Comparative Analysis Of Fertilizer-Use In Imo State: 1990-1999 And 2000-2009

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Abstracts: The work aimed at comparing fertilizer use level in Imo State from 1990-1999 and 2000 – 2009. Data used for this study were collected from National Bureau of Statistics, Imo Agricultural Development Programs and Federal Fertilizer Department. Student t-test was used to analyze these data. Time series data collected on fertilizer use showed that the average fertilizer use levels for before 2000 era, is higher than average fertilizer use level after 2000 era; the trend analyses showed decreases in the fertilizer use before 2000 and increases after 2000; result of the t-test statistics shows significant difference in the level of fertilizer use before and after 2000. It is recommended that effort to make fertilizer readily available and accessible to farmers be emphasized.
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Key words: fertilizer, fertilizer use, subsidy, average fertilizer.

1. Introduction

Fertilizer is combinations of the nutrients that plants must have in a form they can use to grow (FAO, 1999). There is a widespread agreement that increased use of fertilizer and other productivity-enhancing inputs is a precondition for rural productivity growth and poverty reduction (Ricker-Gilbert and Jayne, 2008). It is the only practical way to provide enough plants' nutrient to feed Africa and provide organic matter to restore Africa's nutrient-depleted soils (Africa Fertilizer Summit, 2005). Fertilizer demand has historically been influenced by changing and often interrelated factors such as population and economic growth, agricultural production, prices and government policies (FAO, 2004). The absolute fertilizer price purchase plays an important and direct role as a determinant of demand for fertilizer (Sidibe and Sere, 1998; Sachs, 2003; Sanders and Ahmed, 1998; http://www.ministryofagric.gov.ng/uplaod/ferilizer.pdf). All things being equal, price change affects the demand for fertilizer (Orji, 2002). It is assumed that cheaper fertilizer increases its use (Sajjad, 2009).

However, fertilizer use in Nigeria has been low (FAO, 2003). Prior to the fertilizer subsidy era, the use of fertilizer has been less than 10,000 tons per year (Jayne, *et al*., 2003). The average fertilizer use for 1980-1989 was 8.14kg/ha (FAO, 2003). There is therefore, growing evidence that meeting this challenge of increased fertilizer use will require more attention to soil fertility issues (Eric *et* al., 2006).

Nigerian soil have inherent difficulties for agriculture in terms of fertility, acidity, or drainage, and land use practices during past several decades have exacerbated the situation through nutrient mining by crops, leaching, and inadequate erosion control (Buresh *et al.*, 1997; FAO, 2000; Pol, 1992; Sanchez *et al.*, 1997; Scherr, 1999; Smaling *et* al., 1997; Stoorvogel and Smaling, 1990; UNEP, 1997; Weight and Kelly, 1999). In order to increase her soil fertility, there is need to increase fertilizer usage through several efforts like direct subsidy.

A subsidy on the other hand, is a grant, a subvention, a financial support or assistance paid to a business or economic sector (Amegashie, 2006). In the context of this study, subsidy is seen as a subvention by the government to a sub-sector, to reduce the sales price of the input and therefore cost to farmers and to encourage the activities of that sector. Thus, fertilizer subsidy is the price reduction of fertilizer (Chukwukere, 2013; Chukwukere and Ejiogu, 2013). Subsidy on fertilizer was introduced in Nigeria in 1976 (http://pak-nigeria.org/pdf/11-PolicyBrief3.pdf). It has remained since then at different rates except for some years like 1997, 1998 and 2000 where subsidy on fertilizer was removed. Thus we have a span of 36 years since the introduction of fertilizer subsidy, out of which the study covered 20 years starting from 1990 to 2009. The rationale for this selection is based on the creation of Abia State from Imo State and the transfer of ISADAP to Imo ADP which make data for years before 1990 unavailable. A baseline of 2000 is used to divide the period into two eras, that is 1990 to1999 before the present democratic dispensation and 2000 to 2009 eras. By this subsidy, fertilizer which was

largely imported by the Federal Government was distributed to farmers at prices below the cost of importation. This subsidy applied to all fertilizers used in Imo State (Enwerem, 2009). These include N.P.K, M.O.P and Urea which government sold at N2800, N5000 and N2800 per bag respectively as at 2009. Market prices for these fertilizers were N4100, N7000 and N4100 in 2009. This gives a subsidy cost of N1300, N2000 and N1300 respectively for these fertilizers as at 2009. World price of potash was $875 per ton, Diamonium Phosphate (DAP) was $1,218 per ton and Urea was $452 per ton as at August, 2008 (IFDC, 2008).

Average fertilizer use however, increased from 8.14kg/ha to 11.35kg/ha during 1990-1995 but fell to 5.47kg/ha during 1996-2000 sessions. It further fell to 2.268kg/ha for 2000-2004 period, but later increased to 5.696kg/ha in 2005-2009 period. Reason for the fall as reported by FAO (2008) was deficit in supply of potash in Africa during this period. Also, according to Kherallah *et* al., (2002) fertilizer costs in Africa (especially in Nigeria) were very high and their rice and wheat farmers rely more on traditional crop varieties that are less responsive to fertilizers. Thus, they are less in tune to increase their fertilizer applications. This season falls within the subsidy era. This trend agrees with World Bank (2009) statements that whenever direct price subsidy is used to promote seed and fertilizer, the result is almost always disappointing. They noted that the cost of the subsidies has been high and unsustainable, and the modest benefits generated have only been captured by larger farmers.

2. Materials and Method

The study was carried out in Imo state. Secondary data were used for this study. Imo ADP was purposively sampled for information on quantity of subsidized fertilizer which they distributed through their outlets and quantity used in Imo State. National Bureau of Statistics was sampled for information on subsidy rates and fertilizer use. Federal Fertilizer Department was sampled for data on quantity of fertilizer distributed to Imo State. Other relevant text books were also selected for consultation and analysis of their information. The following objective "to compare the level of fertilizer-use in Imo State before and after 2000 during subsidy program" was tested with a t-test analysis. The lower period is 1990 to 1999 and the upper period is 2000 to 2009.

The model expression is thus:

$$t = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}$$

Where X_1 and X_2 = mean estimates of fertilizer use for the two periods.
S_1^2 and S_2^2 = variance of fertilizer use for n_1 and n_2 periods.
n_1 and n_2 = period for the two groups in years (i.e. 10 years each)
n_1+n_2-2 = degree of freedom
Population size = 36 years
Sample size = 20 years

The level of fertilizer-use before 2000 is expected to be lower than after 2000. This can be argued from the stand point that this subsidy policy which cut down the price of fertilizer and encourages those farmers who are willing but were discouraged by the price to use it have become established and accepted by farmers.

The derived hypothesis "There is no significant difference in the level of fertilizer used in Imo State before and after 2000" was tested using t-test analysis. The lower period is 1990 to 1999 and the upper period is 2000 to 2009. The model expression is thus:

$$t = \frac{\overline{X}_1 - \overline{X}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}$$

Where X_1 = mean estimates of fertilizer use in Imo State from 1990 to 1999
X_2 = mean estimates of fertilizer use in Imo State from 2000 to 2009
S_1^2 = variance of fertilizer use in Imo State from 1990 to 1999
S_2^2 = variance of fertilizer use in Imo State from 2000 to 2009
n_1 = period for 2000 (i.e. 10 years)
n_2 = period after 2000 (i.e. 10 years)

3. Result and Discussion

The level of fertilizer use before 2000 was high with the highest reported usage of 19,208mt in 1991 (Table 1). The average use level before 2000 was 10 631mt. Fertilizer use level after 2000 era recorded the highest reported use level of 11 380mt in 2009. The average use level for fertilizer use after 2000 is 3 982mt. In comparison, the average fertilizer use levels for before 2000 era, is higher than average fertilizer use level after 2000 era. This shows a downward trend in the fertilizer use level despite the existence of fertilizer subsidy in Imo State. Transportation and the inability of state government to clear the over-haul cost have affected its availability and use (Enwerem, 2009).

Table 1: Fertilizer use before and after 2000

Year	Fertilizer use before 2000 ('000mt)	Year	Fertilizer use after 2000 ('000mt)
1990	18.472	2000	2.31
1991	19.208	2001	0.33
1992	15.46	2002	2.22
1993	6.71	2003	1.36
1994	14.28	2004	5.12
1995	14.73	2005	1.76
1996	5.22	2006	3.13
1997	5.58	2007	8.60
1998	5.78	2008	3.61
1999	0.87	2009	11.38

Source: ISADAP, 1990-1991; Imo ADP Annual Report, 1992-2009.

Fertilizer use before 2000 shows a negative change of -1.417 over time (Fig. 1). This means that fertilizer use decreases by 1.417 for every change in time from 1990 till 1999 period. The coefficient of determination (r^2) of fertilizer use over time was 0.594 showing a strong relationship. This shows that our model accounted for 59% of the variance in the dependent variable.

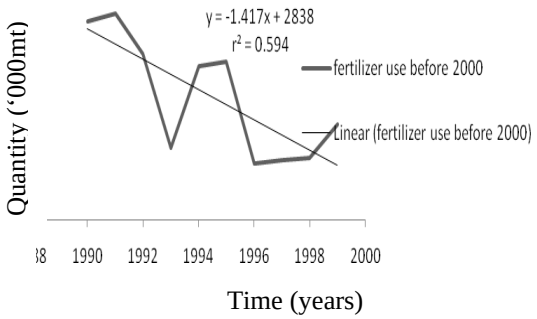

Fig. 1: Fertilizer use by Imo State before 2000

Fertilizer use after 2000 showed a positive relationship with time. There was 0.839 increase in fertilizer use over time from 2000 till 2009 period (Fig. 2). The coefficient of determination (r^2) of fertilizer use after 2000 over time was 0.531 showing a strong relationship. This shows that our model accounted for 53% of the variance in the dependent variable. The implication of this result is that with the increasing rate of fertilizer use in Imo State, food production is expected to rise. This is because fertilizer is a powerful productivity enhancing input (Yanggen *et al*., 2009).

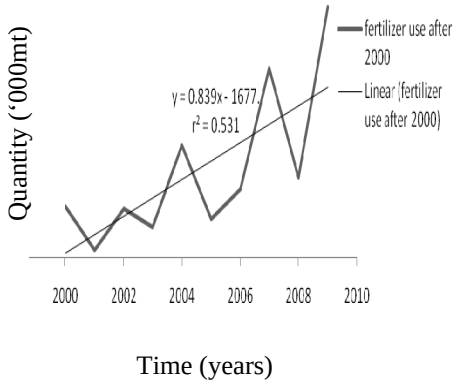

Fig. 2: Fertilizer use by Imo State after 2000

Based on the derived hypothesis "there is no significant difference in the level of fertilizer use between 1990-1999 and 2000-2009" t-test statistics was used to analyze it. The result shows a significant difference at 1% level. This is in line with our a priori expectation that fertilizer use after 2000 will be higher than before 2000 era. It also agrees with Bumb (2008) that subsidy improve incentive for fertilizer use. Thus, we reject the null hypothesis and conclude that there is a significant difference in the level of fertilizer use between 1990-1999 and 2000-2009 in Imo State.

4. Conclusion

The highest level of fertilizer use before 2000 was 19 208mt in 1991, while 11 380mt in 2009 was the highest for after 2000 era. Average use level before 2000 was 10 631mt while it was 3 982mt after 2000. There was a downward trend in fertilizer use level despite fertilizer subsidy. There were negative changes in the use of fertilizer before 2000 while it was positive after 2000. The analysis of the data on the level of fertilizer use before and after 2000 showed significant difference. The study revealed that there was an upward trend in the use of fertilizer after 2000. Thus, it is recommended that effort to make fertilizer readily available and accessible to farmers be emphasized. This will increase its usage and resultant increase on food production.

T-Test
Fertilizer use before and after 2000, during the subsidy era

Paired Samples Statistics

	Mean	N	Std. Deviation	Std. Error Mean
Pair 1 Fertilizer use before	10.6310	10	6.47609	2.04792
Fertilizer use after	3.9820	10	3.48433	1.10184

Paired Samples Correlations

	N	Correlation	Sig.
Pair 1 Fertilizer use before & Fertilizer use after	10	-.673	.033

Paired Samples Test

	Paired Difference					t	df	Sig. (2 tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference		Mean	Std. Deviation	Std. Error Mean
	Lower	Upper	Lower	Upper	Lower	Upper	Lower	Upper
Pair 1 Fertilizer use before – Fertilizer use after	6.64900	9.19058	2.90632	.07445	13.22355	2.288	9	.048

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