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RURAL HOUSEHOLDS' SOURCES OF WATER AND WILLINGNESS-TO-PAY FOR IMPROVED WATER SERVICES IN SOUTH-WEST, NIGERIA

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ABSTRACT

Households' source of water is one of the core development indicators recently gaining prominence in Nigeria. This study examined rural households' sources of water and its Willingness to Pay (WTP). A cross sectional survey involving the use of questionnaire was adopted while a dichotomous choice (DC) with follow up was used as elicitation method. A multi-stage random sampling technique was used to select 437 rural households. Descriptive statistics and Tobit model was used as analytical tool for the study. Results from this study revealed that almost 70% fetched from unimproved water sources. Only 74.4% of the respondents showed WTP for improved water sources. Age($p<0.01$), Sex ($p<0.01$), Education ($p<0.01$), Occupation($p<0.01$), Income ($p<0.01$), Price of water($P<0.01$), Quantity of water ($p<0.01$), Household size($p<0.01$) and Distance($p<0.01$) to existing water sources significantly influenced rural households' WTP for these services. Therefore, good water sources should be cited nearer to rural community at a relatively low price by rural households.

Keywords: Sources of water, Willingness to Pay (WTP), Tobit model, Education, Rural Households.

INTRODUCTION

The Millennium Development Goal (MDG) which calls for environmental sustainability as one of its targets, proposes halving the proportion of people without sustainable access to safe water by 2015. Sustainable access to safe water implies safe water source less than one kilometre from the point of use and is reliable to obtain 25 litres of water per day per person for drinking (WHO, 2012). In Nigeria, this means 70.0% of the households must have access to improved water sources by 2015 (UNICEF, 2008). Closely related to this is achieving a significant improvement (in terms of standard of living) in the lives of at least 100 million rural farm households by 2020. The MDG campaign could not achieve this goal, thus the Sustainable Development Goal (SDG) was launched and proposes sustainable access to water by all by 2030. The percentage of people having access to or using improved water sources globally in 2010 was 87.0%; despite this, 884 million people do not have access to safe drinking water. In the same vein, drinking water coverage or access, in 2011 stood at 89.0%, which is just 1.0% above the Millennium Development Goal (MDG) drinking-water target (WHO, 2012). Worthy of note is that in 2011, 768 million people relied on

unimproved drinking-water sources (WHO/UNICEF, 2013, Graham *et al.,* 2016); and about one third of this population live in SSA (Spanou, 2011; Graham *et al.,* 2016). Despite government's recent efforts in Nigeria, only 47% of the population had access to improved water source in 2008 (WHO/UNICEF, 2012).

In developing regions, about 88.0% of the people without improved water sources reside in rural areas (WHO/UNICEF, 2013; Grahams *et al*., 2016). In rural Africa, women are mostly burdened with water collection whereby inadequate water supply enforce women and children to trek long distances every day for water collection. The alternative is the collection of water from rivers, streams and ponds, which may contain pathogens that might still be lesser father (WHO/UNICEF, 2013; Grahams *et al.,* 2016). The time spent walking, queuing and fetching water could have been used for economic and productive activities. Therefore, provision of safe water is essential for human development (Cairncross and Valdmanis, 2006). From 18 countries in SSA less than one quarter of the population has access to improved water in which Nigeria is not exempted (WHO/UNICEF, 2010; Eberhard, 2019).

Despite some improvement in coverage, it had been shown that in 2006, only 11 out of 36 states of the Federation in Nigeria had more than 20 litres *per capita* per day water supply, while seven states had below two litres *per capita* water supply (Water Aid, 2008; Water Aid, 2020). This was corroborated by the work of Ohwo and Abotutu, 2014 which concluded that 29.28% of the respondents used less than 20 litres per capita per day water supply. The Limited access to safe water have adversely affected millions of people in the world most especially the poor in that they die from preventable diseases caused by inadequate water supply (Weststrate *et al.,* 2018).

Water is essential for human existence, survival and wellbeing. Water access as a right was established by the United Nations General Assembly. This depicts that everybody must have access to improved sources of water. This is far-fetched in developing countries and is more prevalent in rural areas. (Simelane *et al.,* 2020) This study seeks to examine the sources of water, Willingness to Pay (WTP) for improved water services and factors influencing mean WTP for improved water services by rural households in Nigeria. The research work pursues to address the following questions as follow:

1) What are the sources of water used by the rural households the study area?
2) What are the factors influencing Willingness to pay for improved water services by rural households in the study area?

Concept of Willingness-To-Pay (WTP)

Willingness-to-Pay (WTP) value of a good or service may be elicited in two ways:

i. directly by asking consumers, through carefully orchestrated elicitation methods;
ii. indirectly by examining market prices.

The contingent valuation (CV) method is survey-based elicitation technique to estimate WTP values of a good that is not traded in the conventional market. The CV method is often referred to as stated preference method, in contrast to revealed preference methods, which use actual revealed behaviour of consumers in the market. The CV method directly asks consumers' WTP for a non-marketed good under a given condition or a prescribed circumstance. To elicit con-

sumers' WTP values for non-marketed goods, a hypothetical market scenario should be formulated and described to the survey respondents. Thus, the elicited WTP values of a good are "contingent upon" the hypothetical market prescribed in the survey instrument. However, in Smith's assessment, concerns relating to measurement bias in estimating non-use values can be excessive. In the case of water supply and sanitation (WSS); however, similar measurement bias is a lesser concern because of estimation of direct use values. As Smith further elaborates, hypothetical bias can also be large because of the nature of CV surveys. Careful development of survey instruments (through initial preparatory work, focus groups, cognitive interviews, and pretests); conscientious implementation of field work; and rigorous econometric analysis that link the data to underlying theoretical models can help hypotheticality in a CV study. Another important reason behind the expressed reservations about the CV method is the potential divergence between responses and actual behaviour.

The emerging evidence shows that predictions from "hypothetical" CV scenarios seem to compare well with actual behavior (Cameron *et. al.*, 2002, Vossler and Kerkvliet, 2003). Griffin *et al.* (1995) show similar predictable behavior in the case of WSS improvements.

THEORETICAL FRAMEWORK AND LITERATURE REVIEW

Consumer theory of neo-classical economics provides a theoretical framework for monetary measures of changes in utility caused by changes in the environment. According to this theory, consumers make choices among alternatives following their preferences (Johansson, 1991). Preference can be defined as the outcome of a comparative evaluation of a set of objects (Druckman and Lupia, 2000). In the revealed preference theory of consumer, an individual's response that A is preferred to B is understood to mean how the individual feels under situation A than under situation B.

The basis of this study asserted by Johansson,1991 is the empirical valuation of non-market goods which is based on the assumption of neo-classical economic utility maximization. Given this, individual or household will demand greater or less quantities of non-market goods if variable price of this amenity exists. It therefore stands that if a shadow price for the amenity can be estimated and a demand curve traced out, the familiar theory of consumer surplus can be used to assign economic value to non-market goods.

Economic valuation of environmental goods was presented by Johansson (1993). In this theory individual's preference are assumed to be presented by a utility function as in the case of market goods $x = [x_1, x_2, \text{--------}, x_n]$ and environmental services Z. The utility function can then be expressed as

$u = u(x, z)$…….. (i)

where:

u = utility function (dummy)
x = market goods (dummy)
z = environmental services (dummy)

Consumer's choices are constrained by income. Individuals maximize their utility under budget constraint (y) and goods (x) with set of prices $\beta = [p_1, p_2, \text{------}, p_n]$ for market:

$v(p, y, z) = \max u(x, z)$ s. t. $y = px$…….... (ii)

Therefore, the indirect utility function v(p, z, y) expresses the maximum utility that can be achieved given p, z and y.

Studies on sources of water had been addressed by Sobsey (2006), Arouna and Dabbert (2008), Manyanhaire and Kamuzungu (2009), Adewusi (2012) and Addisie (2012). Sobsey (2006) study revealed that most rural drinking water supplies are from ground water sources, which are contaminated with microbes and chemicals. Consequently, Americans were not willing to pay any increment placed on water rates from a community piped supply.

Arouna and Dabbert (2008) reported that both free and purchased water consumption in Benin in the dry season were positively related to household asset expenditure; also household size positively affected water demand while water price and poverty had a negative effect on purchased water use. However, better-off people may travel long distances by motorcycle to fetch water.

Manyanhaire and Kamuzungu (2009) study examined, in Mundena village (Mutasa District, Manical Province) of Zimbabwe, the sources of and access to water by households, constraints to the provision of safe drinking water and the related environmental health implications of unsafe drinking water. Findings of the study revealed that villagers had access to one protected source of water (borehole), female member of the household made two to three trips every day of the week, carrying a total of 60 litres daily of water from the water collection points, as this consumes most of their productive time. Distances to the water point ranged between 500 metres to about 5 kilometres on the average. The erratic borehole maintenance programme exposed a proportion of the population to environmental health risks which included waterborne and water-related diseases.

Adewusi (2012) comparison of Nigeria's 2007 data on WBDs with 2002 data revealed that WBDs declined by 5.75%.

Addisie (2012) study showed that people could not afford improved water sources due to lack of fund in Simada District (Amhara Regional State) of Ethiopia.

Ohwo and Abotutu, 2014 studied households' access to potable water supply in Yenogoa. Results showed that only 29.28% of the respondents consumed below 20 litres of water *per capita* per day, despite the proliferations of wells and boreholes, and the short distances to major sources of water supply. This had been attributed to the high cost of water supply (an average of ₦4, 500 per month) in relation to the monthly minimum national wage of ₦18, 000.

Obeta, 2018 investigated the landscape of water service provision to rural communities in Nigeria using investigative and qualitative approaches due to the desire to explore the experience and opinions of previous workers/agencies in the region. Findings characterized the rural water supply landscape in the region. The community-based service providers are constrained by several policy gaps that negatively impact on the quality and sustainability of rural water supply in the country. Rural water interventions suffer from a high rate of failures due largely to weak institutional framework in the water supply sector.

Akoteyon, 2019 examined factors affecting households' access to water supply in three residential areas in parts of Lagos metropolis, Nigeria. The result showed the dominance of improved water sources in the high/medium -income residential areas. Households in the medium-income area recorded the highest

access in terms of distance to, and safety of water supply.

Simelane *et al.,* 2020 reported on the determinants of households' access to improved drinking Water Sources. Increase in the number of household members was negatively associated with access to improved drinking water sources compared to those with fewer members. Access to improved drinking water sources increased with an increase in the wealth index of the household, and households located in urban areas had higher odds of access to improved drinking water sources compared to those in rural settings.

METHODOLOGY

Study Area and Sampling Procedure

This study was conducted in Southwest, Nigeria. Southwest, Nigeria consists of six states namely, Oyo, Ondo, Ogun, Osun, Ekiti, Ondo and Lagos. A cross-sectional survey involving the use of questionnaire based on dichotomous choice (DC-CVM) with follow-up, was used for data collection. Multistage sampling procedure was used and the first stage involved a simple random sampling of States in the Southwest with the selection of Ogun and Oyo States. The two states were selected because they were agrarians (Adekoya, 2014). Ogun State lies within latitude 6.9^{0}N and longitude 3.5^{0}E and has its capital in Abeokuta. It is bordered by Lagos State to the south, Oyo and Osun States to the north, Ondo State to the east and the Republic of Benin to the west. The average daily temperature in Ogun State is 32^{0}C. It has an annual rainfall of 2152mm with a land mass of 16, 762 km2 and population density of 222/ km2 (NOAA, 2015). The population of the Ogun State was estimated to be 3,920,208 in 2006 (NPC, 2006) and 4,791,670 in 2015, given an average annual growth rate of 2.47%. Crops grown in Ogun State are yam, rice, cassava, maize, cotton, palm oil, cocoa, timber, rubber and kola nut.

Oyo State has its capital in Ibadan and approximately located between latitude 8.1^0 N and longitude3.4^{0}E. The average daily temperature in Oyo State is 25.9^{0}C with an annual rainfall of 1190 mm. It is bordered in the south by Ogun State and in the north by Kwara State, west by the Republic of Benin and in the east by Osun State. Oyo State has a land mass of 27,460 km2, population density of 204/ km2 and it is ranked 14th by size in Nigeria with the population of 5,591,589 (NPC, 2006). It was estimated at 6,834,599.23 in 2015 given an average annual growth rate of 2.47% (World Bank, 2015) in nature. The two States has four agricultural zones operated by the State ADPs i.e. Ogun and Oyo State agricultural development programmes (OGADEP and OYSADEP respectively). The second stage entails sampling across all the zones of the 2 states. In the third stage, two blocks from each zone were randomly sampled in Ogun and Oyo States. The fourth stage involved a purposive sampling of 17 and 20 cells from the 8 selected blocks of Ogun and Oyo States respectively. In the last stage, a systematic sampling of 10 households from each of the selected cells was done in Ogun Sate while 14 households were selected in Oyo State. Thus, data were obtained from 170 and 280 sampled households respectively in Ogun and Oyo States. Albeit, only 169 (Ogun) and 268 (Oyo) questionnaires were valid and used for analysis. The variation in the sample for the two states was based on the population. Oyo state is relatively larger in size than Ogun State. Hence, the data used for analysis were from a total of 437 sampled households. Descriptive statistics and Tobit

regression model were used for data analysis.

Estimation Techniques

Descriptive Statistics: involved the use of tables of frequency, percentages and means.

Tobit Model: Tobit model was used to estimate the bid curves, which provides a statistical relationship between willingness to pay and a set of independent variables. This method was adapted from Wendimu and Bekele (2011). This was used to determine factors influencing rural farm households' willingness-to-pay for improved water sources. The linear regression model for the bid function is specified as:

$$y_i = x_i\beta_i + \mu_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots \text{(iii)}$$

This equation was used to determine factors influencing willingness-to-pay by respondents.

where:
y_i = WTP_i represents the ith rural dwellers' willingness to pay for improved water services
x_i is a vector of independent variables,
β_i is the vector of the parameter to be estimated and μ_i is the error term.

This model has advantage over other discrete choice models (linear probability model, logistic and probit) because it reveals the probability of willingness-to-pay and the maximum WTP of the respondents (Wendimu and Bekele, 2011).

For a sample of N independent observations, the censored maximum likelihood estimator (MLE) maximizes the log-likelihood function for censoring (Cameroon and Trivedi, 2005) stated as:

$$\ln L(\theta) = \sum_{i=1}^{N}[(d_i \ln f(y_i|x_i,\theta) + (1-d_i)\ln F(L_i|x_i,\theta)] \ldots \text{(iv)}$$

where:
θ are the parameters of the distribution of y_i,
d_i is an indicator variable which assumes the value of 1 if $y_i>0$, and is 0 if $y_i = 0$. Note that, in this instance, the lower bound is zero i.e. L = 0 (Cameroon and Trivedi, 2005).
The model is specified as:

$$y_i=\beta_0+\beta_1X_1+\beta_2X_2+\beta_3X_3+\beta_4X_4+\beta_5X_5+\text{---}+\beta_{13}X_{13}\cdots \text{(v)}$$

where:
X_1, X_2, ……., X_{13} are the explanatory variables;
β_0, β_1, ……., β_{13} are the vectors of regression coefficients;
X_s = Value of explanatory or independent variable.

Note: The variables were also tested for multi-collinearity and the total variance inflating factor (VIF) was 75%.

The explanatory variables considered for this model are:
X_1 = Age of household head (years)
X_2 = Sex (1 - female, 0 otherwise)
X_3 = Level of Education (number of years)
X_4 = Monthly Income (naira)
X_5 = Quantity of water used per day (litres)
X_6 = Price paid for fetching water (naira)
X_7 = Experienced water-borne diseases (dummy)
X_8 = Occupation (dummy)
X_{8i} = 1 if farming, 0 otherwise
X_{8ii} = 1 if trading, 0 otherwise
X_{8iii} = 1 if artisanship, 0 otherwise

Note: Civil servant served as reference category

X_9 = Marital status (dummy)
X_{9i} = 1 if married, 0 otherwise
X_{9ii} = 1 if single, 0 otherwise

Note: Divorced served as reference category

X_{10} = Household size (number of people)
X_{11}= Ownership of building (dummy)
X_{11i}= 1 if own house, 0 otherwise
X_{11ii} = 1 if rent house, 0 otherwise
X_{12} = Type of drinking water (dummy)
X_{12i} =1 if deep well water (for drinking), 0 otherwise
X_{12ii} = 1 if rain water (for drinking), 0 otherwise
X_{12iii}= Spring water used for domestic purposes (dummy)
X_{13} = Distance of existing water source to the house (kilometers).

RESULTS AND DISCUSSION

Socio-economic Characteristics

The socio-economic characteristics of the respondents are presented in Table 1. Almost half (48.1%) of the respondents were within the age range of 31-50 years. The mean age was 48 years, depicting that majority were in their active age group. Also, 65.7% of the household heads were male while 34.3% were female. Majority (61.9%) of the ruralites had formal education implying respondents or rural households had basic understanding, adequate disposition and knowledge on consuming improved water sources, as this is likely to positively affect their WTP for improved water. Most (58.6%) of the respondents were engaged in farming activities. The mean household size was 6 people. The mean income of ₦26,905.84 per month in rural areas, may positively influence their WTP for improved water sources in the study area*, ceteris paribus.*

Table 1: Socio-Economic Characteristics of Respondents

Variables	Frequency	Relative Frequency (Percentage)
Age		
≤20	8	1.8
21-30	60	13.7
31-40	97	22.2
41-50	113	25.9
51-60	68	15.6
61-70	67	15.3
≥71	24	5.5
Total	437	100
Mean	48	
Sex		
Female	150	34.3
Male	287	65.7
Total	437	100
Level of Education		
Primary	140	32.0
Secondary	109	24.9
Tertiary	22	5.0
Informal	166	38.0
Total	437	100
Occupation		
Farming	256	58.6
Civil servant	10	2.3
Artisans	59	13.5
Business tycoons	88	20.1
Others	24	5.5
Total	437	100

Household size		
≤4	142	32.5
5-8	215	49.2
9-12	53	12.1
13-16	19	4.3
17-20	6	1.4
≥21	2	0.5
Total	437	100
Mean	6	
Income per month		
≤10,000	146	33.4
10,001-20,000	84	19.2
20,001-30,000	108	24.7
30,001-40,000	25	5.7
40,001- 50,000	24	5.5
≥50,001	50	11.4
Total	437	100
Mean	₦26,905.84	

Rural Households Sources of Water

Table 2 shows the sources of water used by the rural households in both States respectively.

Result obtained from the two States revealed that 41.6%, 31.8%, 31.6% and 21.7% obtained water from well without cover, borehole, stream and river. In the same vein, inference could be drawn that about 70.0% of the respondents fetched water from unimproved sources.

Table 2: Distribution of Rural Households by Sources of Water

Sources of water	Frequency	*Relative Frequency (Percentage)
Stream	138	31.6
River	95	21.7
Well (without cover)	182	41.6
Deep well	9	2.1
Borehole	139	31.8
Rain	12	2.7

*Percentage for multiple response

The sourcing of drinking water from river, well (without cover), stream and ponds by majority of the respondents implies that the households are consuming water classified (according to WHO, 2009; IFPRI, 2010 and Shittu *et al.,* 2010) as unsafe. This has been. This connotes that households in these categories were vulnerable to ailments/ illnesses that are associated with water.

Respondents Willingness to Pay (WTP) for Improved Water Services

Respondents' WTP for improved water services is shown in Table 3. A large proportion (74.4%) of the rural households were willing to pay for improved water services while 25.6% were not willing to pay for improved water services. This indicates that rural households were adversely disposed to un-

improved water sources within their locality. This might be linked to frequent illnesses being encountered by the rural households, which could be associated with their water sources.

Table 3: Respondents WTP for Improved Water Services

WTP	Frequency	Relative Frequency (Percentage)
Yes	325	74.4
No	112	25.6
Total	437	100.0

Factors Influencing Mean WTP for Improved Water Services

Table 4 showed the Tobit regression result on factors influencing rural households mean willingness-to-pay (WTP) for improved water services in the study area. The model produced a good fit of data ($p<0.01$). Age had a positive and significant influence on rural households' willingness to pay for improved water services ($b = 0.026$, $p<0.01$). This implies that as age of the members of rural households' increase, willingness to pay for improved water services will also increase. They also had higher preference for improved water services; this could be because elderly people knew that improved water is a" necessity " and not a "luxury". Therefore, they are willing to pay for it. This result contradicts the study of Omonona and Adeniran (2012) and Akeju *et al* (2018).

Sex of the members of the rural household had negative and significant effect rural households' willingness to pay for improved water services ($b = -3.020$, $p<0.01$). This means that male had higher preference and willingness to pay for improved water services than their female counterparts. It shows that males were ready to relieve their wives and children from the stress of fetching water, most especially from longer distances. The result conforms with the work of Alebel (2000).

Education negatively and significantly impacted willingness to pay for improved water services by rural households ($b = -1.170$, $p<0.01$). The implication of this is that the higher the level of illiteracy, the lower the willingness to pay for improved water services by rural households. This could be attributed to the erroneous belief of the rural households that dirty or unclean water sources does not adversely affect human health. Rural households might lack understanding on the importance of improved water services; it may appear to them that water is a free gift of nature. This result contradicts the findings of Omonona and Adeniran (2012) and Akeju *et al.* (2018).

Income of the members of the rural household was found to have significantly negative effect on rural households' willingness to pay for improved water services ($b = -0.000001$, $p<0.01$). This revealed that there is unwillingness to pay for improved water services by rural household despite a rise in income. There is likelihood or possibility that institutions (government) have failed in delivering these services to the rural households. Moreover, rural households recognised and concluded that it's wasteful being involved in this respect. Although, the result contradicts what had been observed in literature that income increases the willingness to pay for improved water services (Dunfa, 1998; Assefa, 1998; Alebel, 2002; Akeju *et al.*,

2018).

The quantity of water used for domestic purposes per day negatively and significantly influenced rural households' willingness to pay for improved water services (b = -0.001, p<0.01). This indicates that increase in water use reduces rural household's willingness to pay for improved water services. Rural households would have taken into cognizance the effect of paying on their limited income and this has created a vacuum and adverse effect on their willingness to pay for improved water services. This is at variance with the study of Olajuyigbe and Fasakin (2010; Ohwo and Abotutu, 2014).

The price paid by the rural households for fetching water was positively and significantly affected willingness to pay for improved water sources by rural households (b = 0.165, p<0.01). This indicates that the higher the amount paid on fetching water from unsafe or unimproved sources, the higher the preference and willingness to pay for improved water sources. This depicts that rural households had incurred a lot in paying or purchasing unimproved sources of water which are not beneficial and scarce. This is in conformity with the study of Omonona and Adeniran (2012; Akoteyon, 2019).

Moreover, rural households experience of water-borne diseases negatively impacted rural household's willingness to pay for improved water sources (b = -5.546, p<0.01). This connotes that the more the outbreak of water-borne diseases, the lesser the preference and willingness to pay for improved water services. Rural household's dependence on the existing water sources would have constituted a level of ignorance or mentality that these water sources could not have an adverse effect on their health. Therefore, they believed that outbreak of these diseases had no impact on them. This result conforms with the findings of Malik *et al.* (2012)

Engagement in farming by members of the rural households as an occupation positively and significantly influenced willingness to pay for improved water sources by rural households (b = 3.903, p<0.01). This suggests that farming as an occupation significantly increased willingness to pay for improved water services. There is likelihood that farmers might have been oriented or trained by the extension agents on the need for improved water services rather than existing sources.

Also, engagement in trading positively and significantly impacted rural household's willingness to pay for improved water sources (b = 4.785, p<0.01). This implies that traders had higher preference for improved water services than the civil servants.

Engagement in artisanship by members of the rural household was found to be positive and significant factor influencing willingness to pay for improved water sources by rural households (b = 1.403, p<0.01). Artisans might be more willing to pay for improved water services than civil servants because they obtain daily wage, which could make their income level higher than that of civil servants thereby increasing affordability of paying for these services.

Being married as rural household member positively and significantly impacted rural household's willingness to pay for improved water sources (b = 2.425, p<0.01). The implication of this is that married rural households had higher willingness to pay for improved water services. Rural households that

were married had tendency of having more household size than divorced ones and this might increase their rate or level of water consumption. Distances trekked could have resulted in ill health, therefore increasing their willingness to pay for improved water services closer to their residence.

Being single as rural household member was a positive and significant factor influencing rural household's willingness to pay for improved water sources (b = 5.707, $p<0.01$). This implies that single household had higher preference and willingness to pay for improved water services. Singles could afford to pay more than divorced individual, since their water usage is assumed to be lesser than the divorced.

Household size negatively and significantly influenced willingness to pay for improved water sources by rural households (b = -0.395, $p<0.01$). This suggests that a unit increase in the household size decreases willingness to pay for improved water services. This might be due to the fact that water consumption could be higher in married households and money to be spent for fetching would as well be much. In the same vein, availability of labour [wife(s) and children] in collecting or fetching water from existing or unimproved sources would have contributed to their low preference and unwillingness to pay for these services.

The ownership of personal house positively and significantly affected the willingness of rural households to pay for improved water services (b = 1.715, $p<0.01$). This means that the higher the number of rural households living in their permanent residence, the higher the preference and willingness to pay for improved water services. The fact that rural households stayed in their own building will influence their access and readiness to pay for these services.

House rentage was a positive and significant factor influencing willingness to pay for improved water sources by rural households (b = 2.128, $p<0.01$). This indicates that rural households living in rented apartment also had higher preference and willingness to pay for improved water services. This might be facilitated due to the stress encountered in collecting and fetching water outside their residence.

Obtaining drinking water from deep well positively and significantly influenced willingness to pay for improved water sources by rural households (b = 11.581, $p<0.01$). This connotes that rural households that obtained drinking water from deep well would be more willing to pay for improved water services. The deep well found in these rural communities were without cover classified as unsafe/unimproved by International Food Policy Research Institute (IFPRI, 2010). Hence, presenting a unique water source will enhance their willingness to pay.

Furthermore, spring water being used for domestic purposes positively and significantly influenced willingness to pay for improved water sources by rural households (b = 0.594, $p<0.01$). This implies that the rural households using spring water for domestic purposes would be more willing to pay for improved water services. Since, rural households used or consumed spring water that could be insufficient during the dry season, they could be persuaded to pay for improved water services for guaranteed sustainable water supply.

However, drinking of rain water by rural households negatively and significantly influenced rural household's willingness to pay

for improved water sources (b = -7.723, p<0.01). This shows that rural households that obtained drinking water from rain would be less willing to pay for improved water services. Rural households might be complacent with drinking rain water since this is at no cost; but, they had forgotten that rain water could be acidic with asbestos or corrugated iron roofing sheets also contributing to this impurity. It is only rain water from the sky or cloud that is good for drinking. Since, rain water is a free gift of nature, willingness to pay for improved water services by rural households may be low (Elleta and Oyeyipo, 2008; Karen, 2020).

Distance to water sources was a positive and significant factor influencing willingness to pay for improved water sources by rural households (b = 0.0004, p<0.01). This indicates that the farther the distance of water sources from rural households' residence, the higher the willingness to pay for improved water services. The moment distance of existing water sources is far away; households would be willing to pay for water sources that are closer to their domain. Rural households would not want to trek a relatively long distance collecting or fetching water, instead they would prefer paying for services that are closer by.

The mean willingness to pay for improved water services (25 litres) was ₦6.99k per 25

Table 4: Factors Influencing mean WTP for Improved Water Services

Variables	Coefficient	T-Value
Age	0.0257***	6.11
Sex	-3.0199***	-24.29
Education	-1.1702***	-9.17
Income	-7.77x10^{6}***	-4.86
Quantity of water used	-0.0005***	-5.29
Price	0.1647***	19.91
Experience water-borne diseases	-5.5460***	-48.42
Farming	3.9030***	16.25
Trading	4.7848***	18.41
Artisan	1.4033***	5.08
Married	2.4250***	9.71
Single	5.7070***	16.91
Household size	-0.3952***	-23.03
Own house	1.7149***	11.97
Rent house	2.1282***	15.40
Deep well drink	11.5812***	17.60
Rain drink	-7.7231***	-30.19
Spring	0.5942***	3.01
Distance water	0.0004***	4.31
Constant	4.6793***	10.66
No of observation	437	-
Prob>F	0.0000	-
PseudoR2	0.01588	-
Mean WTP	₦6.99k/ 25 litres/day	

*Sig at 10% **Sig at 5% ***Sig at 1%

litres per household per day.

CONCLUSION

Evidences from this study revealed that rural households' sources of water are still appalling and primeval. About 70.0% of the respondents used unimproved water sources, only 31.8% had access to protected borehole. Moreover, 74.4% of the respondents expressed that the existing water sources is not good and the distance is relatively far for collecting water, thereby indicating a willingness to pay a mean of ₦6.99k per 25 litres of water The result further revealed that age, sex, occupation, marital status, price paid for fetching water, quantity of water used experience waterborne diseases, household size, rain drink own house, rent house, drinking deep well water, spring distance (existing sources) water were significant factors influencing mean WTP for improved water services in the study area. Therefore, good water sources should be cited nearer to rural community at a relatively low price by rural households.

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