

ASSESSMENT OF WATER POVERTY STATUS OF FARM HOUSEHOLDS IN OGUN STATE, NIGERIA

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ABSTRACT

This study assessed the water poverty status of farm households in Ogun State, Nigeria. Multistage sampling techniques was used to collect a cross-sectional survey of 360 respondents. Majority (78.61 percent) of the farm households obtain their water from the few boreholes around because most well available did not have water, probably the well is not as deep as the borehole. Meanwhile, 31.11 percent depend on the rainwater to obtain water for the household use and this is only possible during the raining season. Well water accounted for 29.44 percent. Water reservoir (23.89 percent) was another major source of water available for the households in the study area. The distance and trekking time to the sources of water can affect the quantity of water will be available for the households use. The results revealed about 25.56 percent of the households spent less than 15 minutes to obtain water from the water source. However, 53.61 percent of the respondents spent an average of 16 - 30 minutes, and 20.83 percent spent more than 30 minutes to access water. The implication is that the sources of water are not close to the center of the village, and that could discourage the people from using the sources of water. The average minute spent to the water sources was 22.4 minutes. The pattern of water sufficiency index tended to be low with 48.33 percent having between 0.30 – 0.49, implying a low level of water sufficiency. The percentage of households under various forms of vulnerability to water scarcity reveals that majority (44.72 percent) have between 16.0 – 35.9 water scarcity vulnerability indexes, implying a high level of water scarcity. The mean water scarcity vulnerability index is 17.291, this indicates that farm households in the study area are moderately vulnerable to water scarcity. Water Poverty Index calculated was 0.512 implying that severe level of water poverty in the study area. The average incidence of the WPI is estimated at 51.2 percent implying that about 51.6 percent of the farm households are water poor. To address water scarcity problem in the state therefore, need for improved governance in water supply situation to avoid the current lack of government presence in meeting households or communities water demands.

Keywords: accessibility, households, poverty, vulnerability, scarcity

INTRODUCTION

Water is essential for life. It covers 70% of the Earth. Water also is considered a key factor for development since a good water supply will increase productivity in agriculture, livestock, and industry, and help eradicate extreme poverty and hunger. An adequate water supply is a prerequisite for human and economic development.

Global water resources are limited, and only through a more sustainable approach to water management, and more equitable and ecologically sensitive strategies of water allocation and use, can we hope to achieve the

international development targets for poverty reduction that have been set for 2015 (DFID, 2000).

Public water supply in Nigeria's urban and rural areas is generally inadequate and, in most cases, inaccessible, the supply is intermittent and unreliable, thus resulting into high dependency on unsafe supplementary sources such as streams, hand dug wells and ponds with compromised quality (Nnodu and Ilo, 2002; Ocheri, 2006; Ocheri and Vangeryina, 2020). Water is an indispensable resource and serves as the basis of life. Its importance to man

and environmental functioning can never be over emphasized.

According to Shiklamanov (2000), water is a driver for the sustainability of life's quality and for the economic and social wellbeing of people. Despite the importance of this resource to human development, increase in population coupled with industrialization is putting so much pressure on the resource and it is expected that there will be continuous increase in demand which invariably will lead to water scarcity and stress especially in developing countries like Nigeria.

Water scarcity refers to either physical or social water scarcity (Falkenmark *et al.*, 2007). Physical water scarcity arises because of low availability of water resources, while social water scarcity is caused by unbalanced power relations, poverty and related inequalities (Falkenmark *et al.*, 2007). Water scarcity can be further divided into demand-driven scarcity (water stress) and population-driven water scarcity (water shortage) (Falkenmark *et al.*, 2007). Water stress on the other hand occurs when the demand for water exceeds the available volume during a certain period or when poor quality restricts its use. It is often measured with the use to-availability ratio (Rockström *et al.*, 2009). Growing population together with climate change are predicted to considerably increase water stress within the following decades (Döll, 2002) and it is estimated that by 2050 more than half the world's population will live in water-stressed areas (Schlosser *et al.*, 2014). Furthermore, it has been proposed that the higher the water stress, the more vulnerable the population to changing water scarcity (vanBeek *et al.*, 2011).

Sullivan *et al.*, (2003) capture water poverty more succinctly as the unavailability of water to meet existing needs arising from lack of or inability to mobilize resource like human and financial. It therefore implies that the scarcity of water has a strong link with human, financial and institutional poverty.

Water is an essential component to ensure equitable, sustainable and productive rural economies. It is required for guaranteeing food security, health and personal hygiene, as well as for agricultural production and energy supply, among others. Sustainable water management, sufficient water infrastructure and access to a

safe, reliable and affordable supply of water and adequate sanitation services are key to improving rural livelihoods, expanding local economies, creating decent jobs in rural areas and across economic sectors, and maintaining a healthy and productive workforce. A failure to address issues related to water runs the risk of having negative repercussions on rural economies, livelihoods and decent work.

Water is recognized as a human right that "entitles everyone to sufficient, safe, acceptable, physically accessible and affordable water for personal and domestic uses". The United Nations 2030 Agenda for Sustainable Development acknowledges the role of water in eradicating poverty and ensuring sustainable green growth as essential. The Sustainable Development Goal (SDG) 6 on clean water and sanitation aims to put the right to water in practice and to ensure availability and sustainable management of water and sanitation for all. Many other SDGs are closely linked to water-related issues, and water can be considered as a fundamental driver of green growth. The United Nations Declaration on the Rights of Peasants and other People Working in Rural Areas recognizes that their access to natural and productive resources such as water is an increasing challenge, and underscores the importance of the right to access to water and sanitation (UN, 2018). In specific terms, the objectives of the study were:

1. Describe the sources of water available to farm households,
2. Describe the level of accessibility of the water sources of farm households,
3. Assess the extent households' vulnerability to water scarcity,
4. Assess the water poverty status of the farm household, and
5. Determine the socioeconomic factors influencing the water poverty status of the farm households.

METHODOLOGY

Study Area

This study was carried out in Ogun State, Nigeria. Ogun State lies within latitude 7° and 8°27'E in the humid tropical lowland region of the country. It has twenty (20) Local Government Areas, with a land mass of 16,409.26 sq. km, and a population of 3,728,098 (Federal Republic of Nigeria, 2009). Ogun State is divided into four

zones by the Ogun State Agricultural Development Project (OGADEP), namely Abeokuta, Ikenne, Ilaro and Ijebu-Ode. The blocks are further divided into cells while the cells consist of many farming communities.

Study Data: Primary data was used for this study. The data was collected from a cross section of 240 arable crop farmers in Ogun State with the aid of a structured questionnaire. Both individual and communities level data were used.

Sampling Techniques: Multi-stage sampling method was used for this study.

Stage One: The first stage involve a random selection of one (1) block from each zone, making four (4) blocks.

Stage Two: Second stage was a random selection of five (5) cells from each block making a total of 20 cells. The list of cells comprising many farming communities was obtained from Ogun State Agricultural Development Programme (OGADEP) and was used for the sampling frame.

Stage Three: The third stage was a random selection of 20 farming households from each of the 20 cells targeting a total of 400 farm households. However, after data cleaning for any potential outlier observations, 360 respondents were eventually used for this study.

Study Data: Primary data was used for this study collected through administration of questionnaire to household heads in farming communities of Ogun state.

Analytical Techniques: Both descriptive and inferential statistics were used to analysed the data for this study.

Objective One: Descriptive statistics was be used to describe the socioeconomic characteristics of the farm households in the study area.

Objective Two: Descriptive statistics was be used to describe the sources of water available for the farm households in the study area.

Objective Three: Descriptive statistics was be used to describe the level of accessibility of the farm households to the water sources.

Objective Four: The extent of household vulnerability to water scarcity was assessed using water scarcity vulnerability index. Vulnerability to water scarcity in this study was determined using the data obtained from individual households on actual water availability, and

water demand from which water scarcity vulnerability index in the study area was generated as:

$$WSVI = 1 - \left(\frac{HHWA}{HHWD} \right) * 100 \quad (1)$$

Where:

WSVI = Water scarcity vulnerability index

HHWA = Household water availability

HHWD = Household water demand. 1 was the value of water sufficiency a household have if all its water demands are met. The ratio between water demand and availability of a household was used to define the water sufficiency of the household. This was expressed using a simple index:

$$WSVI = \left(\frac{HHWA}{HHWD} \right) * 100 \quad (2)$$

Depending upon the ratio between what was demanded, and what was available, the water scarcity vulnerability index values were obtained using the above formula and this could be as low as 0% and as high as 100%. This means that practically, the lower the values the lower the vulnerability index of a household, and the higher the value the greater the vulnerability. Further analyses of the above scenario, and in comparison with the classifications developed by other studies (Birkman, 2006) enabled the study to develop a vulnerability classification system into five categories of vulnerability to water scarcity and these were acute, high, moderate, low and no scarcity.

Objective Five: Water poverty index (WPI) was used to assess the water poverty status of the farm households in the study area. Methodology of this study is based on a WPI framework developed by Sullivan (2002), Sullivan and Meigh (2003), and Sullivan et al., (2006). The methodology considers five components that integrate physical availability of water with socio-economic, and environmental factors: Resource (R), Access (A), Use (U), Capacity (C) and Environment (E). The Resource component provides an assessment on availability of the water resource in the study area. Access indicates the access to adequate water and sanitation. The Use component shows the water consumption at the domestic level. The Capacity component depicts the socioeconomic capacity of the population to manage water resource. The Environmental component denotes potential pollution sources that influences water

quality and resources. These indicators for the components mentioned above were selected based on availability of data and relevance to the communities. The WPI components, and indicator with their functional relationship to water poverty is shown in Table 1. Water poverty index calculation involves using composite index approach in which five (5) identified components are combined to calculate water poverty (Sullivan et al., 2006; Van der vyver, 2013; Xin et al., 2011; Maheswari, 2016). Mathematically, WPI is expressed as:

$$WPI = \frac{\sum_i^N W_i X_i}{\sum_i^N W_i} \quad (3)$$

Where WPI is water poverty index value for a particular community, x_i refers to component of i of WPI structure for that location and w_i is the weight applied to that component. Each component has indicators which are initially combined using same techniques. In this study, equal weighting (20%) was used for each component. These components have been used in many researches internationally (Sullivan et al., 2006). For each component (Resource, Capacity, Use and Environment), the equation can be rewritten as describe by Lawrence et al. (2000) as:

$$WPI = \frac{WrR + WaA + WcC + WuU + WeE}{wr + wa + wc + wu + we} \quad (4)$$

Where WPI is Water Poverty Index and (w) is weight of each component. Before the application of this formula, the values are normalized. The final value of water poverty index should fall between 1 and 100 with 1 being the most water poor and 100 being the optimum condition.

Normalization of Sub-indicators

All indicator values are normalized to fall between 0 and 1 in order to free them from various units and for harmonisation such that some indicators do not have undue dominance over others (Nardo et al., 2008). The value of 0 indicates the poorest level of water poverty while 1 indicates optimum condition. The normalization is done using the equation 5.

$$Index = \frac{Xi - Xmin}{Xmax - Xmin} \quad (5)$$

Where, Index is Resource, Access, Capacity, Use and Environment. X_i is real value of each parameter, X_{max} is the highest indicator value across the communities when compared and X_{min} is the minimum indicator value. The negative indicator to water poverty is deducted by 1. The normalized values of the indicators are shown in Table 1.

Table 1: Indicators and their functional relationship with water poverty

Components	Indicators (Sub-indicators)	Relationship with Water Poverty
Resource (R)	R1. Water quantity sufficiency (%)	The higher the % reporting water sufficiency, the lower the poverty (+).
	R2. Number of water sources.	The higher the number of water sources or points, the lesser the poverty (+).
Access (A)	A1. Access to safe water (%)	The higher the % of people having safe water, the lesser the poverty (+).
	A2. Access to sanitation (%)	The higher the percentages of people with access to sanitation, the lesser the poverty (+).
	A3. Distance to water source(s) (km)	The longer the distance covered to obtain water, the higher the poverty (-)
Capacity (C)	C1. Poverty rate (%)	The higher the percentage, the higher the level of water poverty (-)
	C2. % of educated people.	The higher the % of educated people, the less the level of poverty (+)
Use (U)	U1. Domestic water consumption rate (Litres per day per capital)	Higher consumption with availability is less poverty (+)
	U2. Use of local water treatment procedure (boil water)	The higher the percentage of those that treat water before consumption, the lower the poverty (+)
Environment (E)	E1. Number of water pollution source(s)	The higher the number of pollution sources, the higher the poverty level and vice-versa (-).

Source: Zahra et al. (2012) Maheswari and Sudha (2016)

Data for the study was collected on the five components of water poverty; Resource, Access, Capacity, Use and Environment. Data on Resource component include; the number of people reporting water sufficiency (R1) and

number of water supply sources in each of the communities (R2). Data on both of these indicators were obtained, and water poverty index was categorised into:

Table 2: Water Poverty categorization

Water Poverty Class	Score
Severe	0 - 47.9
High	48.0 - 55.9
Medium	56.0 - 61.9
Medium Low	62.0 - 67.9
Low	68.0 – 100

Adopted from Maheswari and Sudha (2016)

Objective Six: Socioeconomic factors influencing the water poverty status of the farm households was determine using logit regression model. The model is specified in equation 6:

$$Y = WPI_i = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \dots + \beta_{10} X_{10} + \varepsilon_i \quad (6)$$

The dependent variable is the water poverty status of the farm households (when HHI = 1

implies water poor, and HH1= 0 implies water non-poor). The independent variables were:

- X_1 = Age (years)
- X_2 = Sex (Male=1, Female=0)
- X_3 = Education (years)
- X_4 = Number of water sources
- X_5 = Water scarcity vulnerability (index)
- X_6 = Water sufficiency (index)
- X_7 = Household water demand (litres per day)
- X_8 = Income (N/month)
- X_9 = Access to safe water (1=Yes, 0= No)
- X_{10} = Married status (1=married, 0= otherwise)

RESULTS AND DISCUSSION

Sources of water available for farm households

Table 3 shows the sources of water available in the study area. Majority (78.61 percent) of the farm households obtain their water from the few boreholes around because most well available did not have water, probably the well is not as deep as the borehole. Meanwhile, 31.11 percent depend on the rainwater to obtain water for the household use and this is only possible during the raining season. For centuries people have relied on rainwater harvesting for households, landscape, livestock and agricultural uses (Kelvin, 2006). Well water accounted for 29.44 percent. Water reservoir (23.89 percent) was another major source of water available for the households in the study area. The implication is that many of the farm household's aside borehole water, rely on the rainwater, and well during wet season which is a short period and water is also harvested into the reservoirs during the wet season. The quantity of water stored in reservoirs will serve them during the dry season.

The four major sources of water available in the study area which are boreholes, rainwater, well, and reservoirs but are not sustainable because they directly or indirectly depend on certain factors. For example, the rain water and reservoirs depend on the weather condition which the rural households cannot predict and determine. Ayeni *et al.* (2013) opined that the hydrologic impact of global warming contributes to the change in water balance parameters which increases or reduces water recharge and storage capacity. As a result, the capacity of surface water to supply water for the rural communities is degraded as rainfall reduces and ultimately surface water declines, water scarcity intensifies and ends in water insecurity in the communities.

Also, the borehole might need maintenance and electric power to operate the pumping machine which is not available in the study area thereby making the borehole not functional. These main sources of water could not be effective and sustainable in their present state to solve the problem of water scarcity for livelihoods and domestic use in farm households. Krishna and Hari (2005) opined that water conservation and development of alternative water supplies have become necessary because surface and groundwater supplies will not be enough to meet future demand. The change in climate condition, to some extent, may have a significant impact on surface water availability. The increased temperature leads to an increase of evapotranspiration, thus reducing the recharge rate on a watershed scale and trigger more severe water depletion during the dry season (IPCC, 2007).

Table 3: Sources of water available for farm households

Sources	Frequency*	Percentage
Boreholes	283	78.61
Well	106	29.44
Stream	18	5.00
Rain	112	31.11
Reservoir	86	23.89
Total		

Source: Field survey, 2022. * implies multiple response

Accessibility of the water sources

The distance and trekking time to the sources of water can affect the quantity of water will be available for the households use. Table 4 revealed that 25.56 percent of the households spent less than 15 minutes to obtain water from the water source. However, 53.61 percent of the respondents spent an average of 16 - 30 minutes, and 20.83 percent spent more than 30 minutes to access water. The implication is that the sources of water are not close to the centre of the village, and that could discourage the people from using the sources of water. The average minute spent to the water sources was 22.4 minutes. This finding corroborate Graham *et al.* (2016) report that in 24 sub-Saharan African countries estimated that 13.54 min adult women (and 3.36 min children), spend more than 30 min each day collecting water for their households. Also, Geere *et al.* (2010) report that in a study of six communities in South Africa, women and children carried water

weighing an average of 19.5 kg over an average distance of 335 m. The tap water in the study area is not reliable because they did not flow all the time. It was observed that there was no major river and even the available stream dries up during the dry season. Most (85%) of the rural households had access to the reservoir water within the distance of less than 100m to their households. The available reservoir water depends on the volume of rainfall during the wet season. This implies that the available water in the reservoir is seasonal and it is determined by the amount of rainwater harvested which thereby determine the amount of water available for the households. The reservoir could be sited within the community or even at their respective homes. Rainwater harvesting systems may be installed and serviced in remote villages and may be constructed with local materials and local human power for low cost and efficient maintenance.

Table 3. Distribution of rural households based on their access to different water sources

Accessibility Distance to water source (minutes)	Frequency	Percentage
1 – 15	92	25.56
16 – 30	193	53.61
31 and above	75	20.83
Total	360	
Average minute spent to the water sources	21.18	100

Source: Field survey, 2022.

Extent of farm household vulnerability to water scarcity

Vulnerability to water scarcity assessment in the study area was approached from two view-points. The first view point computed vulnerability to water scarcity on the basis of total water availability while the second view point computed vulnerability on the basis of sufficiency. Tables 4 summarised the results of background data of water sufficiency index and water scarcity vulnerability index thus Table 4 presents summary of mean values of the two indices in the study area. As each of the two indices was expressed as percentages, the values were expected to vary between 1 and 100 where a higher water sufficiency index value reflects higher extent of satisfaction of water supply availability of a household while higher water scarcity vulnerability index values reflect higher

degree of risk of a household to facing the problem of water scarcity.

The values of Water Sufficiency Index (WSI) varied between 11 percent and 98 percent with a mean of 0.362. The mean water sufficiency index condition tended to reflect the condition of water availability as already discussed and it was some measure of extent of satisfaction of water demand. The pattern of water sufficiency index tended to be low with 48.33 percent having between 0.30 – 0.49, implying a low level of water sufficiency. The percentage of households under various forms of vulnerability to water scarcity reveals that majority (44.72 percent) have between 16.0 – 35.9 water scarcity vulnerability indexes, implying a high level of water scarcity. The mean water scarcity vulnerability index is 17.291, this indicates that

farm households in the study area are moderately vulnerable to water scarcity.

Table 4: Extent of farm household's vulnerability to water scarcity

Extent	Frequency	Percentage
Water Sufficiency Index		
0.0-0.29	79	21.94
0.3-0.49	174	48.33
0.5-0.69	53	14.72
0.7-0.89	38	10.56
0.90-1.00	16	4.44
Mean	0.362	100
Water Scarcity Vulnerability Index		
No scarcity (0)	0	
Low scarcity (0.1 – 5.9)	52	14.44
Moderate scarcity (6.0 – 15.9)	109	30.28
High scarcity (16.0 – 35.9)	161	44.72
Acute scarcity (Above 35.9)	38	10.56
Mean	17.291	100

Source: Field survey, 2022.

Assessment of water poverty status of the farm households

Table 5 shows the assessment of the Weight of each component indicator. Result of the resource component indicates that, the study area has an indicator value of 0.58 implying that in terms of water resource, the study area has moderate (good) available physical water sources. Resource component represents the sources of water available for use to the people of a community.

The water sources in the area include the major river, other sources include boreholes, well, water vendors selling in containers and hand dug wells which were seen in most of the households visited with close proximity. For the access component, the study area has a value of 0.22 indicating high level of water poverty. The Access component entails the availability and accessibility of water for consumption by the people. It has to do with the people having access to safe water and sanitation and a close proximity to water sources in kilometer.

Most of the households visited in the study area in the town had hand dug wells close to the household which mean that the people in the area will travel lesser distance to obtain water, moreover the water vendors in the township normally supply water directly to the people at a token. Capacity component shows the poverty rate in terms of financial capacity and literacy which are key components in water poverty assessment. The better the financial capacity and level of education, the lesser the water poverty

level. Financial capacity and level of education helps one to have better ability to access water in terms of quality and quantity. A man which is financially capable will employ wealth to drill a borehole in a community while a less financially buoyant individual cannot.

Under capacity, the study area possessed the highest capacity and therefore a moderate water poverty level with an indicator value of 0.711. The farm households in the urban areas had better capacity than the people in the rural communities. This was responsible for higher value as compared to the other rural areas which have lower values indicating higher level of water poverty. Under the Use component, the study area has a higher level of water poverty with a value of 0.424. In terms of Environment component, the study area has a value of 0.508 indicating a moderate level of water poverty. Water use indicates the rate of water consumption and treatment options. The water consumption rate was higher in urban areas probably due to high population and needs which are peculiar to urban dwellers which resulted in low values of WPI, although most of the household visited noted that they buy drinking water from vendors including the sachet water which in local parlance is called “pure water” the quality of such water remain in doubts. Most of the rural households interviewed in the area do not use any treatment option in treating water before consumption, many do not know the dangers of consuming this water as they fetch directly from the stream for their drinking and domestic purposes making

them water poor in terms of water use. Result of the Water Poverty Index calculated was 0.512 implying that severe level of water poverty in the study area. The average incidence of the WPI is

estimated at 51.2 percent implying that about 51.6 percent of the farm households are water poor.

Table 5. Classification of Water Poverty Index

Water poverty weights	Score	Percentage
Resource	0.618	100
Access	0.334	100
Capacity	0.711	100
Use	0.424	100
Environment	0.506	100
Water Poverty Class	Frequency	
Severe	102	28.33
High	148	41.11
Medium	63	17.50
Medium Low	28	7.78
Low	19	5.28
Water Poverty Index	0.512	100

Source: Field survey, 2022.

Tobit Regression Results of The Socioeconomic Factors Influencing the Water Poverty Status of the Farm Households

Table 6 shows the Tobit regression results of the socioeconomic factors influencing the water poverty status of the farm households reveals that eight out of the ten hypothesized determinants were significant at various levels. These were:

Age: The age of the household head have a positive effects on the water poverty status of the farm households in the study area at 5 percent level of significance. This implies that, the older the farm household heads, the higher the likelihood of the household to be water poor.

Education: The negative and significant coefficient of education implies that the more educated the household head, the more the livelihood of them being water non-poor. This is more so because in developing countries such as Nigeria and like in many other developed ones, education is one of the criteria for securing better paying jobs and such higher income usually trickles down to household members thereby moving them away from poverty.

Household size: The implication of the significant negative sign of household size is that as household size increases, there is a more likelihood of the farm households to be water non-poor.

Number of water sources: The water of sources of water can affect the quantity of water will be available for the households use. The positive coefficient indicates that the higher the number of water sources, the higher the likelihood of being water non-poor. The higher the number of water sources or points, the lesser the water poverty status.

Water scarcity vulnerability (index): Water scarcity vulnerability has a positive influence on the water poverty status of the households. The positive coefficient indicates that the higher the water scarcity vulnerability of the household, the higher the likelihood of being water poor.

Water sufficiency (index): The water quantity sufficiency index exert a negative influence on the water poverty status of households. This implies that the lower the water quantity sufficiency index reported by the households, the higher the likelihood of them to be water poor.

Household water demand (litres per day): Household water demand has a positive influence on the water poverty status of the households. Higher consumption with availability is less poverty.

Access/distance to water sources (km): The distance and trekking time to the sources of water can affect the quantity of water will be available for the households use households. The higher the number of kilometer to access water sources, the higher the likelihood of being water non-poor.

Income (N/month): Income of the household head have a negative effects on the water poverty status. This implies that the income of the household head, the higher the likelihood of being water non-poor.

Access to safe water: Access to safe water have a negative effect on water poverty status of the farm households. The higher the proportion of people having safe water, the lesser the water poverty level.

Table 6: Socioeconomic factors influencing the water poverty status of the farm households

Variables	Coefficients	Standard errors	t-values
Age (years)	7.295	3.447	2.111
Sex (Male=1, Female=0)	-3.264	-1.251	3.056
Education (years)	0.332	0.124	2.685
Household size	-0.772	0.378	-2.037
Number of water sources	-9.973	4.286	-2.326
Water scarcity vulnerability (index)	3.755	1.491	2.517
Water sufficiency (index)	-11.007	4.761	-2.312
Household water demand (litres per day)	0.734	0.132	5.553
Access/distance to water sources (km)	0.285	0.131	2.180
Income (N/month)	-4.887	1.327	-3.68
Access to safe water (1=Yes, 0= No)	-10.212	4.049	-2.522
Married status (1=married, 0= otherwise)	0.451	0.63	0.712
Constant	3.415	1.703	2.004
Number of observations = 120			
LR <i>Chi</i> ² (24) = 694.16			
Prob> <i>Chi</i> ² = 0.013			
Pseudo R ² = 0.676			
Log likelihood = -802.11			

*, **, *** implies significant at 10, 5 and 1% respectively.

CONCLUSION

The study concluded that rural households perceived a negative effect of the water scarcity largely in their livelihood as a result of an increase in expenses in acquiring water, energy and time consumed in order to obtain it, and inability to meet the required available water for their livelihoods. The available water for households in the study area is not adequate and contain some elements which are not of the World Health Organization standard for good potable water. The study recommends increase in the number of water sources to be available for the farm households. Also, solving the problem of the water supply, particularly in rural areas of the state, is highly recommended in addition to adopting effective water regularity systems, encouraging water awareness programs, improving the environmental conditions for water resources, and investing in water and sanitation.

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