Evaluating small scale industrial water use in Pengana/Chiefdom of Bassa L. G. A. of Plateau state

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ABSTRACT

The paradox, that water is not in short supply over the earth as whole (where about 70% of the earth surface is water), yet it's no news that the resources which is so relevant to the existence of life is not readily available at the required quantity and quality at all times, in all places. Therefore, the paper explore small scale industrial water use in Pengana Chiefdom through to use of questionnaires. Five small scale industries were studied namely; poultry production, Block-making, Grinding, cooking (restaurant & road side food vendors) and local beer brewing (Burukutu). However, the study revealed that these industries abstract their water from three major sources; Boreholes, hand dug well and streams. It also shows that 2% of the water was use for grinding, 35% was use for making of blocks, 6% was used in poultry production, 25% went into cooking and 4% went into brewing of local beer (Burukutu). The result of the research therefore show a mark variation in terms of sectorial usage and a use of large volume of water in terms of consumption. It also show a shortage of the resource. Therefore, from the above, the paper suggests the development of more sources of water to meet the increasing demand.
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INTRODUCTION

Among the diverse resources with which mankind has been blessed with water ranks among the most important. According to [Clark, 1991], water is the most fundamental, substance making life possible on earth. It is the only self controlling resources and its industrial importance cannot be over emphasized.

The major Purpose for which we demand water are; house hold (domestic), industrial and agricultural uses [Oyebande, 1973].

In Africa estimated 88% of all fresh water is use for agriculture, 7% for domestic purpose and 5% for industrial use. Asian water is also use mostly for agriculture estimated at 86%. while 8% is used for industrial purposes and 6% is use for domestic purposes. In Europe, however most of its water use by industries and stands at 54%, while agriculture and domestic purposes shares 33% and 13% respectively.

Studies have shown that developing countries donate most of their water supplies for agriculture, But Indian for instance use 90% of its fresh water for domestic purposes, 9% for agriculture, and 3% for domestic use [European school books, 1994].

However, small scale industries occupies a place of strategic importance in the economic structure of every country due to it's contribution in times of out put, exports and employment [lozi, 2000].This is because they provide

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immediate large scale employment, comparatively high capital ratio, they need lower investment, offer a method of ensuring a more equitable distribution of national income and facilitate an effective mobilization of resources, capital and skill which might other wise remain unutilized.

Macro studies indicates that small scale firms in Africa are evolving leading to a rise in per – capital income. However micro studies indicate that a vast majority of new firms are micro enterprise (less than ten workers) which its per capital income growth appears increasingly in larger localities [Liedholim, 2008]. Disappearance rates are highest for micro firms and lowest among larger firms. Death rate are found to be highest during the micro firms initial fours years. If they survive these initial difficult years, prospects typically is brighten, and they are likely to experience a sudden spur of growth that propels them into one of the larger sized categories of micro – enterprise. However relatively few of these firms grow beyond the confines of micro size category and transform themselves, to modern small and medium scale firms.

Small scale industries occupies a pride of place in the Jordanian economy. Development of small scale industries use plan by the government. The government coordinate the development programme through its agencies. Small scale industrial sector account for 50% of the total manufacturing sector, has 20%, share in exports and provide 80% of employment in the industrial sector, inspite of all the odds, it has always performed well. Despite the global and domestic recession small scale industries registered a high growth rate in terms of its number of units.

MATERIALS AND METHODS

In other to achieve the task set in this study; data were collected on the following aspects of small scale industries; water use, sources of water, other uses of water, cost of water, and factor affecting water demand. The information's were obtained through the design and administration of questionnaires. The data used were collected from pengana chiefdom of Bassa Local Government Area of Plateau State (Nigeria). Considering the constraint of time and cost as well as other factors that affect the performance of geographic research, the researcher adopted the stratified simple random sampling technique of data collection and took data from Jengre – town and mista-Ali town respectively. With stratified sample design the effects of certain possible influence can be controlled. Taking a simple random sample for each class or stratum makes the fullest possible use of available information and increases the precision of sample estimate.

Contact (proximal) method was used for collecting data of small scale industrial water use. The contact methods entails the researcher being in direct contact with the source of data. This involves either recording of respondents, responses to questions during interview or issuing of questionnaire which the respondents fill and return to researcher. Hundred questionnaire were administered to the operators of the following five small scale industries; Poultry, Production, Blocks making, Grinding cooking (Restaurant and roadside vendors popularly known as Mama put) and Beer brewing (Burukutu). Twenty five (25) questionnaires were administered to each of these industries.

The major focus of the question were: major sources of water, water use, water demand, cost of water, water shortage water treatment, other uses, and factor affecting water demand.

RESULTS AND DISCUSSION

As [Kollar ,1976], pointed, that one of the greatest obstacles to long range water resources planning is the lack of the basic data of which to base judgment in regards to allocation of resources. This is especially true of the industrial sector   because of its economic goal and their development benefits. The use of foreign country's data may serve for a time, but it is no substitute for a country's accumulation hers and analyses of its reliable local experience.

However, this paper intends to contribute a little to the data bank on industrial water use. The amount of water required by the various industries was not similar for each of the industrial activity for the period under consideration.

However, 35% of the water was use for block making, 25% was use for cooking (Restaurant and roadside food vendors popularly know as (mama put), 6% was for the production of poultry, 4% was use for the brewing of local beer (Burukutu) and 2% was for grinding. Thus meaning a large proportion of the water used for small scale industries activities went into block making.

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OTHER USES OF WATER
Apart from the above usage, a good quantity was use for other industrial activities such as; Washing of hands, washing of machines, food items, washing of plates, and drinking by customer e.t.c. However, 25% of these water used for other purpose was between 51-101 litres, 15% was between 102-152 litres, 8% was between 25-50 litres, while the remaining percentage lied between 204-600+ liters. This can be said that 50-100 litres was put into other uses.

The research also indicated problem of water shortages as follows: 20% occurs between Jan – May, 17% - Feb – May, 10% Dec to Jan, 3% - March to April and 2% - March to May.

FIG 2 – OTHER USES OF WATER

QTY	FREQUENCY	PERCENTAGE
25-50	30	13
51-101	100	45
102-152	56	25
153-203	18	8
204-254	5	2
255-305	8	4
306-356	1	0.5
357-407	1	0.5
408-458	0	0
458-508	2	1
608+	3	1
TOTAL	**224**	**100**

FACTORS AFFECTING WATER DEMAND
In developing countries, the demand for water are also high in particular sectors. But its development to match there requirement with supply is often lacking so that large rapidly growing cities in particular suffer inadequacies of both quantity and quality of water. Several factors are noted to influence a nations industrial use of water e.g. climate, human and economics [Oyebande, 1978]. The study discovered that water use in the area was been affected by the following factors; finance (Economics), distances, diminishing supply (Shortage). 30% of the problem of demand was shortage, 20% was supply and distance, respectively, while 2% was for finance.

FIG 3-FACTORS AFFECTING WATER DEMAND

Factors	Frequency	Percentage
Finance	5	2
Supply	90	27
Distance	85	26
Shortage	150	45
Others	0	0
TOTAL	**330**	**100**

COST OF WATER PROCUREMENT
Several factors are noted to influence a nations industrial use of water as diminishing supplies, increasing demand and stricter pollution control in many cases have substantially increased cost of water, to industries in recent years. This study uncovered that the sum of N2187720 was spend in buying water, in 2000, N1113650. Was expended on water, in 2001, N3343680 was spend in 2002, and N2241670 was also spend on water in 2003 and 1122920 was expended in 2004. Finally in N10009640 was expended for the procurement of water.

FIG 4- COST OF WATER PROCUREMENT

YEAR	NO OF PLANT	AMOUNT
2000	5	2187720
2001	7	1113650
2002	6	3343680
2003	5	2241670
2004	8	1122920
TOTAL	**31**	**N1,000,964**

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CONCLUSION

Small scale industries occupies a very important part of the economic structure of any country, due to their contribution in terms of output and employment [Lozi, 2008]. But all of these benefit cannot be achieved without adequate investment in the development of water resources. For instance the study, revealed that block making alone consumed 24467035 litres of water just within the period under study thereby buttressing the fact that water, is a major component in industrial production and thus agreeing up with [Clark,1991], assertion that water is the must fundamental substance making life possible.

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TESTING OF HYPOTHESIS

Ho (null hypothesis) = There is no significant variation in the quantity of water use by selected small scale industries in Pengana Chiefdom

Hi (alternative hypothesis) = There is significant variation in the quantity of water use by small scale industries in Pengana Chiefdom

Table. 6 Quantity of water use by selected small scale industries in Pengana Chiefdom

PENGANA CHIEFDOM

Year	Poultry	Block	Grounding	Cooking	Beer
2000	4893407	25788707	2144802	13940524	3082499
2001	4893407	2588707	2144802	13940524	3082499
2002	4893407	2588707	2144802	13940524	3082499
2003	4893407	2588707	2144802	13940524	3082499
2004	4893407	2588707	2144802	13940524	3082499
TOTAL	24467035	12943535	10724010	69702620	15412495

USING A FACTOR OF 1000

Year	A	B	C	D	E
2000	489	2579	214	1394	308
2001	489	2579	214	1394	308
2002	489	2579	214	1394	308
2003	489	2579	214	1394	308
2004	489	2579	214	1394	308
TOTAL	2445	12895	1070	6970	1540

Step 1 = E = $\dfrac{24920}{25}$ = 997

Step II = Total sum of values

Year	A-x̄	B - x̄	C – x̄	D-x̄	E-x̄
2000	-508	1582	-783	397	-689
2001	-508	1582	-783	397	-689
2002	-508	1582	-783	397	-689
2003	-508	1582	-783	397	-689
2004	-508	1582	-783	397	-689
TOTAL	2540	7910	3915	1985	3445

Year	$(A-x)^2$	$(B – x)^2$	$(C – x)^2$	$(D-x)^2$	$(E-x)^2$
2000	258064	2502724	613089	157609	474721
2001	258064	2502724	61308	157609	474721
2002	258064	2502724	61308	157609	474721
2003	258064	2502724	61308	157609	474721
2004	258064	2502724	61308	157609	474721
TOTAL	1290320	12513620	3065425	788045	237370

S^2 = 1672,3781

Step 3 = The same with step 3

Step 4 = within variance = Total sum of variance - Between variance
16723281- 16723781=0

Step 5
Construction of Anova table

Source of variance	Source of variance	Degree of freedom	Variance ratio
Within group	0	25- 5 =20	0/ 20 =0
Between group	16723281	5- 1 =4	16723281/ 4 = 4180,945

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F- ratio = large variance estimate/ small variance estimate

16723281/0 = 16723281

Table value at 0.05 = 2.9, and 0.01=4

Decision: for the null hypothesis to be rejected the calculated F must be greater than the table value.

Conclusion: Since the calculated F is greater than the table values. We therefore, reject the null hypothesis and accept the alternative hypothesis.

II . Ho (null hypothesis) = There is no significant variation in the quantity of water employed for other uses.

H1 (alternative hypothesis) = There is a significant variation in the quantity of water employed for the uses