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Farm Households' Access and Constraints to Potable and Irrigation Water Supply in Ebonyi State, Nigeria

Ufiem, O.O[1], Umeh, G.N[2] and Alimba, J.O[2]

[1]Ebonyi State Secondary Education Board, Abakaliki, Ebonyi State, Nigeria.

[2]Department of Agricultural Economics, Management and Extension, Ebonyi State University, P.M.B 053 Abakaliki Ebonyi State, Nigeria.

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ABSTRACT

Farm households' access and constraints to portable and irrigation water supply in Ebonyi State, Nigeria was studied. Multi-stage random sampling technique was used to select a total of 180 farm households. Primary data were collected with the use of structured questionnaire and interview schedule; the data were analyzed using descriptive and inferential statistical tools. The result of the study shows that the farmers lacked access to sanitation, potable and irrigation water. Farm household access to potable and irrigation water were 46% and 0% with average potable and irrigation water insecurity level at 77%. Most of the household water collection was supplied by the children and this affected class attendance and school enrolment. The result of X^2 and regression shows that there is a strong relationship between the socio-economic characteristics of the farmers and their access to water. The respondents identified poor government attitude towards potable and irrigation water provision, lack of money to pay for the users cost, and seasonality of natural water sources as the constraints to access water. The respondents further identified Government and Non-Governmental Organization full involvement in the provision of potable and irrigation water, education or public awareness campaign for proper water management and utilization as ways of mitigating water scarcity. It was recommended that government should articulate and integrate rural water provision into the mainstream policy framework among others.

Introduction

Water is an essential element in rural livelihoods because of the food security and income option it generates in rain-fed, livestock, recreation, navigation and transportation as well as electricity generation. Access to water has been identified as a powerful tool to diversify livelihood and reduce vulnerability for small producers (Damme, 2001).

Water is also essential for household need and access to safe drinking water and sanitation is critical to maintaining health particularly for children. It is estimated that 3,900 children die every day from water borne diseases (WHO, 2004). In 2003 and 2004 in Ebonyi State, a total of 11, 685 diarrhea related cases with 36 deaths were reported, a total of 207 cholera cases with 16 deaths were also reported, while 194 typhoid related diseases with 11 deaths were equally reported and those affected were mostly children (Ministry of Health Ebonyi State, 2005). This is a cardinal indicator of water insecurity in the state. At the same time, it is the poor rural communities that have tended to suffer the greatest health burden from inadequate water supplies and as a result of poor health, have been unable to escape from the cycle of poverty and diseases.

Irrigation is critical for food security and it is a dominant user of water. It is estimated that about 70% of total water demand come from irrigation (Rosegrant, Cai, Sera and Cline 2002). Irrigated agriculture has played a major role in the development of rural economies, supporting economic growth, and poverty reduction, but growing water scarcity stands as a major threat to it. Ebonyi State has irrigation potential of 66,710 hectares with estimated water requirement of 333, 550,000 cubic meters (Ebonyi State Ministry of Agriculture, 2005). Whether water will be available for irrigation, so that agricultural production can provide for the State food security remains an urgent question for the State. One of the major challenges confronting the State is water scarcity. It is estimated that one in every 6 people in the word today faces water shortage (World Water Development Report$_2$ 2006). The universal water and Sanitation Coverage (2001), pointed out that by 2025 additional one billion people will need water supply in the rural areas. This expected increase has raised a considerable fear and debate about the world ability to meet the future water need and food security. It is certain that large scale water development projects will play a major role in poverty alleviation by providing food security, protection from flooding and drought and expanded opportunities for employment.

Safe water access is the meeting of household water supply of an absolute minimum of 20 liters per capita per day within 200 meters of user's dwelling place (WHO, 2005), and access to irrigation water is the meeting of irrigation water supply reliability index of 0.7 (Rosegrant *et al*., 2002). Water scarcity is the point at which the aggregate impact of all users impinges on the supply or quality of water under prevailing institutional arrangement to the extent that demand by all sectors including the environment cannot be satisfied fully.

Tele:
E-mail address: gibsonumeh@yahoo.com

It is a relative term which can occur at any level of supply or demand (World Water Development Reports, 2006). Water scarcity affects all social and economic sectors and threatens the sustainability of the natural resource base. In view of the above, and owing to the limited knowledge and information on the access level of Farm Households to safe drinking and irrigation water supply and their constraints to access adequate drinking and irrigation water supply in Ebonyi State, this study becomes necessary.

Inspite of the well advertised Federal and State Governments investment on potable water supply to urban and rural areas, people are still seen in Ebonyi State drinking from unsafe sources of water and trekking more than one kilometer in search of clean water. Core Welfare Indicator Survey (2006) hinted that only 43% of Ebonyi State have access to potable water. The irrigation situation does not fair better, out of the 66,710 hectares of total crop land of the state, only 500 hectares are under irrigation representing 0.75% of the irrigation potential of the State (Ebonyi State Ministry of Agriculture, 2005). This has led to 100% rainfed agricultural production and has thus affected the economic performance of rural farmers of the State. The springs, streams and rivers which are supposed to be major sources of potable and irrigation water supply of the State are highly seasonal and thus unreliable as water supply sources. High yielding motorized boreholes are not possible and thus cannot meet the water demand of the State especially in the dry seasons (Ebonyi State Rural Water Supply and Sanitation Agency, 2005).

There seem to be lack of knowledge and inadequate information about the level of access of potable and irrigation water supply by rural farm households and the constraints to access sustainable potable and irrigation water in Ebonyi State. The knowledge will guide the policy makers and economic planners towards eradicating extreme poverty and hunger and reduction of proportion of people without sustainable access to safe drinking water. The questions then are: What is the level of potable and irrigation water supply to rural farmers in the State?

What are the major factors that militate against the farm households' access to sustainable water supply in the State?
Is there any demand and supply gap of potable and irrigation water in the rural areas of the State? Is there any relationship between the socio-economic characteristics of the farm households and their access to clean water? And what are the ways of mitigating the water scarcity in the State?

1.1 Objective of the Study

The broad objective of the study is to investigate farm household access and constraints to potable and irrigation water supply in Ebonyi State. The specific objectives are to:

i. determine the level of access to potable and irrigation water by the farmers in the state.
ii. assess the sanitation of the respondents in the study area
iii. analyze the socio-economic characteristics of the respondents in relation to their access to clean water
iv. identify the major constraints to Farm Households' access to adequate potable and irrigation water supply and ways of mitigating water scarcity in the rural area of the State.

1.2 Hypothesis

A null hypothesis was tested

H_{o1}: There is no significant relationship between the socio-economic characteristics of the farm households and their access to potable and irrigation water in the study area.

2. Methodology

The entire Ebonyi State was the study area. The State is made up of 13 L.G.As with a total landmass of 7,087.12km^2 and estimated population of 2198371 (NPC, 2006). The occupation of the people is predominantly farming. The State is geologically of basement complex with springs and streams majorly seasonal. High yielding motorized boreholes are not possible (Ebonyi State Rural Water and Sanitation Agency, 2005). Multi-stage random sampling technique was used for the selection of the respondents used for the study.

Stage1: Two L.G.As were selected at random from each of the three Agricultural Zones of the State making a total of six L.G.As.

Stage2: This involved the selection of three communities at random from each of the six L.G.As. This gave a total of 18 communities in all.

Stage3: Ten farm households were selected at random from each of the 18 communities making a total of 180 Respondents who were used for the study.

Primary data were collected with a well structured questionnaire and oral interview schedule administered to the respondents. Both descriptive and inferential statistics were used in analyzing the data. Descriptive statistics such as frequency counts, percentages and mean, were used to analyze objectives (i) and (ii) and x^2 and multiple regressions were used to analyze objectives, (iii). Objective (iv) was analyzed using Likert scale with decision mean of 2.5.

2.1 Model Specification:

Model for multiple regression analysis was stated as:

$Y = f(x_1\, x_2\, x_3\, x_4\, x_5\, x_6\, x_7)$…… implicit form

$Y = a_o + a_1 x_1 + a_2 x_2 + a_3 x_3 + a_4 x_4 + a_5 x_5 + a_6 x_6 + a_7 x_7 + et$….explicit form

Where:

y= Average quantity of water available to households in liters per capita per day.

x_1 = Age (years)

x_2 = Gender (dummy) (male=1, female =0)

x_3 = Marital status (dummy) (married=1 single =0)

x_4 = Educational level (years of formal education)

x_5 = Farm Income (Naira)

x_6 = Sanitation (adequate toilet and refuse disposal facilities)

x_7 = Household size (number)

x_8 = Farm size (hectare)

x_9 = Farming system (dummy) (livestock =1, crop =2 and mixed farming =3)

a_o = Constant

a_1-a_o = Coefficients of regression.

Model for Chi-square (x^2) analysis that related poverty indicator variables to water supply gap was stated as:

$$X^2 = \frac{\sum(o-e)^2}{e}$$

Where:

X^2 = chi-square

$\sum$ = summation

o = observed frequency

e= expected frequency

2.2 Test of Hypothesis

F-test and x^2 - test were used to test the hypothesis at 5% level of significance. These were expressed thus:

i. F-cal = $\frac{R^2 (N-K)}{I- R^2 (K-1)}$

Where:

R^2 = coefficient of multiple determination

N = sample size

K = number of variables

Decision Rule: If f-cal > f-tab. reject the null hypothesis, otherwise accept it's alternative, and if x^2 –cal > x^2-tab reject the null hypothesis, otherwise accept it's alternative.

3. Results and Discussion

The result and discussion were done according to the specific objectives of the study

3.1 Farm Household level of access to potable and irrigation Water Supply. Access to potable water is defined as water availability in absolute minimum of 20 liters per capita per day within 1km from the dwelling place of the user.

Table 1. Percentage distribution of respondents based on the access to Potable and Irrigation Water.

Variables	Frequency 180	Percentage %
Sources of Clean Water		
House connection	10	5.6
Public stan`d pipe	15	8.3
Borehole	23	12.8
Protected dug well	26	14.4
Protected springs	8	4.4
Unprotected pond	78	43.3
Rivers	6	3.3
Streams	14	7.7
Access to potable water in liter per capita per day		
Less than 20L	97	54.00
Above 20L	83	46.00
Access to Irrigation		
Available	0	0
Not Available	180	100
Distance in km to potable water source		
Less than I km	74	41.00
Above I km	106	59.00
Persons for daily water collection		
Men	28	15.5
Women	52	28.9
Children	100	55.6

Average Potable and Irrigation water insecurity level is at 77%
Source: Field Surrey, 2014

The result of the source of clean water shows that the majority of the farmers represented by 43.3% in the State used pond water while 3.3% of then used rivers. This is in line with the report of the National Development Goal (2005) which pointed out that rural people in the country still depend much on rivers, streams, ponds and shallow wells for their water needs.

The result of access to potable water in liters per capita per day indicates that 54% of the respondents had no access to clean water supply having less than 20 liters per capita per day. World Bank (2013) pointed out that 80% of Nigerian who do not have access to clean water live in rural areas.

The result of the access to irrigation is zero. This on the average puts potable and irrigation water poverty level at 77%. According to African Development Bank Report (2006) only 6% of cultivated land in Africa is irrigated.

The result of the persons for daily water collection shows that children are the highest water collectors represented by 55% followed by that of women represented by 28.9%. Living Water Africa (2014) stated that children fetch water instead of attending school and many women spend so much of their day carrying water that they have no time for cash-generating business activities that can lift families of total poverty.

3.2 Sanitation

This was determined by the type of toilet and refuse disposal facilities available WHO (1996) defined Sanitation as at least adequate excreta disposal facilities that can effectively prevent human, animal and insect contact with excreta. Suitable facilities range from simple but protected pit latrine to flush toilet with sewage.

Table 2. Percentage distribution of the Respondents based on the toilet and refuse disposal facilities.

Sanitation variables	Frequency180	Percent %
Toilet system (latrine)		
Water closet	8	4.5
Ventilated improved pit (vip)	36	20.0
Covered or uncovered pit	65	36.1
Open or log latrine	71	39.4
Refuse Disposal		
Unauthorized heap (dump)	98	54.4
Dust bin	27	15.0
Dumping into streams and rivers	10	5.6
Disposal within compounds	42	23.3
Government collection	3	1.7

Source: Field Survey, 2014

The result from Table 2 shows that the majority of the farmers in the study area represented by 39.4% used open or log latrine, while only 4.5% of the respondents had water closet toilet. 54% of the respondents in the area disposed their refuse indiscriminately in unauthorized heap, while 1.7% of them had government collection as method of refuse disposal. All these indicate that the farmers in the rural area of the state lacked access to sanitation facilities. Lack of access to sanitation facilities is one of the leading causes of water pollution which result to water born diseases and infant mortality. Pacific Institute Research for People and Planet (2013) stated that clean water isn't enough, if it is made dirty because of toilets, and use of toilet must be encouraged by hygiene and education to get communities change the

Table4. Multiple Regression Result of socio-economic characteristic of respondent in relation to their access to potable water supply.

Variables	Variables Names	Regression coefficient	Standard errors	t-value
B_o	Constant	4.4	0.96	4.583*
X_1	Gender	0.702	0.325	2.160**
X_2	Age in years	0.671	0.215	2.44**
X_3	Educational qualification	0.801	0.258	3.105*
X_4	Marital status	0.090	0.035	2.571**
X_5	Household size	0.930	0.240	3.875*
X_6	Sanitation	0.082	0.034	2.411**
X_7	Farm size	0.170	0.074	2.297**
X_8	Farming system	0.160	0.201	0.796Ns
X_9	Annual farm income	0.296	0.082	3.609*

Ns= Not Significant *= significant at 1% level of probability **= significant at 5% level of probability*** = significant at 10% level of probability Source: Data Analysis, 2014

habit of generation. World Bank (1996) stated that 81% of the rural people in Sub-Saharan Africa do not have access to sanitation facilities. The core poverty indicator (2006) also noted that only 21.2% of Ebonyi State has access to safe sanitation.

3.3 The Socio-economic Characteristics of the Respondents in relation to their access to potable water supply.

The result of multiple regression analysis presented in Table 4 indicates that the coefficient of multiple determination (R^2) was 88.7% and adjusted R^2 was 75.4%. This means that about 88.8% variation in level of access to potable water in the area was caused by combined relationship of socio-economic characteristics of the sampled respondents. The high value of R^2 (88.8%) signifies that the socio-economic characteristics of the farmers had significant relationship to their level of access to potable water in the study area and this was confirmed by the positive coefficients of the independent variables adopted in the regression model, and the closeness of adjusted R^2 (75.4%) to R^2 (88.8%) in numerical value indicates that the explanatory power of the regression was not exaggerated. Also, the overall significant relationship of socio-economic characteristics of the farmers and their level of access to potable water was shown by the high value of F-ratio (3.596*), which was statistically significant at 1% (0.004) level of probability.

The co-efficients of gender (x_1), age in years (x_2), marital status (x_4), sanitation (x_6) and farm size (x_7) were statistically significant at 5% level of probability and they all bore positive signs, this implies that they all had positive relationship to the respondents' level of access to potable water and so, the a prior expectations were met.

Educational status (x_3), household size (x_5) and annual farm income (x_9) were all statistically significant at 1% and all bore positive signs to the farmers' level of access to potable water and so they met the a prior expectations.

Table 5. x^2 Results of the Social-Economic Variables of the Respondents in Relation to Access to Potable Water in Litres per Capita per day.

Socio-economic characteristics	X^2 cal	X^2 tab	Df	Significance
Gender	195.000	24.7250	11	1%
Age in years	135.4400	40.2894	22	1%
Level of education	152.000	31.9999	16	1%
Household size	171.09823	31.9999	16	1%
Farming system	151.6430	26.2170	12	1%
Farm size in hectares	126.24050	38.9321	21	1%
Annual farm income	172.4892	41.6384	23	1%
Marital status	172.91047	40.2894	22	1%
Sanitation	173.12630	38.9321	21	1%

Source: Field Survey, 2014.

Table5: shows that all the social-economic characteristics of the respondents in relation to average water supply in litres per capita per day were all significant at 1%.This implies that there is a relationship between the social economic characteristics of the farmers and the their level of access to potable water supply.

3.4 Constraints to Farm Households' Access to Potable and Irrigation Water and ways of mitigating water scarcity

Table 6 shows that non-availability of potable and irrigation water, Lack of finance to pay for the user's cost and seasonality of potable and irrigation water had their means above the cut-off mean of 2.5 and thus were accepted as constraints to farm household access to potable and irrigation water, while conflict over the ownership of water supply source had mean below 2.5 and thus was not perceived as a constraint to farm household access to potable and irrigation water.

Table 6.Likert scale analysis of constraints to access to potable and Irrigation water by the respondents, using a decision mean of 2.5

Constraints to access to potable and irrigation supply (items)	X	Remark
Non availability of potable and irrigation water	3.7	Accept
Lack of finance to pay for the user's cost	2.9	Accept
Poor government attitude toward potable and irrigation water supply	3.6	Accept
Conflict over the ownership of water supply source	2.1	Reject
Seasonality of potable and irrigation water	2.9	Accept

Source: Field Survey, 2014

Table 7 indicates that the respondents identified: Government full involvement in the provision of potable and irrigation water, education or public awareness campaign to change people's behaviour for proper water management and utilization, communities to establish or build earth dam, household to harvest and store water during rains and full participation of NGOs in potable and irrigation water provision having their means above 2.5 as ways of mitigating water scarcity, while, water pricing and marketing, limited hours and rotational domestic and irrigation water supply had their means below 2.5 mark and were thus rejected by the respondents as possible ways of mitigating water supply problem. Rose grant *et al* (2001) pointed out that although economic means such as water pricing and water marketing can create economic incentives to conserve water; there may be also public opposition to charging for water.

3.5 Test of Hypothesis

H_0: The null hypothesis which states that the socio-economic characteristics of the farmers have no significant relationship with their level of access to clean water supply in the study area was tested using X^2 –test and F- Test statistics under 0.05 level of significance. The tests were significance at 1% level of probability leading to the rejection of the null hypothesis and the acceptance of the alternative hypothesis, which affirms that there is a significant relationship between the socio economic characteristics of the farmers and their level of access to potable water supply in the study area.

Table 7: Ways of mitigating water scarcity

Ways of mitigating water scarcity (items)	X	Remark
Government should be fully involved in provision of and	4.0	Accept
There should be education or public awareness campaign towards proper water management and utilization	4.0	Accept
individual household or communities should establish or build earth dam	3.0	Accept
Household should harvest and store water during rains.	3.1	Accept
Water should be priced and marketed	2.00	Reject
There should be limited hours for domestic water supply and rotational irrigation water delivery	2.3	Reject
There should be full participation of NGOs in potable and irrigation water supply	3.4	Accept

Source: Field Survey, 2014

Conclusion and Recommendations

The study has shown that the farm households in the study area lacked access to potable and Sirrigation water supply, and this affected their health, productivity and economic performance. Based on the result of the study it was recommended that government should as a matter of necessity integrate rural water provision into the main stream of her rural development policy framework. Besides Non Government Organization (NGO) and private individuals should assist the government in rural potable and irrigation water provision, while farmers in the rural area should be educated on water management, sanitation and environmental conservation. This will increase the access of the farmers in the rural areas to potable and irrigation water supply and thus enhance their productivity, health and economic performance.

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