

## **ANALYSIS OF OPEN WELL WATER QUALITY FOR DOMESTIC USES IN SAMARU KATAF, ZANGON KATAF LOCAL GOVERNMENT AREA - KADUNA STATE.**

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<sup>1</sup>YUNANA MBA ABUL, <sup>2</sup>BONET RIKICHI ATIYONG & <sup>3</sup>STEPHEN MAGAJI SIAKA

<sup>1</sup>*School of Environmental Management, Kaduna State University*

<sup>2</sup>*Science Shehu Idris College of Health And Technology, Makarfi, Kaduna State*

<sup>3</sup>*Nuhu Bamalli Poly Technic, Zaria, Kaduna State*

### **Abstract**

Water is one of the most important most essential elements needed for all forms of life and human activities. The quantity and quality of this important resources is obviously varying over time and space. Yet the demand for water in many parts of the world for various uses is increasing. The scarcity of water and none supply of pipe – borne water in Samaru Kataf has led to the exploitation of underground water from wells in order to meet the domestic demands. The paper examines the quality of open wells water of Samaru Kataf. In order to assess the degree to which the open well water in the study area is portable for domestic uses. Water samples were collected from six wells. These include: Tagama, Nuhu Bamalli Polytechnic, Samaru Kataf Mosque, Samaru Kataf ECWA I, Masukwai and TBMCC School randomly, using Grab method as recommended by WHO (1998). The samples were collected in 250mls plastic containers which were taken to the laboratory of Kaduna state water board. The analysis employed the use of Standard Methods for the examination of waste water. The parameters tested include temperature, colour, pH, conductivity, turbidity, total hardness, calcium, magnesium, total dissolved solid, iron, nitrate, chloride, lead and total coliforms. The results obtained indicated that the physical parameters such as temperature, odour, were found to conform with the SON and WHO guidelines except that the water samples are light brown in colour, the turbidity value exceeded the permissible limit. In the chemical parameters, chloride, conductivity, total dissolved solid, hardness, calcium are within the permissible limit. Zinc, copper and nickel were not dictated in the water samples except at Masukwai where the nickel level was found beyond the stipulated value of 0.002 mg/. It is clearly that the the presence of these substances in the water above the stipulated value is capable of making the water not suitable for human consumption and causing cancer, interference with vitamin D metabolism, affects mental development, in infants, diarrhea, meningitis, Urinary track infections and acute renal failures. This result is at variance with the targets of the Government vision 20:2020 of the 7 point agenda goal in the study area. The area is yet to be informed about the government policy of eradicating health problems associated with well water. The paper therefore suggests that more bore holes be provided by the stake holders, adequate funding is needed to revive the existing station at Manchok and other abstraction methods be strongly adhered to as a remedy.

***Keywords:*** Portable Water, Quality, Parameters, Coliform and Policy.

### **Introduction**

Water is the most important natural resource in the world; since without it life cannot exist and most of the Poor quality water industries cannot operate. Although, human life can exist for many days without food, the absence of water

for only a few days has total consequences (David, 1988). The presence of a safe and reliable source of water is thus an essential pre – requisite for the establishment of a stable community. In the absence of such source a nomadic life style becomes necessary and community must move from

one area to another as demand for water exceed its availability. It is therefore not surprising that sources of water are often seriously guarded. Poor quality water can pose health problems enough to threaten human life; the idea of the need for good quality water is most appreciated only when it is scarce. However, in developing countries like Nigeria, the entire diseases are predominantly health hazard. (Concord News, 1986) stated that safe and portable drinking water should conform to the above water qualities characteristic, which should be free from pathogenic organism and low concentration of toxic compounds that have a long term effect.

### **Study problem**

The scarcity of water and none supply of pipe – borne water in Samaru Kataf has led to the exploitation of underground water from wells in order to meet the domestic demands. Since the location is in a rural agricultural area, run-off discharge by erosion channel become necessary in view of the effect of permeability and seepage effects on the recharge and yield of the well. Therefore, the need to assess the quality of the open wells water in order to ensure good health standard of the people.

### **Aims and objectives**

The aim of the study is to assess the physiochemical and microbiological quality of the open wells water for domestic uses.

**The study therefore attempt to achieve this aim using the following objectives:**

1. To determine the physiological and microbiological quality of water from the open well of Samara Kataf.
2. Examine the suitability of the water for domestic uses (drinking, washing and cooking)

### **Theoretical framework**

The provision of reliable and clean water supplies is among the essential requisite for improving the quality of life for the rural population in the developing world (Newton, 2002).

The ever increasing population of developing countries and creation of numerous local administrative units have rising the world demands of water for domestic consumption and the demand for the assessment and management of the critical resources has become paramount. In most Africa countries as revealed by sustainably theory, recurring increase in population have heighten the chronic water shortage and unfair allocation of water resources. These led to the uncontrolled price of water resources, conveyance of water from far distance sources, impaired health, diminished livelihoods and even lost of lives.

Owing to the aforementioned problem, a new approach emerged for the development of sustainable smaller water projects. The programme that aimed at utilizing local competence exploiting local financial resources and which is well adjusted to local needs would therefore be more sustainable

Water, the world over, is sustained through the cyclical process of nature. The availability of it is always an equilibrium

between inputs and outputs, which ensures the sustainability of the total availability of water (Newson 2002).

This balance leading to sustainability is only achieved when the natural pattern of these process are not disturbed or altered. However, where the natural state is disturbed through alteration or modification by mans activities in the physical environment the equilibrium is lost and attendant consequences set in. Few human activities that poses such enormous threat to the natural equilibrium of the environment like industrialization process. This is because industrial development, especially in the developing countries, hardly considers the nature of the actions among several elements operating in the environment (Keller 2006). With increases in the tempo of industrial development water pollution rate and consequently scarcity and health problems also escalate.

Also, rapid growth of human population and rapid advances in technology, the speed of industrialization in terms of global coverage and technological innovations increases in a geometric rate. Mans desire to meet the demands of human population that is projected to reach 8 millions by the year 2030 is on the other hand exacerbating water problems such pollution (Botkin 2007). However, when considered along with the legitimate water demands of this growing population for reasonable living standards, the situation demand a balanced approach that would accommodate the human needs of water and at the same time do not jeopardize the natural settings

of the water resources (Hilter 2006).

This awareness has lead and generated the water resources movements of the 1960's and 1970's among the academics. This in turn gave rise to emergence or re-emergence of expository and explanatory concept like the ; land use paradigm, Degrading allocation concept , environmental decay concept , ecosystem concept, sustainable development concept and others. However, non is a more relevant in the water management, conservation and availability.

The sustainable development concept originated from the concern of people about the environmental impact of projects on water quality and quantity (health and safety of people).

The new approach for water supply programmes for long term objectives include: Develop a sustainable service for the provision of water supply, provision for safe water ti a large population and increase private sector to actively supported water supply.

So, the study of the assessment of open well water quality for domestic uses in an African developing country, like Nigeria, is in line with the urgent need for the studies on demand and the sustainability of water.

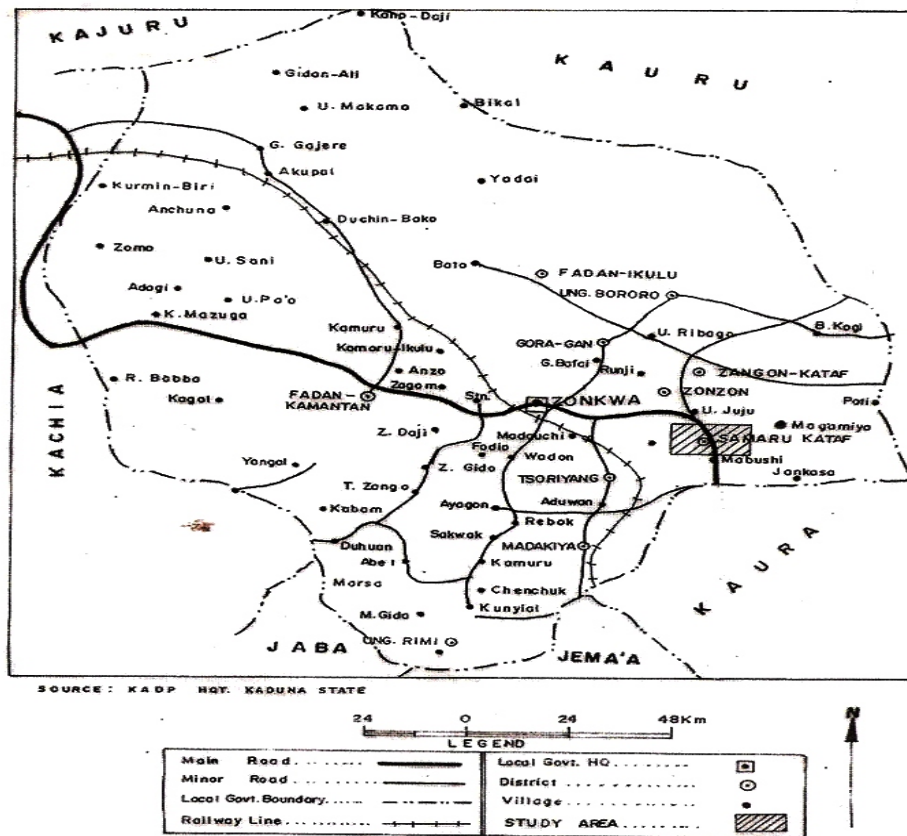
There is therefore the urgent need for water monitoring and analyses so as to ensure the sustainability of both the surface and the ground water which is the thrust of the present study.

### **The study area**

Samaru Kataf is located at Atyap Chiefdom in Zangon Kataf Local Government area, Kaduna State at

between Latitudes 10° 18' and 10° 30'N and Longitudes 7° 15' and 7° 45' (fig 1). It is sited on central high plain of northern Nigeria. The area terrain extended westward of Kaura area into the escarpment of Jos Plateau (Emielu, 2008). The area is made of granite rocks. The surface has decomposed to laterite. The water table is usually quite high and wells are sunk to a comparatively shallow bore depth of about (100 meters). The soils,

falls within the tropical ferruginous soil. The climate is part of the tropical wet and dry climate of Nigeria. The wet seasons begins in April and ends in October, though there is fluctuation in the beginning and the ending of the wet season from year to year (Adebayo, 2004). The dry season always occupied by the dry dusty cool harmatan wind migrating from the Sahara Desert (Aayi, 2009). The area is drained by seasonal streams that dry up during the dry seasons.



**Fig. 1** MAP OF ZANGO KATAF LOCAL GOVT. AREA SHOWING SAMARU KATAF.

## **Methodology**

The data required for the study were obtained from laboratory analysis of the selected water parameters as recommended by Wayne,(1978) and ELE International Ltd, (1991). These include: temperature, color, odour, turbidity, electrical conductivity, chloride, total dissolved, hardness, calcium, magnesium, Nitrate, iron, pH, Sulphate, sodium, potassium, lead, zinc, nickel, copper microbiological total coliforms count.

The water samples were collected from six wells these include: Tagama, Nuhu Bamalli Polytechnic, Samaru Kataf Mosque, Samaru Kataf ECWA I, Masukwai and TBMCC School randomly using Grab method as recommended by WHO, (1998). The samples were collected in 250mls plastic containers which were taken to the laboratory within one hour for analysis. The reason is to ensure that the result obtained give a true representation of the parameters in the water. The samples were collected in April 2012 when the area was experiencing its peak of water scarcity for domestic uses.

The analysis was carried out in the chemistry laboratory of the Kaduna State Water Board (KSWB) using standard methods for the examination of water and waste water as described by World Health Organization (WHO) 1984.

Four methods were used for the analysis to determine the quality. For turbidity, conductivity, total dissolved and pH, their corresponding meter were used. Chloride, hardness, calcium and magnesium, atomic absorption spectrometer (AAS) was used. For the analysis of sodium, potassium, lead, zinc, nickel, copper, nitrate and iron, spectrophotometer was used. Multiple tube method was adopted for the total coliforms count, and the used of visual and smelling senses were employed for colour and odour of the water respectively at the time of collection

## **Results**

The results obtained from the laboratory analysis of the open well water samples were compared with the World Health Organization and Standard Organization of Nigeria guidelines as shown table I.

*Analysis of Open Well Water Quality for Domestic uses in Samaru Kataf, Zangon Kataf  
Local Government Area - Kaduna State.*

S/No	Parameter	Location							Who Std
		A Tagama	B Poly	C Mosque	D Ecwa	E Msk	F Gss	Who	
1.	Turbidity (NTU)	50	41.70	120	180	187	75.70	0-5.0	
2.	Chloride mg/L	49.97	16.99	13.99	30.99	14.99	16.99	250	
3.	Conductivity /cm	76.00	40.60	36.30	84.50	29.80	68.90	1000	
4.	Total dissolved	38.00	20.30	18.15	42.25	14.90	34.40	500	
5.	Hardness mg/L	100.00	34.00	58.00	84.00	62.00	98.00	150	
6.	Calcium mg/L	62.04	32.00	42.00	60.00	36.00	48.00	100	
7.	Magnesium mg/L	38.00	2.00	16.00	24.00	26.00	50.00	150	
8.	Nitrate mg/L	4.20	3.60	3.10	3.40	3.01	3.20	44'	
9.	Iron mg/L	0.86	1.86	1.82	1.88	1.88	1.88	1.00	
10.	PH	5.80	6.60	6.70	6.90	6.70	6.80	6-5-8.4	
11.	Sulphate mg/L	20.00	40.00	36.00	83.00	53.00	63.00	200	
12.	Sodium mg/L	15.33	7.96	4.83	11.84	Nd	11.75	200	
13.	Potassium mg/L	3.66	0.85	0.83	2.52	0.43	0.03		
14.	Lead mg/L	0.62	0.41	0.90	0.70	0.99	1.11	0.1	
15.	Zin mg/L	Nd	Nd	Nd	Nd	Nd	Nd	5.0	
16.	Ni mg/L	Nd	Nd	Nd	Nd	0.09	Nd	Nd	
17.	Copper (Cu)	Nd	Nd	Nd	Nd	Nd	Nd	0.05	
<b>Microbiology</b>									
	<b>TOTAL COLIFORMS</b>	>1800	>1800	>1800	>1800	>1800	>1800	Nil	

The results reveals that the physical parameters such as temperature, odour, were found to conform with the SON and WHO guidelines except that the water samples are light brown in colour, the turbidity value exceeded the permissible limit. In the chemical parameters, chloride, conductivity, total dissolved solid, hardness, calcium are within the permissible limit. Zinc, copper and nickel were not dictated in the water samples except at Masukwai where the nickel level was found beyond the stipulated value of 0.002 mg/l, others such as iron, lead were found above the

stipulated limit. The pH was found to conform to the guideline, except at Tagama where the water sample were observed to be acidic. In the microbiological parameter test, total coliforms were found to exceed the limit of the WHO and SON guide lines.

### Discussion

The results of the analysis presented in table I show that the well water samples were discovered to be reddish in colour and has high turbidity water content. This shows to be originated from the soil particles. Dix (1981),



observed that small soil particles make water turbid. According to SON, 2007, high turbidity in the water make the it not suitable for human consumption.

Chemical parameters like lead and nickel are highly concentrated. The content of lead in well water according to SON (2007) can cause cancer, interference with vitamin “D” metabolism, affect mental development in infants, and is toxic to the central and peripheral nervous systems. The presence of Nickel above the required level is also carcinogenic.

In the microbiological test the total coliforms content in the well water of Samaru Kataf is high. It is an indication of faecal contamination which can result to health problems like urinary track infections, bacteraemia, meningitis, diarrhea, acute renal failure and haemolytic anaemia though the authors could not collect data on the existing health problems caused by the poor water quality.

#### **Government Policy Toward Improving Water Quality and Supply in Nigeria**

In the pre – Independence period, provision of domestic water supply was largely through individual and community efforts. The Nigerian government later got involved with the main of developing schemes to urban and semi urban to the neglect to the rural communities. Water Boards were established for this purpose by the Nigeria government to provide the services. Institutions like Federal Ministry of Water Resources was established in 1976, National Water Resources Institutes in 1977 and River Basin Development Authorities in 1978 and was shoulder with the responsibilities of formulating policies and giving advice, manpower training and research. The tempo of water supply was raised in 1980 with the preparation for and campaign in favour of the United Nation International Drinking water supply and sanitation. The goal

of this programmes were to provide sanity water for all by the year 1990. However, just before the commencement of these programmes, only 22% of the rural and 55% of the urban population enjoyed potable water. Many of these projects failed because of unreliable and inadequate data on which analysis planning and management are based. Here come the vision 20:2020.

The results obtained in this study is at variance with the targets of the Government vision 20:2020 agenda goal in the study area. The area is yet to be informed with the government policy of eradicating health problems associated with well water.

The Nigeria policy lack basic planning data. The role of data collection has been ignored. It is therefore always very difficult to assemble and adequate technique and socio – economic data capable of assisting in the assessment, planning, design, construction and maintenance of various projects. The policy also lack manpower. This affect then proper planning, implementation and management of water resources programmes and projects. The non- availability of fund s has also posed a major problem to the development of water resources programmes and projects.

#### **Strategies for improving water quality and supply in the study area**

In view of the absence and poor quality of water supply in Samaru Kataf area, The paper therefore recommend both long term and short term projects:

##### **a. Short term projects include the following:**

- I. The stake holders in the provision of bore holes in Samaru Kataf should increase the number of the existing ones as they are grossly insufficient.
- ii. Adequate fund is needed to revive the existing water station at Manchok for

- regular supply of water.
- iii. Other water abstraction method should be strongly adhered to such as rain harvest and tank water collections.
- b. Long term projects:**
- i. Procurement of equipments and spare parts for easy and fast maintenance of broken Boreholes in the Local Government.
- ii. Quantification of groundwater reserve for judicious exploitation planning to meet the multipurpose uses.
- iii. Provision of fund and trained manpower to cope with the changing demands and techniques

#### **Summary and Conclusion**

The open well water of Samaru Kataf was determined using a laboratory analysis. The parameters observed were Temperature, colour, odour, turbidity, chloride, conductivity, total dissolved, hardness, calcium, magnesium, nitrate, iron, pH, Sulphate, sodium, potassium, lead, zinc, nickel, copper and total coliforms. The samples were subjected to standard methods in accordance to WHO and SON guidelines. The water was found not fit for human consumption; this is at variance with the targets of the Nigeria policy of supply water to rural dweller. Hence, the said target achieving these goals by two thousand and fifteen (2015) will just be a mere saying if most of the rural dwellers are not touched and felt by the real indices of the water policy.

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