DOMESTIC WATER USE IN SELECTED SETTLEMENTS IN THE SUDANO-SAHELIAN REGION OF NIGERIA

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ABSTRACT

The study which adopted the survey design aimed at examining the coping strategy been adopted and the level of intensity of water stress experience vis-à-vis domestic water use. Three Settlements in Sudano-Sahalian Region of Nigeria were selected for the study using systematic - random sampling technique. Field tools include a well structured questionnaire and Focus Group Discussion (FGD). The household crowding index was computed as ten to twenty persons per household. The perception of the local dwellers was that there is increase water scarcity and most of the responses include long distance mileage to available sources of water, multiple re-use, and multiple water sources. Results showed that the Sudano-Sahelian region of Nigeria has no significant variation in its domestic water sources using the ANOVA statistical analysis. Therefore rain harvesting, conjunctive water uses, sinking of deeper boreholes, among others were recommended for the region.

INTRODUCTION

The demand for water by man (Newton, 2003; Pickering & Owen, 1997; ES, 1994) can broadly be divided into three major categories: domestic, industrial and agricultural. The purpose of this study is to examine the perception of domestic water use by locals with regard to coping strategy especially in the face of scarcity of water supply accompanying climatic trends of persistent drought in the Sudano-Sahelian region as confirmed by IPCC (2002), Olaniran (2002), Ojonigu (1990), Sawa (2002).

Water is life has been the commonest term that is often used in describing the important role of water to man. Amongst the diverse resources with which mankind has been blessed, water ranks the highest in importance. According to Clark (1991), water is the most fundamental making life possible on earth. Water represents unique and significant feature in any settlement; for drinking, sanitation, washing, planting, recreation, industrial process and the list continue like that (Aderogba, 2005). Irrespective of the sources, its availability and quantity often affect or determine the type of use. Thus, water use (demand) is a function of availability (supply).

According to Faniran (1977) as cited in Ogunnowo (2004), "an assured supply of water both qualitatively and quantitatively for this purpose greatly improves the social and economic activities of the people". Thus, an average man requires 1.5 liters of water daily for drinking, and about 380 liters (100 gallons) for daily domestic uses (Ayoade and Oyebande, 1983; Leeden, 1975). The growth rate of the population has impacted on the water supply within the study area. The Sudano-Sahelian zones characterized by persistent drought, wet and dry spells (Sawa, 2002), declining rainfall intensities and increasing the dry season (Ojonigu, 1990). Olaniran, (2002) summarized all these anomalies and confirm that there has been climate change in rainfall regions in the area. The combined effects of drought and increasing potential evaporation as recorded by Ayoade and Oyebande (1983), World Book (2001), Salama and Okafor (2003) put the water balance or budget on the deficit, which signifies scarcity. The per-capita domestic water consumption when computed on the increasing population of the region which has risen to about 33,039,886 (NPC, 2007) persons has already define an increasing domestic water demand in an established low water supply. The

anticipated attitudinal changes is what this study attempts to understand. The issue of climate change has come to stay.

The IPCC report (2002) reveals that climatic variations have been the persistent decline in the rainfall in the Sudano-Sahelian region since 1960s. Moreover, drought and desertification has been on the increase. Suffice to say that the paper examined the perception of the local dwellers with regard to their coping strategy to the declining rainfall pattern which has in turn affected their domestic water supply/availability in the area. This trend has resulted to a perennial water scarcity in the region. The paper aimed to examine the coping strategy been adopted and the level of intensity of water stress experience vis-à-vis domestic water use. This in turn would aid the policy makers and Non-governmental Organization to articulate the plight of the local/rural dwellers in the Sudano-Sahelian region and perhaps bring succour to them

MATERIALS AND METHODS

The Sudano-Sahelian region of Nigeria is roughly located on longitude 3^0 and 15^0 East and latitude 10^0 and 14^0 North. The temperature is high, except during the cold harmattan and rainy season. The average temperature in the hot season is about 40.6^0C, while the annual rainfall is less than 75 cm. The rainy seasons are usually short, which is often within the ranges of four to five months. Owing to seasonal fluctuations, it could even drop to less than four months. Hence, evaportranspiration is usually high most especially in the hot season (Areola et-al 1992; Ayoade, 1988; and Desanker & Magardza, 2001). The Sudano-sahelian region spand roughly through Sokoto, Zamfara, Katsina, Kano, Jigawa, Yobe, and Borno States respectively (Fig. 1 & 2).

The study adopted a survey design, which used a systematic sampling technique in choosing the settlement for the research. The reason is to cater for spatial representation for the region that lies within this belt. Hence, longitude and latitude were used in the selection of the three sample locations. The Settlements that were chosen are Kalalawa village (Long 5.024[l] and lat 13.210[l]) in Kware Local Government Area (LGA) of Sokoto state; Zangon Buhari (long 8.550[l] and lat 11.663[l]) in Bunkure LGA of Kano state; and Chingowa (long 12.888[l] and lat 12.537[l]) in Magumeri LGA of Borno state.

A well structured questionnaire was designed and administered along with Focus Group Discussion (FGD) in each of the selected sample location. In administering the questionnaire, in each of the villages /location, the area was grouped into five zones to cater for spatial representation and it was in the ratio of 10:1 each of the sub-zones within the village to make it a total of 50 in each of the sample settlement. Moreover, three different sessions of FGD were held for the young, adults/household head and married women, and the aged in each of the sample locations.

The descriptive and inferential statistical techniques were used in the analysis. The descriptive statistics included data summaries in the form of frequencies and percentages presented in tables, and graphs. The inferential statistics were used to examine the level of variation that exists between and within the domestic water sources using the Analysis of variance F-ratio (ANOVA F-test).

RESULTS AND DISCUSSION

The domestic water sources in the region are rainwater, well water, Borehole, community well, River and Water vendors. As presented in Table 1, rain water is invariably the major sources and beside, the means through which other sources are replenished. There is no significant variation among the water sources in the region. At the specify probability level using the Analysis of Variance (ANOVA) F-ratio was 1.3, while the table value is 6.4 . Thus, the Sudano-Sahelian region of Nigeria has no significant variation in its respective domestic water sources.

However, the dominant effect of rainwater as a source can not be over emphasized, owing to its dependability in the rainy season, and equally not down playing the role of other sources in augmenting supply in the dry season. The potential areas being under utilized are the Rima River with a mean annual flow of 3,200 million cubic meters (M^3) can be dammed and the flow regulated, through which the water can be treated and distributed to residential areas as a major source of domestic water. In Maiduguri, the Alau Dam is recharged by the River Yedzaram and Ngadda with both constituting a mean annual flow of 540 million cubic meter (M^3). Thus, areas with perennial rivers like (River Yobe) can equally maximize it for domestic purposes.

The data presented on table 2 show that cooking ranks the highest amongst the category of domestic water uses while drinking and washing of cooking utensils follow. This is not to undermine the fact that population/ family size of a household affects the rate of water use. With an estimated population of about 33,039,866 persons in the Sudano-sahelian region (NPC, 2007), the bulk of the population constitutes children while the Adults make the remaining proportion. Owing to the fact that population growth in Sub-Saharan Africa has been on the increase, by extension it reflects in the household size of which the Sudano-Sahelian region is without exception. The Household size in the sample location lies within the ranges of 7 - 12. However, there are few families/household with a size of 16 and above. On a whole, the average household size is nine persons per household. To a great extent, such scenarios often reflect in the daily household domestic water consumption as presented in Fig 3.

It can be stated that most of the household in the region use 41-60 liters of water daily for their domestic chores. Water by all standard that is meant for drinking, should be of the highest quality, while that of cooking and other forms of domestic chores should be of good quality. Domestic water is hauled from different sources and store-up in different types of water containers which ranges from Earth-pots, Plastic Jerricans, and Gallons either for immediate or future use.

In the Sudano-Sahelian region, mostly within the period of the dry season, the local dwellers pass through stress in order to source for domestic water. With the onset of the dry season, a consistently low water yield is witness from the surface and groundwater sources. Sources like community well in Kalalawa for instance usually dry-up at the peak of the dry season. The general perception of the respondents to this seasonal trend that has been on the increase is attributed to the consistent decrease in rainfall pattern (that's both the duration and intensity) as illustrates in Fig 4.

Owing to the fact that, domestic water scarcity becomes inevitable whereas, the severity has momentarily bedeviled the local dwellers in the region into perennial hardship, the data presented on table 4 clearly show that domestic water scarcity in the region has been on the increase. A good example is in Kalalawa where they said that in the early 80s nomadic cattle rearers often grazed around their homes and water from the community well

was dependable perennially, but all that has changed. Owing to the decline in water sources and chiefly rainfall (Fig 4), the locals are forced to make do with whatever type of water that they are able to access, irrespective of the quality. Young men, children, and women often cover longer distances in search of water in the dry season. The impact is mostly within Nov/Dec to May/June. The containers used in hauling and storage of water include earth-pots, drums, plastic bockets, gallons, and jerricans.

The water is sourced and transported using animals, bicycles, vehicles, and on foot. Most of the locals cover an average of up to a kilometer to source for water (Fig 4). In most instances, some of the locals have resorted to patronizing water vendors in meeting up with their domestic water need/demand. The consistent decline in the rainfall pattern in the Sudano-Sahelian region has aided in the manifestation of drought and desertification vis-à-vis intensifying the severity of domestic water scarcity in the region.

Water resource management is having the right amount of water available for particular use at the right time, and with the right quality (Eziashi, 2007). As a measure of water management, most of the people after sourcing their water, they store them in different plastic, metallic, and earth-pot containers for domestic use. Besides, water used for domestic activities are put in to multiple uses, before discharging it. A good example is water use for washing of food stuff is also used for washing of plates before it is discharged or even fed to animals. Other forms of management strategy have been through the cutting down on the rate, as well as category of daily domestic water use.

It is obvious to state that rainfall remains the most dependable source despite its seasonality. The average water consumption rate was assessed between forty-one and sixty liters per household. Cooking and drinking rank highest in the water use category in the study area.

CONCLUSION AND RECOMMENDATIONS

The paper examined domestic water use in the Sahelian region of Nigeria. The main dependable source of domestic water supply is rainwater which is usually seasonal. Most of their domestic water utilization ranges in terms of cooking, drinking, washing of utensils, and laundry /bathing respectively. Owing to climatic changes, which they are aware of most of

them have device different ways through which they can adjust to the changes is all the climatic elements (rainfall and temperature) which has affected their domestic water sources. Drought and desertification is one other area that has been greatly identified, which has manifested in so many ways vis-à-vis drying up of water sources. Most of the water sources are no longer dependable, hence, resulting in scarcity situation.

Presently, the situation in the region is such that water is in great demand, while at the peak of the scarcity (December - July) emphasis is on quantity than quality. Owing to non-availability, people make use with what they see, aside the longer distances that they have to cover to access supply or patronizing water vendors whose sources of water in most instances are questionable. The people depend on multiple sources for their domestic sources of water which can be risky to their health, and moreover, as a way of coping with water scarcity, they have to cut down on their daily water per-capita consumption as well as water re-use. The situation is such that requires some level of urgent attention. Other areas that the paper recommends as a way forward in augmenting domestic supply are: rain harvesting, conjunctive water use in areas or places that are traverse with perennial rivers, water re-use, sinking of deeper boreholes, planting of trees, and government participation.

Table 1: Domestic Water Sources per 50 Household

Water Sources	Kalalawa	Zangon Buhari	Chingowa	Total	Percentage
Rain water	41	42	44	127	26.4
Well water	28	32	28	88	18.2
Borehole	43	28	4	75	15.6
Community Well	11	21	15	47	10
River	3	44	7	64	13.3
Water vendors	8	28	44	80	16.6
Total	134	195	142	471	100

Source: Field work, 2008

Table 2: Domestic Water use Per 50 Household

Water use Category	Kalalawa	Zangon Buhari	Chingowa	Total	Percentage
Cooking	48	45	50	143	26.4
Drinking	48	42	44	134	18.2
Washing Utensils	37	43	39	119	15.6
Laundry/Bathing	41	47	45	133	10
Household Hygiene	46	43	38	127	17.3
Others	28	18	31	77	16.6
Total	248	238	247	733	100

Source: Field work, 2008.

Table 3: Household Size

Household Size	Kalalawa	Zangon Buhari	Chingowa	Total	%
1-3	8	6	9	23	15.6
4-6	4	9	5	18	12.2
7-9	11	17	13	41	27.9
10-12	17	12	19	48	32.7
13-15	5	3	2	10	6.8
16+	3	2	2	7	4.8
Total	48	49	50	147	100

Source: Field work, 2008.

Table 4: Perception of the Locals on Water Scarcity

Category of FGD	Nature scarcity			Reason for Scarcity		Periods of water Scarcity		
	Reduce	Stable	Increase	Population Growth	Decline in Water sources	Oct/Nov - April/May	Nov/Dec- May/June	Dec/Jan- June/July
The Young Groups	8	4	22	6	28	7	19	8
Household & Married women	2	1	31	12	24	-	32	4
Aged & Retired *	-	1	35	4	32	1	30	5
Total	10	6	88	22	84	8	81	17
Percentage (%)	9.5	5.7	84.8	20.8	79.2	7.55	76.42	16.04

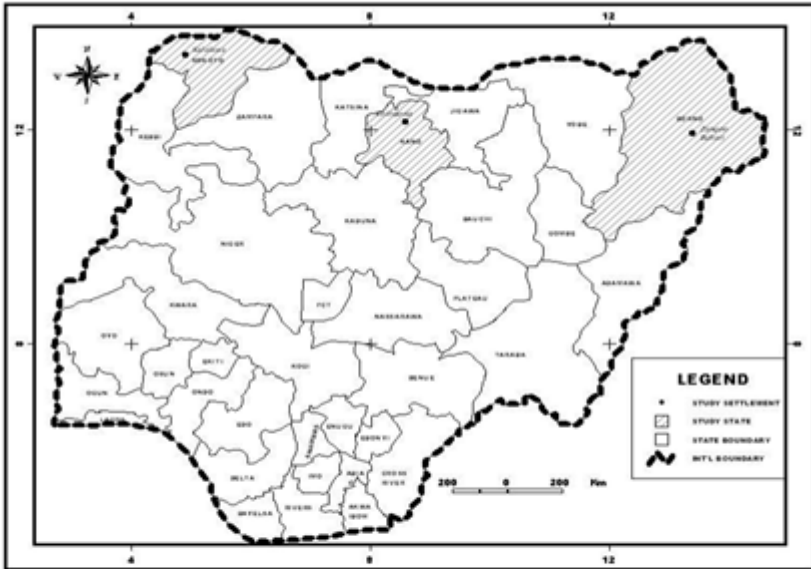**Source:** Field work, 2008 *who have live in the sample location over the past 15 years

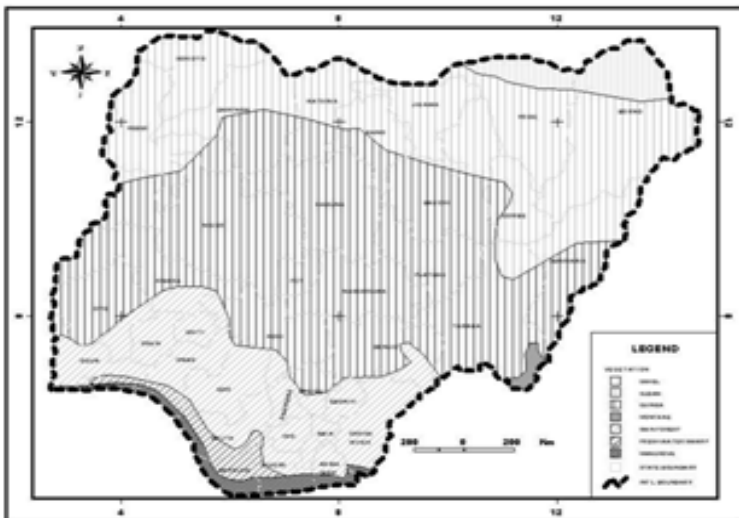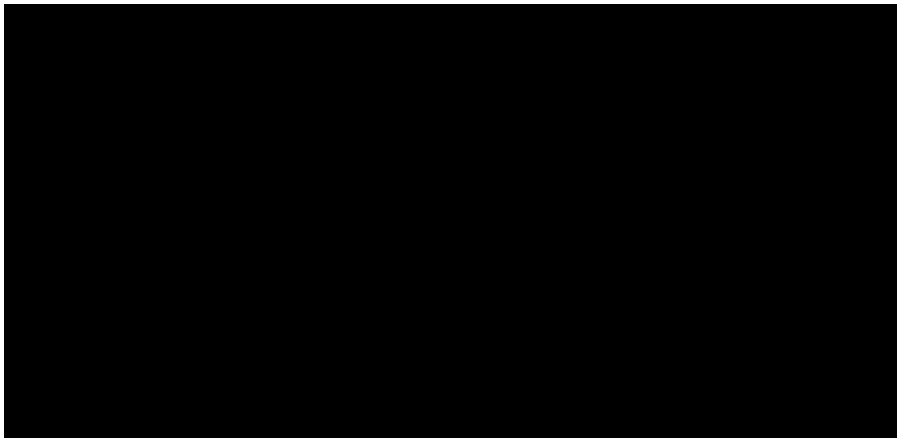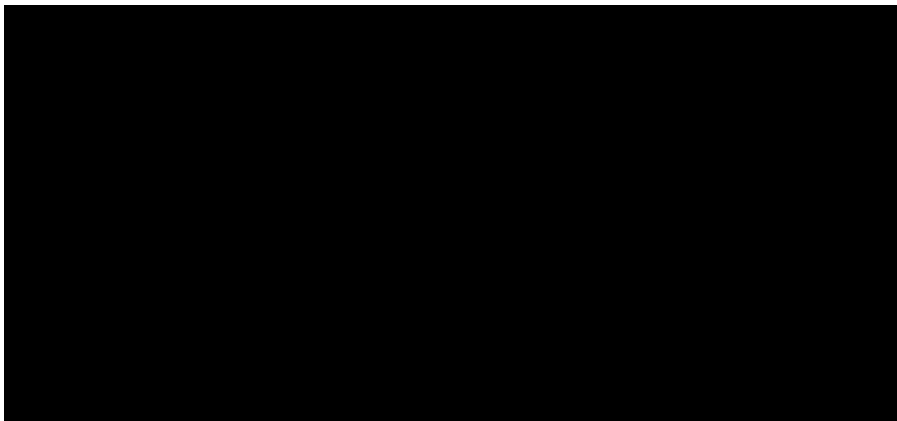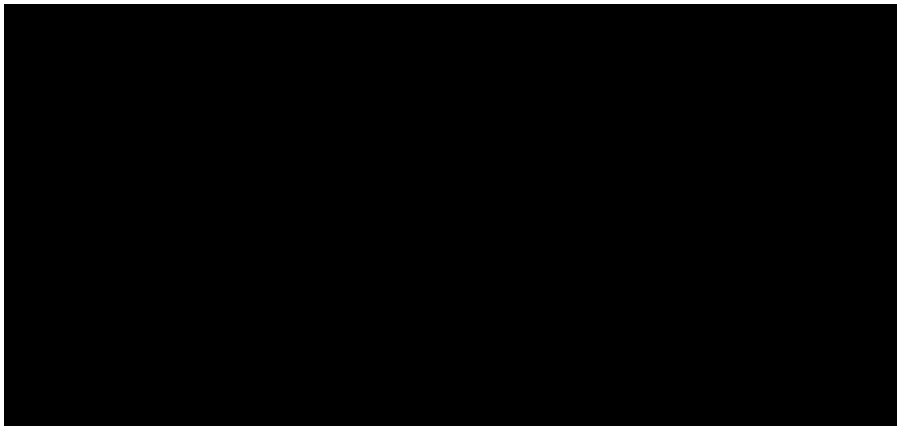Fig.1: Nigeria Showing The Studied Locations Sampled

Source: GIS lab, UNIJOS

Fig.2: Vegetation Zones of Nigeria

Source: GIS lab, UNIJOS

* 1 Medium Bocket = 10 liters

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