Available online at www.elixirpublishers.com (Elixir International Journal)

Agriculture

Elixir Agriculture 107 (2017) 47109-47114

ISSN: 2229-712X

Willingness to Pay for Safe Water in Ejigbo Local Government Area, Osun State, Nigeria

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ARTICLE INFO

Article history:

Received: 21 January 2017;

Received in revised form:

5 June 2017;

Accepted: 14 June 2017;

Keywords

Willingness,

Pay,

Safe Water logit model

ABSTRACT

This study examines the willingness to pay for safe water by households in Ejigbo local government of Osun State. Eighty respondents were selected for the study. A multistage random sampling technique was used to select the respondents. The data used for this study are mainly primary data through the use of structured questionnaire administered via personal interviews emphasizing on the importance of safe water and willingness to pay for safe water among households in Ejigbo Local Government Area. Descriptive statistics such as tabula presentation, frequency distribution, cumulative percentages and mean were used to analyze the slated objectives. The Logit model was also used to test for the formulated hypothesis.The study revealed from the socio-economic characteristics that majority of the respondents is male while most of them are within their youthful age. Sixty percent are married, 55% of them have a household size of between 1 and 5. More than four-fifth (80%) of them get their water from wells and boreholes, 62.5% treat their water before consumption, 47.5% have a record of one illness or the other. Two-third (67.5%) prefer other water sources. The highest percentage of respondents (56.3%) was willing to pay for safe water. Marital status is statistically significant at 5% with a value of 2.079, these shows that marital status has a positive significance with the willingness to pay for water. Primary occupation is statistically significant at 5% with a value of -2.227, this implies that it has a negative significance with the wiliness to pay for safe water. Secondary occupation is statistically significant ay 5% with a value of -2230, this implies that it has negative significance on the willingness to pay for safe water. Age, primary occupation and secondary occupation have a negative marginal effect on the willingness to pay for safe water in the study area with a value of -2.192,-2227 and -2230 respectively. Even though significant, and increase in these three variables will not raise the morale to willingly pay for safe water.Conclusion was drawn that most of these respondents are willing to pay for safe water but a lot of factors inhibit their willingness to pay such as price, distance to the source of water supply and availability.

Introduction

Water is a natural resource of fundamental importance. It supports all forms of life and creates jobs and wealth in the water sector, tourism, recreation and fisheries (Ntengwe, 2005).

The World Health Organization (WHO) estimate 1.8 million people in developing countries die every year from Diarrhea and Cholera, out of these 90 percent are children under the age of five years. While 88 percent of Diarrheal diseases are attributed to unsafe water supply, inadequate sanitation and hygiene (WHO, 2004).

The need to define the quality of water has developed with the increasing demand for water which is suitable for specific uses and conforms to desired quality (Deborah, 1996). Although water quality and water quantity are inextricably linked, water quality deserves special attention because of its implications on public health and quality of life (Warren and Mark, 1998).

An adequate supply of safe water is the most important precondition for sustaining human life, formulating ecosystems that support all life, formulating ecosystems that support all life and for achieving sustainable development (Topfer, 1998).

The number of people who rely on the earth's limited freshwater reserves is increasing every day. In fact, a scarcity of clean, fresh water is one of the world's most pressing environmental problems (Arms, 2008). At the 2002 World Summit on Sustainable Development in Johannesburg, South Africa, great concern was expressed about the 1.1 billion people in the world who do not have access to safe drinking water and the 2.4 billion who live without proper sanitation (Cech, 2005).

Since 1999, a huge amount of public funds have been spent on provision and management of water. However, there is still no potable water and many lack access to adequate sanitation. In the last eight years, the Federal Government attempted to develop water infrastructure like dams, but these were basically for irrigation purposes, because little attention was paid to water for domestic use. Government insists it cannot handle water supply all by itself for lack of funds, and have ceded its statutory role to shylock water producers, who do not know or care about safe water standards (Oghifo, 2008).

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In Nigeria, Diarrhea a major cause of child mortality which results from poor sanitation and consuming poor quality water has been a major subject of discussion. The prevalence of the disease is higher in the rural areas than in the urban centre and in the Northern zones of the country than in the South. An estimated 150,000 to 200,000 diarrhea related deaths occur among children below the age of 5 each year (UNICEF, 2003). The drive for poverty reduction in Nigeria recognizes water supply and sanitation as an important component. Water supply and sanitation cuts across several sectors such as Agriculture, Rural Development, Education, Industrial development, indeed all sectors of the Economy require the use of water for the welfare and overall well-being of Human beings. (Adefolalu and Ibitoye, 1993).

The willingness to pay for any service is regarded as a means of long term sustainability of such a service. The willingness to pay provides a good platform for effective production, efficient maintenance, good planning, sustainability and expansion by Government. (Pean, 1993).

In summary, this study aims at analyzing the challenges involved in the willingness to pay for safe water by the household in Ejigbo Local Government Area with a view to providing viable solutions to such challenges. Specifically, the paper: identified and discussed socio-economic characteristics of households; determined the factors that contribute to their willingness to pay for safe water; estimate how much they are willing to pay; and identified the constraints to availability and accessibility of water in the study area.

Methodology

The study was carried out in Ejigbo Local Government Area of Osun State. The Local Government has her headquarters located at Ejigbo Township and was one of the oldest Local Government Areas in Osun State in which no Local Government had been carved out since its creation in 1976. The area comprises of 10 wards, while other major towns in the area include: Ola, Masifa, Isoko, Ilawo, Agurodo, Ife-Odan, Osinmo, Aato, Inisa-titi, Inisa-edoro, Ado-Orioke, Ika, Isundunrin and so on. It shares boundaries in the North with Surulere LGA, Oyo State, in the East by Egbedore LGA, Osun State, in the West by Ogo-Oluwa LGA, Oyo State and in the South by Ola-Oluwa LGA, Osun State.

Agriculture is the major occupation of the people in the area; there are also many market places in the area with major markets located in Ejigbo, Ola, and Masifa. The major agricultural produce in the area includes Cash crops and Food crops such as Cocoa, Cashew, Mango, banana, melon, maize, groundnut, yam and palm oil. People in the area are also involved in trading especially international trading between Nigeria and Ivory Coast.

Household in Ejigbo LGA constitutes the sampling frame for the study. A multistage random sampling technique was used to select the respondents. In the first stage, the study area was stratified into wards. The second stage involved selection of 4 wards out of the 10 wards. The third stage involved random selection of 2 villages from each ward making a total of 8 villages. The last stage involved random selection of 10 respondents from each village making a total of 80 respondents.

Primary data were collected through the use of structured questionnaire administered via personal interviews emphasizing on the importance of safe water and the willingness to pay for safe water among households in the area. Data collected were analyzed using: descriptive analysis such as frequency and percentages were used to analyze the socio-economic characteristics of the respondents and constraints to availability and accessibility of water; while Logit model was used to determine the willingness to pay for safe water by households. (The Logit model which is based on the cumulative probability function was adopted because it has the ability to deal with dependent variables which is supported by well-established theoretical background).

Logistic regression according to (Braka and Kelly, 2001) is a uni/multivariate technique which allows for estimating the probability that an event will occur or not through the prediction of the binary dependent outcome from a set of independent variables.

The focus in this study is the logit model which is based on the logistic distribution.

$$\boldsymbol{P_1 = P_r(Y_1 = 1) = \frac{e^{Bx}}{1+e^{Bx}}} \quad \ldots\ldots\ldots\ldots\ldots (1)$$

$= \lambda^{(\boldsymbol{B^1 x})}$

Where:

λ = logistic cumulative distribution

The odd ratio, which defines the probability of time use pattern, is given as

$$\frac{\boldsymbol{P_{iid}}}{\boldsymbol{l-P_i}} = \boldsymbol{e^{Bx}} \ldots\ldots\ldots\ldots\ldots\ldots \quad \ldots\ldots\ldots (2)$$

From equation (1)

$$l - P = \frac{\boldsymbol{e^{xbx}}}{\boldsymbol{l+e^{-xb}}} = \frac{\boldsymbol{1}}{\boldsymbol{1+e^{-xb}}} \quad \ldots\ldots\ldots\ldots (3)$$

Rearrangement of these expressions gives

$$L = \log \frac{\boldsymbol{P}}{\boldsymbol{l-P_1}} = \boldsymbol{\log p - \log(1-p)}$$

$$= -\log\left[\boldsymbol{l + e^{-x\beta}}\right] - \left[\boldsymbol{\log(e^{-x\beta})}\right] = \boldsymbol{x^1\beta} \quad \ldots\ldots (4)$$

L = Logit or the log of the odd ratios, and analysis based upon the logistic distribution is often called logit analysis

$$\boldsymbol{\beta^1 x = \beta_0 + \sum \beta_1 x_1 + u_1} \quad \ldots\ldots\ldots\ldots (5)$$

Where:

e = the natural logarithm

$\boldsymbol{\beta_0}$ = constant term

$\boldsymbol{\beta_1}$ = vector of coefficients

X_1 = vector of the explanatory variables

V_1 = error term

Where:

Logistic cumulative distribution

The odd ratio, which defines the probability of time use pattern, is given as

Rearrangement of these expressions gives

Result and Discussion

Socio-economic characteristics of the households

Frequency distribution of respondents by their characteristics was revealed in Table 1. From the table, 57.5% of the respondents were male which implies that males are the dominant users of water in the area. Mean age of 41years for majority of the household interviewed implies that most of the respondents are still within their youthful age, thus they are more likely to pay for safe water. More than half of the respondents (60%) are married with dependents (children) which, implies they will be more willing to pay for water than those who are still single. The literacy level of the respondents is high with 66.2%, with only 33.8% them had no formal of education, this will be favorable to their willingness to pay because the more educated you are, the more enlightened you are about the importance of safe water and the more willing you are to pay for it. The household size of 55% of them was between 1 and 5 family members per farm while others have more. So it indicates that households in the study area are large in number; they are productive in terms of childbirth and

can be used as family labour. In addition, 51. 25% took farming as their primary occupation while 8.75% are civil servant, 32.5% have their own enterprise, 7.5% artisan and half of them had no secondary occupation

Table 1. Socio-economic characteristics of the respondents.

Socio economic Characteristics	Frequency	percentage
Sex		
Male	46	57.5
Female	34	42.5
Age of the respondents		
15 – 25	13	16.3
26 – 35	17	21.3
36 – 45	17	21.3
46 – 55	23	28.8
56 – 65	10	12.5
Marital Status		
Single	26	32.5
Married	48	60.0
Separated	6	7.5
Level of Education		
No formal education	27	33.8
Primary school	23	28.8
Secondary school	21	26.3
NCE	8	10.0
HND/B. Sc.	1	1.3
Household size		
1 – 5	44	55.0
6 -10	23	28.8
11 -15	10	12.5
16 – 20	2	2.5
21 25	1	1.3
Occupation		
Civil service	7	8.75
Self-owned enterprise	26	32.5
Farming	41	51.25
Artisan (carpentry, tailoring, bricklaying)	6	7.5
Secondary occupation		
None	40	50.0
Artisan (carpentry, tailoring,	3	3.75
bricklaying)Trading	32	40
Farming	5	6.25
Total	80	100

Source: Computed from field survey, 2016

Monthly expenditure of the respondents

Table 2 below shows that 2.5% of the household spend between N1,001-N5,000 in a month, 22.5% spend between N5,001 – N10,000 monthly as 33.8% spends N10,001-N15,000 monthly, 23.8% spends N15,001 – N20,000 monthly, it also shows that 15% spends N20,001-N25,000 monthly while 2.5% spends between N25,001-N30,000 monthly. This implies that the monthly expenditure of the respondents is low.

Table 2. Percentage and Frequency distribution of household by monthly expenditure.

Monthly	Frequency	Percentage
expenditure (N)		
1001-5000	2	2.5
5001-1000	18	22.5
10001-15000	27	33.8
15001-20000	19	23.8
20001-25000	12	15.0
25001-30000	2	2.5
Total	80	100.0

Source: Computed from field survey, 2016.

Availability of water

Household source, cost, quality and treatment of water used

Table 3 shows that 80% of the respondents source their water from the wells and boreholes, 10% fetched water from community public taps, 7.5% get water from streams while 2.5% sourced water from public water connection. This indicates that wells and boreholes are the major sources of water in the study area. All the respondents (100%) fetch water daily for household use. This implies that the respondents use water every day and rely on their water sources. This implies that the water sources where they fetch water is very dependable. More than three-quarter (81.3%) of the respondents do not purchase water for household use. Also, 83.8% fetched water from a distance of less than 1 km, 45% of the respondents fetch between 1-4 buckets of water daily, 43.8% fetch between 5-9 bucket daily. This implies that most of the respondents fetch above 5 buckets of water daily and will be willing to pay. Majority 82.5% of the respondents do not pay for water because they do not buy water, 6.3% pay N10 per bucket, 10% pay N20 per bucket while 1.3% pays N25 per bucket. In addition, 62.5% treat water before consumption while others do not. About half 52.5% had no record of diseases and illnesses as a result of source of water consumed. This implies that most of the respondents do not have water-borne diseases because majority of them treat water before use.

Table 3. Source, cost, quality and treatment of water.

Source of water	Frequency	Percentage
Well and borehole	64	80.0
Community public tap	8	10.0
Stream	6	7.5
Public water connection	2	2.5
How often water is sourced		
Daily	80	100.0
Reliability		
Reliable	80	100.0
Buying of water		
Yes	15	18.8
No	65	81.3
Distance (km)		
<1	67	83.8
1	7	8.8
2	4	5.0
3	1	1.3
5	1	1.3
Buckets of water		
1-4	36	45
5-9	35	43.8
10-14	7	8.8
15-24	2	2.7
Price per bucket (N)		
0	66	82.5
10	5	6.3
20	8	10.0
25	1	1.3
Treatment of water		
Yes	50	62.5
No	30	37.5
Treatment method		
None	30	37.5
Boiling	21	26.3
Filtering	6	7.5
Alum	23	28.3
Diseases Record		
Yes	38	47.5
No	42	52.5
Disease type		
None	42	52.5
Cholera	0	0
Dysentery	26	32.5

Diarrhea	3	3.8
Skin rashes	9	11.3
Preference for alternative source of water		
Yes	54	67.5
No	26	32.5
Total	*80*	*100*

Willingness to pay

This section discussed Preference for alternative source of water by the respondents, Respondents willingness to pay, Amount willing to pay daily, Frequency of their willingness to pay Table 4 shows that 67.5% prefer a more reliable alternative source of water while 32.5% don not prefer a more reliable alternative source of water. This is because they are not satisfied with their present water sources and also because of the distance and price of such sources. **Also,** 56.3% of the respondents are willing to pay for safe water, 43.8% of the respondents are not willing to pay for safe water. This implies that most of the respondents are willing to pay for safe water because they are dissatisfied with their present water sources. In addition**,** 43.8% are not willing to pay for safe water, 36.4% can afford to pay between 10 and 50 naira, 18.8% can afford to pay between 51 and 100 naira while 1.3% can pay between 151 and 200 naira.

It was also reported from Table 4 shows that 37.5% are willing to pay daily, 20.0% are willing to pay weekly while 1.3% is willing to pay monthly. This implies that a large percentage of the respondents are willing to pay for safe water on a daily basis.

Table 4. Percentage and frequency distribution of Respondents willingness to pay.

Willingness to pay	Frequency	Percentage
Yes	45	56.3
No	35	43.8
Total	80	100.0
Amount paid daily by Respondents		
Amount (N)	Frequency	Percentage
0	35	43.8
10-50	29	36.4
51-100	15	18.8
101-150	0	0
151-200	1	1.3
Total	80	100.0
Frequency of payment		
None	33	41.3
Daily	30	37.5
Weekly	16	20.0
Monthly	1	1.3
Total	80	100.0
Total	80	100

Source: Computed from field survey, 2016.

Test of Hypothesis

Ho:There is no significant relationship between the socio-economic characteristics and the willingness to pay for safe water.

This section discusses the results of the Logit model that was used for testing the formulated hypothesis in relation to the factors associated with the willingness to pay safe water in Surulere local government area of Oyo state.

The socio-economic characteristics that were Age, Sex, Marital status, Educational level, Type of family, Family size, Primary occupation, Secondary occupation and Monthly expenditure. The variables that were significant were age, marital status, primary occupation and secondary occupation. Therefore, the null hypothesis is hereby rejected and alternative hypothesis is accepted.

Table 5 shows the Logit model for the willingness to pay for safe water in Surulere local government area of Oyo state. The table revels that Age is statistically significant at 5% with a value 0f -2.190, this show that Age has a negative significant with the willingness to pay for safe water. Marital status is statistically significant at 5% with a value of 2.079, this show that Marital status has a positive significant with willingness to pay for safe water. Primary occupation is statistically significant at 5% with a value of -2.227; this implies that it has a negative significance with the willingness to pay for safe water. Secondary occupation is statistically significant at 5% with a value of -2.230; this implies that it has negative significance on the willingness to pay for safe water.

Table 5. Logit model for willingness to pay for safe water in Surulere local government.

Variable	Coefficient	Standard error	t-ratio
Constant	1.985	1.830	1.084
Sex	0.167	0.551	0.304
Age	-0.400	0.333	-2.190**
Marital status	0.784	0.377	2.079**
Educational level	-0.793	0.303	-0.262
Family size	-0.405	0.589	-0.687
Family composition	0.623	0.828	0.752
Primary occupation	-0.328	0.267	-2.227**
Secondary occupation	-0.116	0.941	-2.230

***** means significance at 10%

** means significance at 5%

*** means significance at 1%

Source: Computed from field survey, 2016.

The marginal effects in the willingness to pay for safe water

Table 6 shows the marginal effects in the willingness to pay for safe water among the households in Ejigbo local government area of Osun state. It shows that Martial status has a positive marginal effect on the willingness to pay for safe water among the respondents in the area, the economic implication of this is that any increase in the variation of marital status will lead to an increased attempt by the respondents to willingly pay for safe water in the study area. In economic terms, any attempt to increase the marital status will amount to raising the morale of the respondents to willingly pay for safe water.

Table 6. Summary of marginal effects on the willingness to pay for safe water in Ejigbo Local Government.

Variable	Coefficient	Standard error	t-ratio
Constant	0.486	0.446	1.089
Sex	0.410	0.135	0.304
Age	-0.970	0.813	-2.192**
Marital status	0.192	0.915	2.097**
Educational level	-0.194	0.741	-0.262
Family type	-0.991	0.144	-0.687
Family composition	0.152	0.203	0.752
Primary occupation	-0.802	0.653	-2.227**
Secondary occupation	-0.283	0.230	-2.230**

* means significance at 10%

** means significance at 5%

*** means significance at 1%

Source: Computed from field survey, 2015.

Age, Primary occupation and Secondary occupation have a negative marginal effect on the willingness to pay for safe water in the study area with a value of -2.192, -2.227 and -2.230 respectively. Even though significant, any increase in

these three variables will not raise the morale to willingly pay for safe water.

Summary of major findings

The study examined the willingness to pay for safe water in Ejigbo Local Government Area of Osun state, Nigeria.

Relevant literature was also reviewed on the subjects of Willingness to pay, provision of safe water, water supply programmes and National water supply policies.

This research work critically examined the socio-economic characteristics that affect the willingness to pay for safe water in the study area, the existing source of water, respondents' perception of the importance of safe water and the general characteristics of water. Data were collected from households through the use of well-structured questionnaires. 80 respondents were sampled from chosen villages and the suburbs within the local government area. The data were subsequently analyzed with the use of percentages, standard deviation, mean and frequency count, these were used to describe the socio-economic characteristics of the respondents. The study also employed Logit model to analyze the hypotheses.

The major findings of the study reveal the large proportion of the household were male. The study also reveals that large proportion of the respondents have no formal education and only a little proportion of them go further than primary school education. The study area is characterized by large families with some families being as large as between 17-23. Most of those residing in the study area are married. The major primary occupation of the area is farming and the major source of income, the major secondary occupation is trading.

There is a significant relationship between selected socio-economic characteristics and the willingness to pay for safe water. From the result of the study, the significant variables are Age, Marital status, Primary occupation and Secondary occupation and they were all significant at 5%.

Conclusion

From the findings of this study, conclusions were drawn that most of these respondents are willing to pay for safe water but a lot of factors inhibit their willingness to pay such as price, distance to the source of water supply and availability.

Also, the study has shown that there is significant relationship between the selected socio-economic variables and the willingness to pay for safe water by the respondents in the study area. Age, Marital status, Primary occupation and Secondary occupation are the factors affecting the Respondents willingness to pay in the Study area. While Age, Primary occupation and Secondary occupation all have a negative significance on the willingness to pay for safe water, marital status has a positive significance on the willingness to pay.

Recommendations

The following recommendations are suggested based on the findings of the study on willingness to pay for safe water in Ejigbo local government area of Osun state.

1. In a bid to stimulate people's willingness to maintain and improve water supply, Government should allow communities to assume greater responsibilities in the area of policy articulation, project prioritization, design, execution, routine monitoring and management.
2. More funds should be allocated to water resources development and there should be provision of alternative sources of water supply such as boreholes and public taps in strategic locations in the study area.
3. Government should subsidize water so that it can be affordable for people to pay.
4. NGO.s and Private organizations as part of their social responsibility programmes should provide clean, affordable, safe water to area where safe water is not available.
5. Community groups, local NGOs, and local government should be effectively involved in management of local water sources, this is because they better understand the terrain and the needs of the local community better that the State government.
6. Proper sensitization should be given to people to educate them about the importance of safe water by Community groups, NGO's, organized private sector and the Government.

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