Pattern of Domestic Water Supply in Ugbokolo Community in Benue State, Nigeria

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ABSTRACT

This study which adopted the survey research design assessed the spatial and seasonal pattern of domestic water supply in Ugbokolo community, Benue State. The pattern of water supply in this study was based on data collected through the use of questionniare and personal observation and oral interview from 17 settlements in the community covering 1,784 households in 2007 using random sampling technique and analysed using percentages. The result showed that mean daily household water demand in Ugbokolo community was estimated at 155,788 lpd more than the actual available supply of 113,249 lpd, causing water shortage of about 2,381 lpd. This shortage as revealed by the study was due to the poor water yield from natural and man-made sources, seasonality/irregularity of rainfall, prolonging dry seasons, poor water storage and rainwater harvesting facilities and overwhelming demands for socio-economic activities in the community. It was recommended that the community should be empowered to treat water from streams in the dry season before drinking to prevent incidences of diseases.
*****Keywords:*** *Domestic water supply, dry season, wet season, water shortage, ugbokolo community*

INTRODUCTION

The problem of community water supply is common to most developing countries around the world including Nigeria. Many urban and rural areas face acute water supply problems leading to different water related diseases. According to Agberemi (2003), over half of the diseases affecting children below five years of age are attributed to poor water supply and sanitation conditions in Nigeria. Domestic water sufficiency differs seasonally and spatially even within a geographical region because of differing water demand and supply patterns and other factors among communities. According to Anderson (1974) and Ufah (1986), such factors include internal economic activities and physical environmental conditions like nature of geology, availability of surface water, soil and seasonality of rainfall which interplay to create variation in domestic water availability in an area.

These numerous factors that are involved in water demand and supply are responsible for intensity of insufficiency that requires different intervention options. Thus domestic water supply poses dynamic challenges despite continuing efforts by government, NGOs, and international donor agencies. Common issues include inadequate knowledge, wrong approaches and methods of tackling water problems, inadequate information and poor data on water needs of communities. This situation calls for more concerted efforts in community based research on domestic rural water supply situations especially in developing countries. Improved research on actual water deficiency scenarios in communities can promote supply interventions and appropriate demand projections that can address community water problems. It is in the light of this persisting need to overcome water problems and generate adequate information to achieve effective interventions that this study attempts to examine the spatial variability of water demand/supply and deficiency in Ugbokolo community with the view to improve the knowledge of decision makers and guide policy direction in improving domestic water situations at community level.

METHOD

The Ugbokolo community is located in Okpokwu Local Government Area in the western part of Benue State. It lies approximately between latitudes 7°08'00" and 7°13'48" N and longitudes 7°41'42"E and

7º49'30" E. The area is bounded in the north by Ohimini LGA, in the northwest by Kogi State, and southwest by Ogbadibo LGA, and southeast by Okonobo district and east by Ameji district in Edumoga. Figures I, II, and III show Benue State of Nigeria with Okpokwu LGA, Okpokwu showing Ugbokolo Community and Ugbokolo showing settlements and drainage pattern. The community experiences a tropical wet and dry period climate (Koppen's Aw) with rainfall for 6 months between May and November and the rest as dry season and harmattan experienced from December to February.

The area is dotted with hills in some parts especially the northern part while the southern parts are generally lowland regions. Drainage of the area is poor as cases of flood are experienced during heavy down pour. This poor drainage emanates from the type of geology of the area being underlain by the Asata Nkoporo shale formation. This shale formation where no exploitable aquifers have been located is very poor in ground water. The fractures in the shale are not interconnected and may be as wide as 30cm (Tahal Consultants, 1981). The major streams in the area are Mabeh, Abode, Ohimini and Omulewu (Figure 2). These rivers experiences reduced water volume to near dry in the first weeks of the dry season (Figs on Study Area). Some of the rivers however, have stagnant pools in their channels in dry season that last until rainy season. This seasonality of streams/rivers creates serious water shortage problems to the inhabitants of Ugbokolo community. The population of the community based on the 2006 census figures is 25, 123 and projected growth rate of 2.8%. The pattern of settlement is predominantly scattered and without a definite structure. Even Odessassa, which is the only urban settlement, is not planned. Socio-economic activities in the community include farming and cottage industries (Agbehi, 2007).

Data on domestic water supply in Ugbokolo community were collected using questionnaire, observation and oral interview in 2007 on 1,784 households from 17 settlements in the community using simple random sampling method. A household consists of the inhabitants and their activities in a residential unit under a common head. Some government officials in charge of rural water supply were also interviewed. The data collected was collated according to the settlements in the study analyzed using simple percentages and demand-supply differential measure to determine water deficiency. The data is presented in form of maps and tables to aid discussion and interpretation of results.

RESULTS AND DISCUSSION

Sources of Water Supply in Ugbokolo Community: Field information on the water sources available to households in Ugbokolo community shows that different sources of water supply of the study area include streams/rivers, rainwater, hand-dug wells, boreholes and water vendors. About 27.89% households in the community get water from stream/river in the dry and rainy season respectively. However, 27.22% get water from rainfall in the rainy season, while in the dry season this source of water contributes nothing as rainwater harvesting is neither practiced in the community. Responses show that 6.70% and 9.18% households obtain water from hand-dug wells in dry and rainy seasons while 0.67% get their water supply from vendors boreholes in the dry seasons. 3.11% and 1.11% in Odessassa get water from vendors in dry and rainy seasons respectively (table 1).

From responses and observation, there is a clear indication that the major sources of water supply of the study area are streams/rivers, hand-dug wells and rainwater (in the rainy season). However other sources like boreholes and water from vendors also contribute to the domestic household water needs of the community. From the analysis, all the settlements access streams/rivers in both dry and rainy season while rainwater is only used in rainy season. The reason is that the marked dry and rainy seasons means that rainwater can contribute to dry season if rain harvesting reservoirs are available in the community. The households lack storage facilities to store rainwater during rainy season for use in the dry season.

In Ugbokolo community, settlements that access hand-dug wells are those that have the facilities in their area like Odessassa, Aobida, Ondo, Akpali, Okwungaga, Aochichodo, Ankpa and Akpeke. The wells in Ankpa however, dry up after rains and well water in Akpeke settlement I muddy in the rainy season because of sediments. Boreholes exist in Odessassa, Aobida and Okwungaga and the percentage water supply contribution is mostly limited to the immediate environment. In Odessassa, the limitation of boreholes is complemented by the services of water vendors who from the water scheme that is not piped to all parts of Odessassa.

On a general note, the households in Ugbokolo community use mainly water from streams/rivers, and less of hand-dug well and rainwater. Also, boreholes are inadequate making some part of the community to depend on

vendors. Thus water quality from streams cannot be guaranteed and vendors use unsafe storage and transport facilities. Thus the problem of domestic water needs in Ugbokolo community just like most communities in developing countries is that of quantity and then quality.

Patterns of water Demand in Ugbokolo Community: In most communities in developing countries, the quantity of water needed is more than what is supplied. It has been established that the water needs of the people according to the data gathered from the field, also vary among settlements depending on intensity of socio-economic and sanitation water requirements. Thus the domestic demand for water exceeds water availability and by implication, shortage of water supply is generally experienced in the area. For example, Odessassa settlement needs 75,656 lpd of water, Effa needs 14,921 lpd, Aobida, 7,390, Ondo, 6,612, Aokpe, 7,264, Akpali, 7,054, Aikpla, 5,283 lpd to meet their water needs. Also, Okwungaga, Efeche, Ola-Eja, Ola-Okpe, Ankpa, Akpeke and Aochichodo need 5,292, 4,484, 3,994, 3,009, 3,551, 3,043, 3,184 litres of water daily to satisfy their water needs. Mabeh-Ehaje, Afujo and Ohimini also require varying quantities of water to meet their domestic needs (table 2).

From Table 2, all the settlements in the community have varying domestic water demands. Odessassa has the highest water demand while Ohimini has the least. This could be as a result of the large population in Odessassa and small number of households in Ohimini and variations in internal activities of these settlements. Some of these settlements are more engaged on local industrial activities than others ranging from garri processing, palm oil production and so on. These could make some settlements demands for more water on daily basis than others. The percentage water demand in the entire Ugbokolo community is highest in Odessassa with the obvious reason that more people reside there than any other part of Ugbokolo community and lowest in Mabeh-Ehaje, Afujo and Ohimini with 1% each. These three settlements have less households, hence the low percentage of water demand.

Pattern of Domestic Water Supply in Ugbokolo Community: The amount of water consumed in all the settlements of the community is as varied as demand, but generally below expectation. None of the settlements have enough water to satisfy domestic water needs. This leaves a difference of 23,807 lpd unmet by available water supply (table 3).

Ohimini settlement has the highest per capita water consumption and Ola-Okpe has the lowest. The differences could emanate from the various economic status of different settlements or how readily available water supply is to the different settlements. The percentage water supply in the settlements in Ugbokolo community is highest in Odessassa and lowest in Mabeh-Ehaje, Afujo and Ohimini with 1 % each. This could be as a result of more inhabitants in Odessassa, which definitely consumes more water than the rest of the study area due to high level of social and economic activities, as the most developed part of the community.

The status of water supply depends on water supply needs and quantity made available for use as at when needed. According to Chima (1988), household water consumption equals household water availability. None of the households in the study area according to response is connected to any kind of central water supply, except the Benue State Polytechnic, Ugbokolo, whose residents and those residents of Odessassa town residing along Otukpo-Enugu road share serviced water pipes laid along the tarred road. Information on Mabeh waterworks that service the Ugbokolo-Odessassa central scheme shows that the whole system is currently not distributing and the inhabitants have to depend on vendors, which is less than the amount of water demand.

Variability of Water Supply Deficiency in Ugbokolo Community: The per capita household water need for Ugbokolo community was found to be 1,512 lpd on the average against the per capita household water supply of 1,147 lpd. This indicates a deficiency of per capita household water supply needed in the community to about 365 lpd representing about 76% of the per capita household water supply needed but not met by supply.

The mean water of households need for the study area is 5,577 lpd as against the mean household water available of 11,325 lpd. However, this also shows a deficiency of mean household actual water demand of about 4,252 lpd constitutes about 27% of the demand. It also shows that the mean household actual water supply of 11,325 lpd represents about 73% of the demanded. The result of Akpeke shows that it has the highest deficiency which is unexpected as the settlement is approximately 0.5%km from the nearest stream, a major source of water supply in the community. The streams are not dry throughout the year, the water volume reduces significantly in the dry season. From oral interview, it was gathered that in dry season, organic

matter decays in the streams in the community breeding microbial organisms and larvae thereby making the water unfit for drinking. In another situation, during rainy season, the water becomes turbid as a result of rain-washed sediments into the streams.

The water shortage situation in Odessassa, which is the most urbanized and populated settlement in the community is explained by the facts that residents are civil servants and businessmen and have money to dig hand-dug wells and engage the services of vendors as others alternatives to the natural sources. Residents in Odessassa however walk about 0.7km and 1.2km in rainy and dry seasons respectively to access their water needs from streams.

The situation in respect of Okwungaga could be as a result of the fact that most boreholes and hand-dug wells available to households are not functional and the few functional ones are overstretched. In both the dry and rainy seasons households have to travel an average distance of 0.8km to get supplementary water from streams. The Efeche settlement which has access to a perennial stream within an average distance of about 0.6km in both dry and rainy season, still records high deficiency of 29%. This could be as a result of water quality in dry season emanating from reduction in volume and presence of debris in the water during rainy season as a result of washed pollutants into the stream. Mabeh-Ehaje settlement has 27% deficiency. This is unexpected as the largest river (River Mabeh) in the study area is about 0.5km and the quality of water in dry season is fair. This 27% deficiency could be as a result of the quality of water in this river during the rainy season. Heavy rainfall as gathered from interview changes the colour of the river thereby making people of the area to look for alternative sources of water supply.

The settlement with the lowest difference between available and expected water supply is Ola-Eja. It is located close to the largest river (Mabeh) in the community. The river Mabeh is perennial and is about 0.5km away from any part of the settlement and yields water throughout the year (Figure 4). In summary, Odessassa has the highest water deficiency of 2,381 lpd while Ohimini has the least. This shows a water shortage variation of about 2,352 lpd among the settlements, an indication of the uneven water availability situation over Ugbokolo community.

CONCLUSION AND RECOMMENDATIONS

Common sources of domestic water supply in the community include streams, rainwater, hand-dug wells, boreholes and water vendors, with only Odessassa, the community centre, having the only piped water scheme. Domestic water demand in the area is influenced by livelihood activities like cassava processing, palm oil production, water for domestic animals and daily household use. It is observed that streams, rivers and hand-dug wells are the major sources of water in Ugbokolo and generally, the situation of water supply is that of overwhelming demand over the available supply, hence, the high prevalence of water supply shortage and the likely accompanying problems. The intervention of government and other efforts in supplementary water supply shows that of the 17 settlements sampled in the study, only Odessassa has a water supply facility and very few community projects are available to complement natural water supply sources in other settlements. Because of pollution of sources, it is recommended that the community should be empowered to treat water from streams in the dry season before drinking to prevent incidences of diseases.

To alleviate water problems, the community is encouraged to have a reservoir and store rainwater for use in the dry season, a practice which is lacking completely in the area. It is also recommended that water supply projects should be provided and located in each of the settlements. There is also need for community and government efforts to repair collapsed water supply facilities, particularly in settlements centres. NGOs and donor agencies should assist to train community members to manage water supply facilities and available sources. The community should be empowered to provide additional sources of water and sensitized on sanitation implications of inadequate water supply and health consequences of using unsafe and untreated water. This may probably spur them into stepping up efforts in community water supply projects that will complement external efforts. Further research efforts should be made in the area of water related diseases surveillance and to monitor changing water supply indices to evaluate water supply situation in the community for effective interventions.

Table 1: Contribution of ources of Water Supply in Ugbokolo Community

Settlements	Households Water Sources in the Community										Total
	STR		RNW		HDW		BRH		VND		
	D	R	D	R	D	R	D	R	D	R	
Odessassa	612	432	0	795	348	461	10	17	190	68	2933
Effa	243	202	0	143	0	0	0	0	0	0	588
Aobida	79	76	0	76	46	42	2	2	0	0	323
Ondo	102	95	0	71	2	2	0	0	0	0	272
Aokpe	72	71	0	72	0	0	0	0	0	0	215
Akpali	96	101	0	72	3	3	0	0	0	0	275
Aikpla	65	90	0	72	0	0	0	0	0	0	210
Okwungaga	56	56	0	54	5	7	5	22	0	0	204
Efeche	53	52	0	53	0	0	0	0	0	0	158
Ola-Eja	78	68	0	50	0	0	0	0	0	0	196
Ola-Okpe	50	40	0	43	0	0	0	0	0	0	133
Ankpa	39	39	0	38	0	37	0	0	0	0	155
Akpeke	43	40	0	31	2	0	0	0	0	0	112
Aochichodo	32	32	0	32	3	8	0	0	0	0	107
Mabeh Ehaje	36	36	0	26	0	0	0	0	0	0	98
Afujo	33	31	0	20	0	0	0	0	0	0	84
Ohimini	13	13	0	13	0	0	0	0	0	0	39
Total	1702	1474	0	1661	409	560	17	41	190	68	6102
(%)	29	24	0	27	7	9	0.3	0.7	3.1	1.1	100

STR=Streams/rivers, RNW=rainfall, HDW=hand-dug wells, BRH=boreholes, VND=vendors, D=dry, R=rainy.
Source: Fieldwork, 2007.

Table 2: Daily Domestic Water Demand in Ugbokolo Community (Litres)

Settlements	Water Demand Indices in Ugbokolo Community		
	PCD	*TWD*	*% Demand*
Odessassa	87	75,656	48.56
Effa	83	14,921	9.58
Aobida	91	7,390	4.74
Ondo	86	6,612	4.24
Aokpe	101	7,264	4.66
Akpali	97	7,054	4.58
Aikpla	96	5,283	3.39
Okwungaga	95	5,292	3.40
Efeche	85	4,484	2.88
Ola-Eja	77	3,994	2.56
Ola-Okpe	70	3,009	1.98
Ankpa	91	3,551	2.28
Akpeke	90	3,043	1.95
Aochichodo	100	3,184	2.04
Mabeh-Ehaje	77	2,077	1.38
Afujo	81	1,610	1.03
Ohimini	105	1,364	0.88
Total	1512	155,788	100

PCD=Per Capita Demand; TWD=Total Water Demand
Source: Authors Fieldwork, 2007

Table3: Daily Household Water Use in Ugbokolo Community (Litres)

Settlements	PWS	TWS	%
Odessassa	60	51849	45.78
Effa	64	11506	10.16
Aobida	70	5596	4.94
Ondo	66	5087	4.49
Aokpe	81	5864	5.18
Akpali	77	5609	4.95
Aikpla	71	3918	3.46
Okwungaga	69	3778	3.34
Efeche	60	3199	2.82
Ola-Eja	64	3304	2.92
Ola-Okpe	54	2434	2.15
Ankpa	71	2806	2.48
Akpeke	58	1983	1.75
Aochichodo	76	2444	2.16
Mabeh-Ehaje	56	1513	1.34
Afujo	65	1290	1.14
Ohimini	82	1069	0.94
Total	1,144	113,249	100

PWS=per capita water supply, TWS=total water supply
Source: Authors Fieldwork, 2007

Table 4: Pattern of Domestic Water Deficiency in Ugbokolo Community (lpd)

Settlements	Water Demand and Supply Situation in Ugbokolo Community						
	PCD	MHC	PCN	MHN	%WC	%WD	TOD
Odessassa	60	5185	87	7566	69	31	2381
Effa	64	1151	83	1492	77	23	341
Aobida	70	560	91	739	76	24	179
Ondo	66	509	86	662	77	23	153
Aokpe	81	586	101	726	81	19	140
Akpali	77	561	97	705	80	20	144
Aikpla	71	392	96	528	74	26	136
Okwungaga	69	378	95	529	71	29	151
Efeche	60	320	85	448	71	29	128
Ola-Eja	64	330	77	399	82	17	69
Ola-Okpe	54	243	70	301	81	19	58
Ankpa	71	281	91	355	79	21	74
Akpeke	58	198	90	304	65	35	106
Aochichodo	76	244	100	318	77	23	74
Mabeh-Ehaje	56	151	77	208	73	27	57
Afujo	65	129	81	161	80	20	32
Ohimini	82	107	105	136	79	21	29
Total	1,147	11,325	1,512	15,577	73	27	4,252

NOTE: PCD=Daily per capita water consumed, MHD=Mean household water consumed, PCN=Per capita household water need, PCN=Per capita water need, %WC=Water Consumption, %WD=water demand, TOD=Total water demand.
Source: Authors Fieldwork, 2007

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