Productive Time of Women and Water Supply in Ijumu, Local Government Area, Kogi State, Nigeria.

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***Abstract*-The study assessed productive time of women and water supply in Ijumu L.G.A. of Kogi state, Nigeria. Two hundred questionnaires were administered in the LGA and 32 socio-economic variables were generated altogether. Principal component analysis and stepwise regression analysis were used to interpret the data. The result of the principal components reduced the 32 variables to seven orthogonal components. The factor defining variables underlying the explanation are: water borne diseases, marital status and distances to the nearest water points. Others are: number of days lost to treatment, family size, and age of respondent. These components offered 95.5% explanation to the variance. Furthermore, the result of the stepwise regression analysis showed that all variables entered into the equation and they together contributed 98% to the equation. The paper concludes that water use characteristics at the household level differ from place to place and therefore there is need for caution on result interpolation. The paper recommends the need for provision of more public water points in the local government area in other to improve access to water supply and release more time for productive activities in the community. This results calls for further studies particularly on water chemistry, gender, poverty and on determination of efficient distances to water points**

Keywords-productive time, women, water supply, water use components

I. INTRODUCTION

The average time spent in fetching water is an important indicator of the level of efficiency of rural water supply within the rural communities. In the developing countries, women and girls spend hours every day walking many kilometres to collect water from different water sources. As reported by UNPF (2001) women in developing countries walk an average of 6 kilometres per day to collect drinking water. Meanwhile, it has been discovered that these statistics vary according to countries. For example, in Cameroun women spend an average of 6 hours per day (NISC, 2004). In Kenya, it is about 4 hours in dry season and 2hours in wet season. Averages of 4-6hours have been reported in Burkina Faso, Botswana and Ivory Coast. About 17 hours a week has been estimated for Senegal (UN, 2000). On the whole, the average time lost by children and women in a day has been put at 200million hours in search of water. Meanwhile, the time spent to search for water could be diverted for economic activities that could be of financial gain to these poor rural families. According to Whittington, et al (1990) a study in Kenya among rural dwellers of Ukanda showed that household in the village place a surprisingly high value on the time they spend collecting water. Finally, Coasta, et al (2009) in a recent study in Ghana discovered that the time spent on remunerated job increases when household are provided with electricity and also that the supply of water reduces the time burden faced by rural women. There are recorded indications that a strong association exist between poor access to water, in particular, time spent in collecting water and material poverty across the world (WDR, 2000; GWSSAR, 2000). Poor access to water is an implication that women and children have less time to engage in income generating economic activities, as they spend more time caring for their sick children and relatives due to unhygienic living standard (David, 1998). Poor access to water and the amount of time spent collecting water may also result in female child illiteracy and perpetration of female poverty (UNESCO, 2005). Already 2/3 of illiterates in the world are women (UN, 2000). Across the world one of the approaches of resolving the issue of time wastage in water resources management is by improving access to water. According to World Bank (2003) Morocco successfully reduced time spent in collecting water by girls and women by between 50-90%. The project also raised female attendance in schools by 20% within four years. A study in India reported that combining improvement in access to water supply with income generating projects for women results in higher income for women and improved relations; a condition that has reduced rural poverty and improved status of women in India (Verhagen, et. al. 2004; Sybessima, et. al. 2009). Saskia (2000) observed that accessibility to water improve female health, increased dignity, less exposure to both gender related hazards and water borne diseases. It also enhances school attendance and performance of female children. A notable feature of studies of water supply and demand at the household level is that it is always complex and their results cannot be interpolated for other areas. Hence, this present paper will attempt a study of the pattern of water supply and productive time of women in the Ijumu, L.G.A. of Kogi state, Nigeria.

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II. THE STUDY AREA.

Ijumu Local Government area is located between latitude 7^o 30` and $8^o$ 10`and longitude 5^o 45`and $6^o$ 15` with Iyara as the headquarters (Fig.1). According to 2006 population census it has a population of 119,929 with women forming 50% of this.

The climate of Ijumu L.G.A. belongs to the humid tropical climate with distinct seasons. The wet season starts from April and ends in October. Rainfall is about 1,500mm with relative humidity of about 75%. The rate of evaporation is high about 75mm per annum. This will impact on the amount of water requirement in the LGA.

The local government is underlain by Basement Complex rocks and this suggests that drainage pattern will be dendritic. The major principal drainage line is River Oyi which originated from the Yoruba highland and drains Northeast into River Niger (Fig.1). The depth of weathered regolith has been discovered to be between 15-25meters thick across the L.G.A. this has been found to support a number of boreholes and hand dug wells tapping different regolith aquifers which dotted the villages.

The relief is generally undulating with series of inselberg and ridges. The relief is prominently dominated by Okoro-Agbo mountain in Ogidi. A number of rock outcrops are also visible throughout the local government.

The vegetation is that of deciduous forest and southern guinea savanna, thick gallery forest is found all over the LGA. Rainforest species of mahogany, iroko and several hard woods are common. The coming of exotic species such as *tectona grandis* and pulp wood in the local government have encouraged the growth several saw mills industries which supply many markets in the northern parts of Nigeria. Economic trees such as cocoa, kola nuts, citrus species, cashew nuts, etc are also found in large quantity.

The dominant ethnic group is Yoruba, whose major occupation is farming. Farming is done by both men and women. Farming is mainly rain fed. The major tree crops are coffee, cocoa, oranges, cashew nuts. Annual crops are very common and they include: yam, maize, guinea corn, beans, cassava which are grown extensively. Indeed apart from when helping their spouses on the farms, women are also reputed to have large cassava farms.

The major sources of water are mainly from hand dug wells and a few public hand pumps and open streams; which most of the time dry up in the 5-6 months of dry season. In some cases, the hand pumps are broken down for months only waiting for maintenance crew from Lokoja the state capita. In the dry season water is generally scarce and it is a period when women and children which traditionally fetches water are greatly tasked searching for water as some shallow wells and stream would have dried up.

III. METHODOLOGY.

The data required in this study are mainly on the water use characteristics and socio- economic characteristics of women in the study area. This information were obtained from structured questionnaire.The study adopts a systematic stratified, random sampling method in which the LGA was divided into 10 districts wherein 20 women were sampled randomly in the communities of each of these districts. This translates to administration of 20 copies of questionnaire per districts. Altogether 200 copies of questionnaires were administered in this study.

The generated socio-economic indices were subjected to principal component analysis procedure in other to reduce them to few orthogonal variables which could be used to explain the pattern of water supply in the area. The multiple regression analysis was later used to study the relationship between time and water use variables.

IV. RESULTS OF FINDINGS SOME PRIMARY ATTRIBUTES OF RESPONDENTS

Generally 20% of the respondents were less than 20 years old. In Araromi district 60% of the respondents were between ages of 41-60, at Iffe district 30% of the respondents were above 61 years old. According to Table 1 majority of the respondents have relatively large household sizes with most of the household within the range of 6-8 people. As depicted in Table 1, distances to most respondents water points lies between 0-50 meters and 51-100 meters. Indeed, it was also discovered that most respondents obtain their water from hand dug wells which are scattered within the communities of the study area. Further analysis also showed that most of the respondents spend about 10-30 minutes and between 30 minutes to 1 hour before collecting water. All these will affect water supply and productive time of women in the study area.

V. DETERMINANTS OF WATER USE IN IJUMU LGA.

The results of the principal component analysis after vari-max rotation show some underlying factors. These components are seven in number. They altogether explained 95.5% of the explanation (Table2).

a) *Component 1:*

It has the strongest loading on diarrhoea, suggesting that diarrhoea is a common disease in Ijumu. This component is also strongly loaded on typhoid fever, 2 days of treatment and on treatment more than 3days. Component I is an **index of water borne diseases**. The component defining variable is diarrhoea. It offered 20.3% contribution to the variance. Component I has the greatest contribution to water use in the LGA. This suggests that water borne diseases affect dispassionately the productive time of women as days are taken off for treatment.

b) *Component 2***:**

This component contributes 18.0% to the variance. It has the highest loading on divorced women. It is equally loaded of three variables: single women, women spending up to 1hr before obtaining water, women trekking up to 100 meters distance. It has it strongest loading on percentages of divorced women. It is a **measure of marital status.** A close affinity exists between the demographic statuses of being single and divorced as the two connotes a state of

being single. It therefore suggest that single and divorced women are trekking relatively long distances to water pints and are therefore spending much of their productive time fetching water.

c) *Component 3:*

It contributes as much as 14.5% to the explanation. The highest loading is on women covering less than 50 meters to water points. This component is equally strongly loaded on two educational variables: secondary and tertiary educational levels; suggesting that the level of education affects distance covered to water points as educated women, are likely to be more enlightened, more economically empowered to provide water within (hand dug wells) their houses. This trend was noticed on the field. This component is **an index of distance to water point**.

d) Component 4:

Offered 12.7 % explanation with highest loading on stream water. This component equally has high loadings on hand dug wells and time spent collecting water. This component point to the fact that high level of association exist between sources of water and time spent in collecting water. This is expected as women collecting from streams covers more distance than those collecting water from hand dug wells. Component 4 **is an index of water source**. This is expected as time spent in fetching water depends on the sources of water.

e) Component 5:

It contributes 11.51% with highest loading on time spent in treatments, particularly on respondents that lost 3 days to treatment. It equally loaded highly on respondents who fetch water from wells and women with primary school education. This implies that in the study area there is a relationship between times spent receiving treatment, source of water, level of education and women's productive time. This is expected because educated women are expected to have higher level of hygiene compared to the illiterate ones. Hand dug wells are expected to provide hygienic water compared to stream water. This component is **an index of days lost to treatment**.

f) *Component 6:*

Offered 10.9% to the explanation. The highest loading is on family size 6-8people. It is also strongly loaded on age 41-60 and age greater than 60 years. This point to the relevance of household demography to water use behaviour and women's productive time at the household level. This component shows that women within the age range of 41-60 years and women older than 60 years of age are likely to have relatively large family sizes. Hence, women within this age grade are likely to be grandmothers who have under them various relatives, including their grand children. This component **measures family size**.

g) *Component 7:*

This component loaded strongly on age variable of less than 20 years. It also loaded strongly on category of women without any education. This association indicates that women of less than 20 years are likely to be victims of early marriage and therefore may be less informed and therefore will exhibit a peculiar water use habit. It has 7.58% contribution to the variance. This component is **an index of women's age. A**ccording to the above, seven important variables underlie water use behaviour in Ijumu LGA. These include: water borne diseases, marital status, distance to nearest water points, sources of water, days lost to treatment, size of the family, and age of respondents. Water use characteristics can therefore be summarized. The implication of this is that in Ijumu LGA, women, particularly singles, divorced, and widows are all involved in water collection. These women have relatively large family sizes of between 6-8 people. These women do cover relatively long distances to the nearest water points before collecting water mainly from streams and hand dug wells. Water borne diseases such as diarrhoea are the most common with patients losing about 3 days while receiving treatment. However, women of age 20 and below have unique water use behaviour of all other category of women. This results calls for further studies particularly on water chemistry, gender, poverty and on determination of efficient distances to water points.

VI. Relationship between time and water use variables

The result of the principal component analysis was later subjected to regression analysis in other to predict the relationship between time of women and socio-economic components. The results (Table 3 and equation 1) showed that all the seven components were important in the explanation and they both explained 98% of time spent in fetching water in the area. This relationship can be predicted with equation 1.

$$Y=30.300+3.846Dsce + 3.453Mtus - .412Dstc - 25.275 Sorc + 2.195Ndlt + .337Dvoc-770Agew \quad \text{(eq.1)}$$

$$R^2=98\%; SE=8.5$$

Equation 1 show that for a period 30.3 minutes spent collecting water, there shall be 3.8% incidences of water borne diseases, 3.453% of this time frame will be determined by the marital status of the respondents, 0.412% will be depending on distance to water points, 25.27% will be due to the source of water Also, 2.99% will depend on time taken off for treatment, 0.337% will be due to family size, and finally age of women will determine 0.770% of this period.

This analysis will be used for the production of water supply models for rural water supply in the LGA.

VII. SPATIAL PATTERNS OF WATER USE DETERMINANTS IN IJUMU LGA.

`Water borne diseases are most prominent in Ohakiti, Iyamoye, Ijumu I and Ijumu II districts but least prominent in Iyara, Aiyegunle and Ilupa districts This point to the fact that these later sets of communities have better access to potable water compared to the former districts. For example, Iyara district, the local government headquarters has more hand pumps than other districts (Fig.2a). The impact of marital status is mostly felt positively in Iyara, Ikoyi, Iffe, and Ijumu I districts (Fig. 2b), while it does not have much impact in other areas. At Ilupa, Ohakiti, and Iffe districts, longer distances to water points translate to increases in the lost of women productive time. While, at Ijumu I, Aiyegunle, Araromi, Iyamoye, and II districts long distances do not really matter. This may be due to the use of auto mobiles (cars and *okada* (motor cycles)) in fetching water (Fig.2c). At Iyara, Aiyegunle, Ilupa, Ohakiti, and Ijumu I districts the sources of water affect positively time spent, while in other areas the sources reduces women productive time (Fig2d). Further in Aiyegunle, Ohakiti, and Iffe districts the productive time is affected by the numbers of days lost to treatment while for other areas, productive time is not really affected positively (Fig.2e). Large family sizes have affected productive time in Aiyegunle, Ilupa, Ohakiti, Ikoyi, Araromi and Ijumu I districts
(Fig 2f) while it has reduced productive time in other districts. Age of respondent increased productive time lost in Ilupa, Araromi, Iffe, and Ijumu I, while in other districts it does not matter (Fig.2g).

VIII. DISCUSSION OF RESULTS.

Diarrhoea an oral faecal disease is a prominent disease in Ijumu LGA. Diarrhoea is mainly caused by E. coli. High coliform has been recorded in drinking water in many rural areas in Nigeria. It is responsible for 90% death in children under the age of five. The symptoms of diarrhoea include: fatigue, running stomach, stomach pain, dizziness and dehydration. These will keep the victims indoor and render them unproductive. The high dominance of diarrhoea is because many of the respondents collect water from contaminated shallow wells and streams.
Household demographic characteristic such as marital status is an important factor in water management. For example, families that are together (not divorced) have tendencies of large household sizes compared to single and divorced respondents. Hence, for large household more water will be required and more time will be spent in water collection. Nkang, et al, (2006) in a study in Calabar, Nigeria reported that farmers' income, number of plots, collection time for water and marital status were found to be significant determinants of water demand. This also agreed with the findings of NBWRT, (1993) in Nigeria and Jayasundara (1999) in India.
The source of water is a variant that will directly affect time spent in fetching water and the productive time of women.

Most of the respondents do not have water in their houses; therefore, they do trek some distance to get to the water points. Where the distance is short less time is spent before getting water. It was reported in Mozambique that a reduction in the length of water collection journey from 5hrs to 10 minutes has significant impacts on household water use and other activities (Cairncross and Cuff; 1987).
The numbers of days spent receiving treatment will affect individual productive time and water demand. For example, Buor (2004) observed in Ghana while studying the impact of water collection on the health of women reported that quality of water, hours spent in fetching water are some of the factors influencing woman health in Kumasi.
The size of the family is a direct bearing of the amount of gallons of water required at the household level. Where the family is large water demand will be high and more time will be spent in fetching water. In a study in India Jayasundara (1988) also observed similar result.
In the study area collection of water is definitely the duty of woman and children and therefore age 20 and below are mostly sighted fetching water. It is a common thing early in the morning to sight pupils and students fetching water before preparing for school in the morning. This agrees with previous work that women and children play dominant role in water collection globally (WBWDRT, 1993; Briscoe and deFerranti, 1988).
Explanations of water supply at the household level in Ijumu land can therefore be based on these seven factors.

IX. CONCLUSION AND IMPLICATION OF STUDY

Water demand at the house level is a complex discussion as the variables involved differ from one case study to the other. Hence, explanation on water management should be based on empirical studies rather than interpolation of results. The 32 variables investigated in this study were reduced to seven with little loss in explanation (4.5% loss). This also confirms that high redundancies exist in such analysis. In Ijumu LGA, water resource policies should take into cognisance such variable as water borne diseases, marital status, distance to water points, and source of water. Others are days spent in treatment, family size, and age of the inhabitants. It is imperative from this result that there is the need to improve access to water in order to overcome some problems, particularly with a view to reducing the problems of water borne diseases, reduction in distances to water points and reduction of the time spent at water points. Improved assess will assist large family sizes and the young girls from the burden of water fetching such that they would be able to go to school and participate in other productive activities.
This results calls for further studies particularly on water chemistry, gender, poverty and on determination of efficient distances to water points

X. References

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Table 1: Selected characteristics of respondents

District	Age				Size Of Household				Distance To Water Points				Time Spent Collecting Water			
	<20	21-40	41-64	>60	<5	6-8	9-11	12-15	>50	50-100	100-150	>200	<10	10-30	30-1hr	>1
1.Iyara	10	40	20	30	30	30	40	0	20	10	30	40	0	30	40	30
2. Aiyegunle	20	40	40	0	50	50	0	0	20	40	0	40	30	70	0	0
3.Ilupa	20	20	50	10	30	60	10	0	50	40	10	0	10	30	60	0
4.Ohakiti	10	30	40	20	30	40	10	10	70	20	10	10	20	30	30	20
5.Ikoyi	0	40	50	10	20	60	20	0	40	30	20	10	0	70	10	20
6.Araromi	20	20	60	0	10	70	20	0	20	50	20	0	20	60	0	20
7.Iyamoye	10	60	10	20	20	80	0	0	20	70	10	0	10	50	40	0
8.Iffe	20	40	10	30	50	0	40	10	60	10	10	10	0	50	20	30
9.Ijumu I	20	70	10	0	0	70	20	10	0	50	50	0	0	0	50	50
10.Ijumu II	0	70	20	10	0	80	20	0	20	50	20	10	0	30	50	20

#*All responses have been converted to percentage*

Table 2: Factors controlling water use

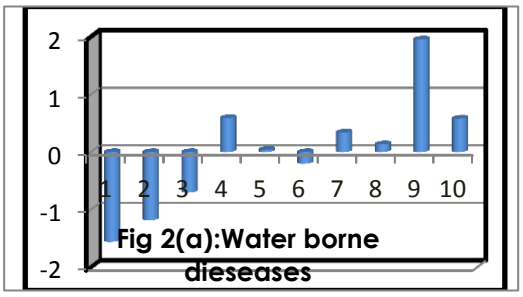
Variables			Components						
			1	2	3	4	5	6	7
Age	1	<20	-.084	-.230	-.012	.363	.206	.208	.780*
	2.	21-40yrs	.578	-.007	-.419	.220	.004	-.519	-.388
	3	41-60ys	-.372	-.109	.113	-.322	-.100	.832*	.021
	4	>61yrs	-.238	.355	.484	-.074	.014	-.701*	.023
Marital Status	5	Single	-.339	-.875*	-.096	.150	.249	-.009	.084
	6	Married	.400	.424	.596	.131	-.125	-.039	.400
	7	Divorced	.008	.900*	.137	.075	.018	-.069	-.427
	8	Widowed	.096	.705*	-.395	-.456	-.130	.311	.094
Level Of Education	9	Primary	-.246	-.288	.477	.211	-.700*	.218	.102
	10	Secondary	-.166	-.208	-.862	-.032	.315	.216	.170
	11	Tertiary	.165	-.117	.817	.360	.064	-.075	-.048
	12	None	.428	.122	.230	-.375	.349	-.241	.733*
Family Size	13	<5 People	-.606	-.070	.445	.041	.533	-.135	.122
	14	6-8 People	.003	.082	-.122	.238	-.081	.939*	.083
	15	9-11 People	-.083	.894*	.033	.011	-.092	-.284	.299
	16	12-15 People	.616	.259	.439	.260	.432	-.070	.308
Sources Of Water	17	Well	.112	.110	.047	-.711*	-.716*	-.093	.023
	18	Rivers	.447	.382	.113	.964*	-.008	-.010	.075
Distance To Nearest Water Point	19	0-50 Meters	-.123	.051	.928*	-.293	.158	.029	.079
	20	51-100 Meters	.307	-.749*	-.470	.070	-.226	-.119	.199
	21	101-150 Meters	.425	.525	-.494	.376	-.369	.046	.041
	22	151-200 Meters	-.700*	.219	-.166	.361	.451	-.138	-.278
Time Spent In Fetching Water	23	<10 Min	-.316	-.625	-.025	-.021	.484	.426	.166
	24	10-30 Min	.147	.132	-.016	-.749*	.084	.013	-.029
	25	30-1hr	.459	.048	.059	.463	-.440	-.544	-.176
	26	>1hr	.525	.762*	-.143	.286	.070	-.017	.184
Common Diseases	27	Typhoid	-.936*	-.173	-.096	.186	-.043	.134	-.068
	28	Cholera	-.106	.066	-.378	-.402	-.052	.422	.590
	29	Diarrhoea	.939*	.020	.021	-.131	-.041	-.100	-.103
Time spent in Treatment	30	2 Days	.877*	.063	-.073	.451	.067	-.085	.016
	31	3 Days	.012	.335	-.149	.069	-.882*	.086	-.250
	32	Others	-.700*	-.385	-.092	-.323	.484	.067	.086
Component Defining Variable			Water borne diseases (diarrhoea)	Marital status (divorced women)	Distances to water points (50 meters	Source of water (streams)	Days lost to treatment (3 days of treatment	Family size (6-8people)	Age (Women less than 20 years)

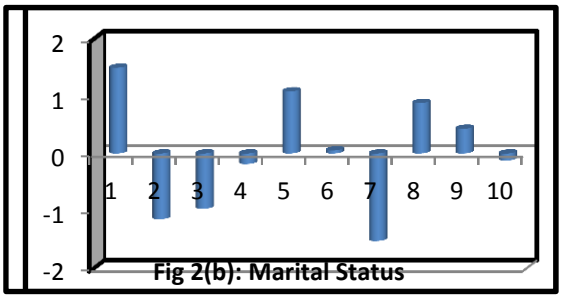
			distance)		)		
A. Eigen Value	6.48	5.77	4.64	4.07	3.68	3.49	2.43
B. % Variance	20.25	18.03	14.5	12.7	11.5	10.9	7.58
C. % Cumulative Variance	20.3	38.3	52.8	65.5	77.0	87.9	95.5

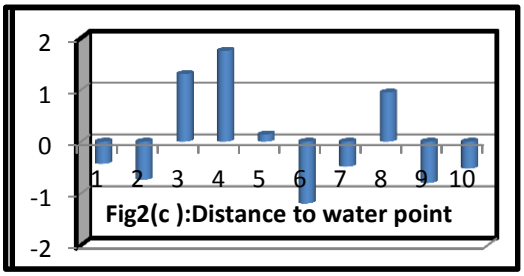
- *Key *= Variables greater than 0.70 and were used in the interpretation of principal component analysis result.*

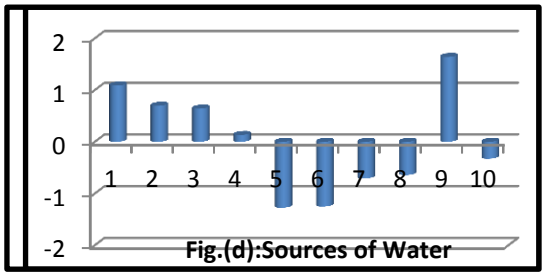
- Table 3: Multiple regression between time and water use variables

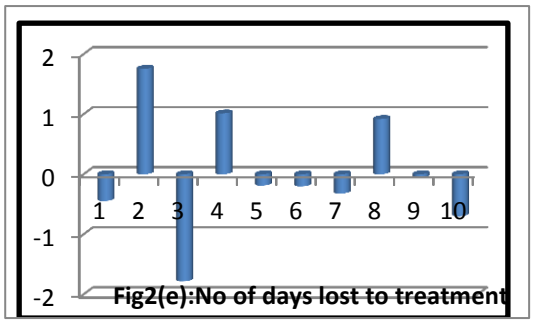
Model and components of productive time and water supply		Unstandardized Coefficients		T	
		B	Std. Error	B	% R^2 Explained
	(Constant)	30.300	2.693	11.252	98
1	Water borne diseases (Dsce))	3.846	2.838	1.355	
2	Marital status (Mtus)	3.453	2.838	1.217	
3	Distance (Dstc)	-.412	2.838	-.145	
4.	Source of water (Sorc)	-25.275	2.838	-8.905	
5.	No of days lost to treatment (Ndlt)	2.195	2.838	.773	
6.	Family size (Famz)	.337	2.838	.119	
7.	Age of women (Agew)	-.770	2.838	-.271	

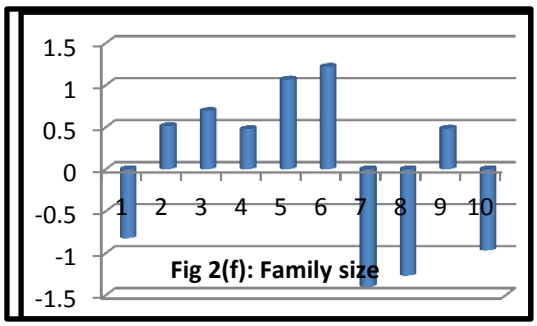












Legend

1. Iyara
2. Aiyegunle
3. Ilupa
4. Ohakiti
5. Ikoyi
6. Araromi
7. Iyamoye
8. Iffe
9. Ijumu I
10. Ijumu II

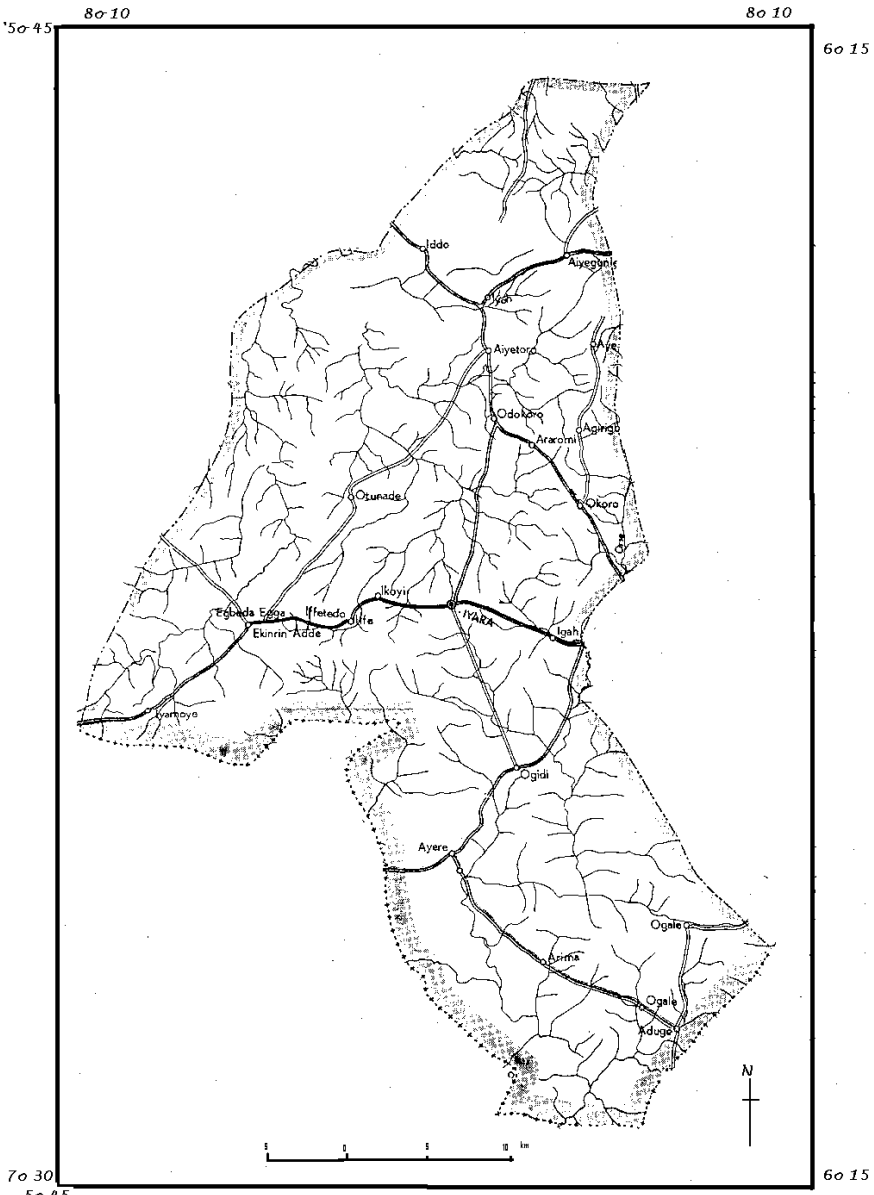


Fig. 1: Hydrographic Map of Ijumu LGA, Kogi State