.

Conflict of Interest

The authors declare that they have no competing interests.

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