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Housing Affordability for the Low-Income: An Evaluation of the National Housing Fund Loan Beneficiaries in Akwa Ibom State

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ABSTRACT - The National Housing Fund established by Decree No. 3 of 1992 assumes that not more than 20% of the income of any Nigerian may be used for mortgage loan repayment or housing rent. In this study, effort was directed at determining the affordability of the National Housing Fund Loan by the populace in Akwa Ibom State. Information on household income, assets, housing tenure and investment priority were obtained with the aid of a structured household questionnaire administered to 450 respondents in a randomly selected Local Government Areas of Akwa Ibom State. Results show that National Housing Loan is not affordable, particularly to the low-income earners. Beneficiaries earning N5,000.00 monthly income used more than 80% of their income for repayment. The study, therefore, presents housing cost or amount affordable to the low-income households.

KEYWORDS: Low-income housing, Affordability, National Housing Fund Loan.

INTRODUCTION

The adoptions of the structural adjustment measures in most developing counties in the 1980s have increased the number of individuals and households with income below the poverty-line. It has also increase the

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intensity of deprivation of the general populace (Satterthwaite, 1995). The United Nations (1996) reported that the severity of the problem is such that the world is sliding back-ward into poverty of which more than one billion people today live in absolute conditions mostly in the developing countries. This situation has been compounded by the continued economic and social marginalization of the poorest communities and persons. This is gradually excluding a sizeable proportion of the indigenous people from social and economic progress.

Generally, the deprivation suffered by the poor is nowhere more visible than in the matter of housing (MacNamara, 1975). Housing shortage is one of the controversial issues in the world today. This is because none of the sources of its supply is directly responsive to demand in the way that most goods are. Unlike many other consumer goods, housing or shelter does respond to an absolute need, being vital to human survival and reproduction. It is not surprising, therefore, that the quest for home ownership is a universal one. It is also common knowledge as noted by Agbola (1990), that this quest can only be met or satisfied by only a fraction of residents in each country as various problems prevent individuals from achieving from achieving this desirable goal.

In Nigeria, the number of people who can own their own houses is low and this is normally attributed to the social factors affecting housing. One of such factors is housing policies. Often, housing policies are not attuned to the country's income level or household affordability level. In many countries, including Nigeria, the approach has been to direct scarce resources into the provision of a few high standard dwellings. This approach is insufficient because it tends to inhibit large-scale production of affordable standard dwellings and sometimes-even lead to a reduction of the existing stock of housing by clearing squatter settlements (Roger et al, 1982). Of course, this has led to an undue hardship and widening of the gap between the poor and the very rich.

Akwa Ibom State was created in 1987. One of the consequences of the state creation has been increasing urbanization of its population. The rapid urbanization has tended to worsen the housing situation in the State especially for the urban poor. The degree of Urbanization in the state does not seem to reflect the general level of economic growth, as the State lacks solid economic base that could help to absorb it burgeoning population into productive medium and high income occupation.

The situation has become a case of great concern to the various administrations in the State and various Strategies have been evolved to ameliorate it. These include, among others, the establishment of a mortgage

finance company-AKWA SAVINGS AND LOAN- to aid housing production in the State. Such moves like the Federal Mortgage Bank scheme, may not achieve much unless the affordability level of those that really need the financial assistance are determined for proper targeting.

In 1995, Akwa Savings and Loan, a Primary Mortgage Institution (PMI) was established to grant small loans for housing construction and maintenance in the state. Before this, the National Housing Fund (NHF) was established by Decree No. 3 of 1992. Its aim was to mobilize funds for housing development in the country. By this decree, it became mandatory for every worker in the country, either in public or private sector, earning N3,000.00 and above per annum to make contributions of 2.5% of his/her monthly income to the fund. Towards the end of 1997, the NHF started disbursing loan to contributors nationwide. Akwa Savings and Loan was appointed as one of the Primary Mortgage Institution (PMI) to disburse the NHF loan in Akwa Ibom State.

A Statement from the bank suggests the following:

- (i) The loan has a flat rate N500,000.00 to any eligible contributor;
- (ii) The rate of interest charge is 9%;
- (iii) Repayment period is between 20-25 years with a moratorium period of 5 years from the date of first disbursement;
- (iv) All contributors are eligible;
- (v) To benefit even as a contributor one must possess a land (Certificate of Occupation) and two years tax clearance. Must have an account with the bank and must obtain consent to mortgage the land from the state governor.

The NHF (1992) assumes that not more than 20% of the income of any Nigeria may be used for mortgage loan repayment or housing rent. Thus, the issues here are what percentage of income is used for housing by the low income in the state? What is the number of households in excess of that percentage that can afford the National Housing Fund Loan or any housing loan for that matter?

LITERATURE REVIEW

This study is based on the concept of affordability. Generally, affordability is used to mean the ability and capacity of the households to meet their periodic mortgage obligations without jeopardizing their families well being (Agbola, 1990). It is based on the belief that certain level of services are affordable to beneficiary if the amount the household is willing and able to pay for shelter-related expenses is sufficient to cover the monthly

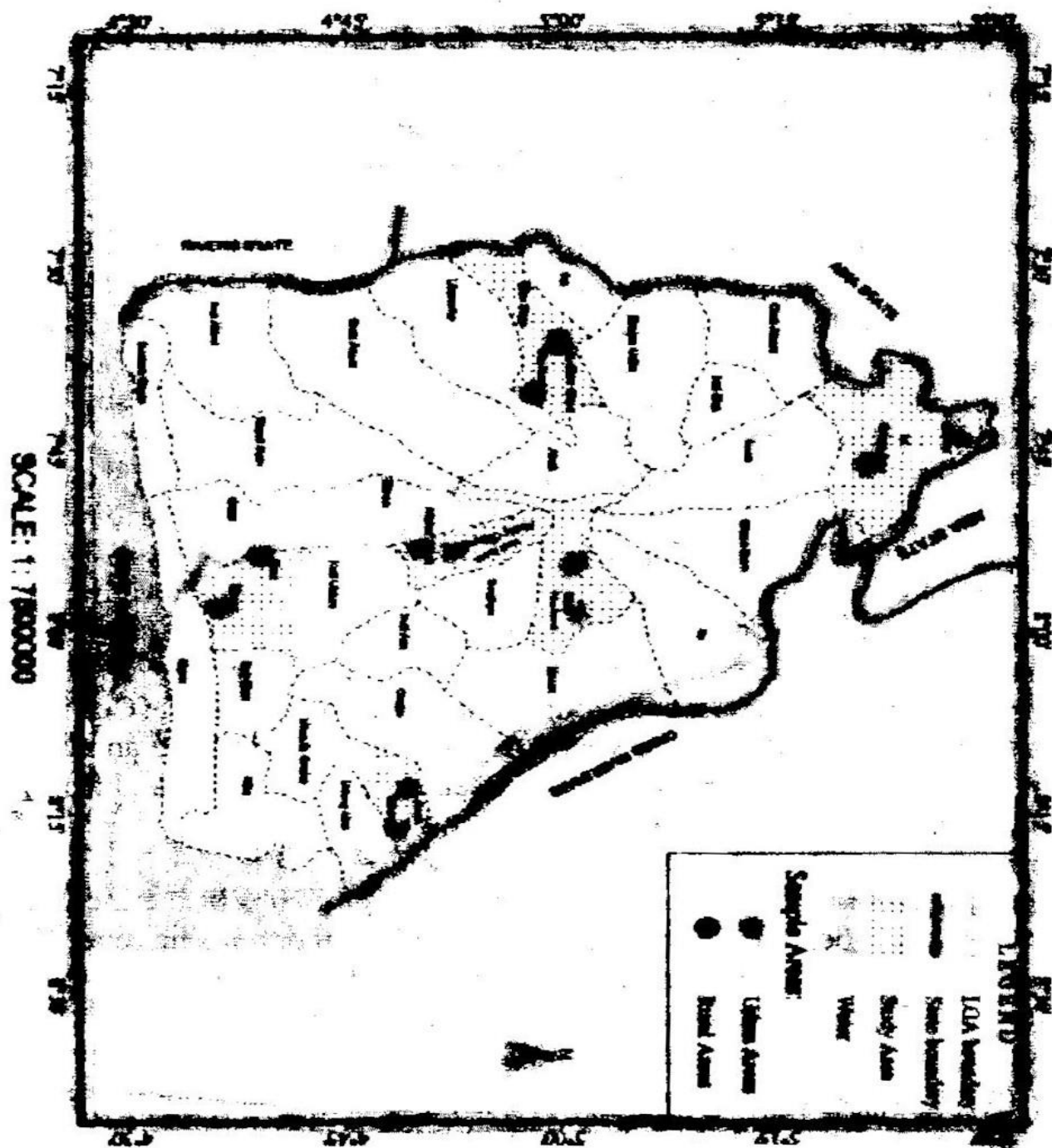


Fig. 1.1: Akwa Ibom State Showing Study Area

cost of services. It is classified by the World Bank as 'progressive development'. This implies that improvements on housing would be made at the pace dependent on the income and preference of households (Keare et al, 1983).

Affordability can be estimated by predicting housing expenditure for different income or target groups, residential zones and tenure type. The predicted expenditure values can then be used to obtain affordability consistent with the household characteristics (Arimah, 1994). Affordability, therefore, is a function of income as well as relative costs of the housing, household size, gender of household head, assets and savings, certain characteristics of the extended family and importance attached to improved housing. Nevertheless, income, housing tenure and willingness to pay are normally the dominant variable used in estimating affordability.

However, income is difficult to measure and usually impossible to record accurately. Equally knotting is the problem involved in setting realistic housing standards especially for the low-income. To overcome these hurdles, Keare *et al.*, (1984) asserts that total household income including "unearned" income is the most reliable indicator of household willingness too pay for housing. To estimate the capacity to pay much reliance is on a percentage of income (between 20-30%) or measured monthly rents whether actual or implicit a beneficiary must be charged. For this study actual and / or implicit rents were used from which the percentage of income used was calculated for the state.

METHODOLOGY

In the quest to determine the housing affordability level of the low-income earners in Akwa Ibom State within the concept of the National Housing Fund Loan, three interrelated objectives were set for thorough analysis. One of the objectives was to determine the number of households who can afford the loan and proffer reasons for these peculiarities, information on these were collected with the aid of a household survey questionnaire structured of find out income, housing tenure, household assets, etc. Using the random table, six local government areas were chosen for the study.

Six Local Government Areas (Fig. 1) were randomly sampled. Each Local Government Area was then stratified into urban and rural areas and one settlement selected from each stratum. A total of 12 locations from each of the randomly sampled Local Government Areas of Uyo, Oron, Eket, Nsit Ibom, Etim Ekpo and Ini were selected for the study. For the urban areas, Uyo metropolis, Oron urban, Eket urban, Utu Etim Ekpo, Odoro Ikpe and Afaha Offiong respectively were selected. While Ekpri Nsukara, Eboma,

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Utu-nsekhe, Afaha Nsit 1, Otioro and Obron were selected as representatives of the rural areas of the Local Government Areas. Each of the urban areas was further stratified into low, medium and high-income substrata. In the rural areas, there was no further stratification because of the homogenous nature of the areas.

In the urban areas the streets were randomly selected to reflect the income levels. The list of all buildings on the selected streets was compiled and sampled building were chosen using the random number table. In the villages (rural) cluster sampling was used to select required units.

A total of 450 households were sampled within the selected streets and cluster units for detailed investigation in the six Local Government areas. There was a complete enumeration of the households in the buildings selected.

To calculate the affordability of each household, the income multiplier (im) was used. This is expressed as:

$$im = \frac{2ni}{200 + r(n-2)}$$

Where:

- n = number of years of repayment
- i = percentage of income as repayment
- r = interest rate on loan

To determine the cost of affordable house of each income group, the following equation was used.

$$Hc = im \times t$$

Where:

- Hc = House cost
- t = total income (salary and allowances)

For the computation of the repayable amount on National Housing Fund Loan the following basic equation for subsidy calculation by the Federation Mortgage Finance was used. This is given as:

$$L = \frac{a(1-r)^n}{R^n(1-r)}$$

Where:

- L = loan amount
- a = repayment rate per annum

$$n = \text{amortization period (years)}$$

$$r = 1 + x, \text{ where } x = \text{rate of interest}$$

From the above equation, to calculate for 'a' the following holds:

$$a = \frac{L \times r^n (1-r)}{(1-r^n)}$$

RESULTS AND DISCUSSION

1. INCOME LEVEL: Income level is a surrogate of the economic well being of a household. It determines access to institutional and other opportunities, which make humanly significant activities and functions possible (Ebong, 1986). The experience in the State demonstrates gross inadequacy in the distribution of this vital index of wealth. Table 1 shows that 68 (17.9%) of respondents earn above 6,000.00 per month with 42 (19.4%) and 26(15.9%) in urban and rural areas respectively. Rather, the state is dominated by respondents earning N3,000-N6.000 with 76 (36.% and 59(36.2%) for urban and rural areas respectively. This implies that the affordability of many households in the state is more likely to be low.

Table 1: Distribution of Household Income

Income	Urban		Rural		Total	
	Frequency	%	Frequency	%	Frequency	%
Below 3000	96	44.2	78	47.8	174	45.8
3000 - 6000	79	36.4	59	36.2	138	36.3
Above 6000	42	19.4	26	15.9	68	17.9
Total	217	100	163	100	380	100

Source: Field survey, 1998

II HOUSEHOLD ASSETS: Inadequate possession of physical assets such as land, building (s), vehicles (s) etc is one of the variables for assessing personal income (World Bank 1996). Also to benefit from the NHF Loan, a contributor must possess a land or building. From table 2, only 36 (16.6%) in urban and rural respectively own land while as high as 85(39.2%) and 57(35%) households sampled did not possess any asset and 46(12.1%) had only building(s). This implies that only very few household can have access to the NHF or any housing loan or credit facilities. This is because at present, these landed properties are acceptable collateral for the NHF Loan.

The skewed nature of land ownership between rural and urban dwellers should be noted. The result reveals that more rural dwellers own land whereas fewer numbers of urban dwellers own this important asset.

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This situation could be explained from several perspectives. Firstly, rural dwellers are necessarily indigenes who, of course belong to land owning families (no matter the size of the plots). Thus, most of them are likely to own land. Customarily, land ownership is an inalienable right of the rural men of Akwa Ibom State.

Secondly, majority of the urban dwellers are migrants who often must purchase land to own one. Given the high cost of plots of land in urban Nigeria generally and the low income and savings, many urban dwellers may find it difficult to have land. This also has serious implications for housing ownership (see table 2).

Table 2: Distribution of Major Household Assets

Tenure	Urban		Rural		Total	
	Frequency	%	Frequency	%	Frequency	%
Land	36	16.6	76	46.6	128	33.6
Building	21	9.7	23	14.1	46	12.1
Vehicle	58	26.7	4	2.5	50	13.2
Equipment	17	7.8	3	1.8	17	4.5
No Asset	85	39.2	57	35	139	36.6
Total	217	100	163	100	380	100

Source: Field survey, 1998

III HOUSING TENURE: The housing tenure reflects the percentage of housing ownerships in a place. Agbola (1990) reported that the quest for housing ownership can only be met or satisfied by small fraction of residents in each country. This is consistent with the situation in Akwa Ibom State. As shown in table 3, 62.3% and 47.2% of the sampled households rent the apartment they live in while 20.7% and 42.9% are owner-occupiers buildings in the urban and rural areas respectively. 42.9% for rural areas is quite high but considerations should be made on the quality of such houses. This shows a very low housing ownership in the state.

Table 3: Housing Tenure

Household	Urban		Rural		Total	
	Frequency	%	Frequency	%	Frequency	%
Rent	168	77.42	97	59.51	265	69.74
Free	24	11.05	22	13.50	46	12.11
Owner Occupier	12	5.53	40	24.54	52	13.68
Institutional	13	5.99	4	2.45	17	4.47
Total	217	100	163	100	380	100

Source: Field survey, 1998

IV INVESTMENT PRIORITY: Table 4 measures the people's perception of housing shortage in Akwa Ibom State and also reflects their priority in terms of investment. It shows people's willingness to pay for or build and the importance attached to better housing. As shown in the table, 55.7% and 22.8% of the sampled households are willing to invest in housing in urban and rural areas respectively. That the number of people willing to invest in transport in rural areas is next in ranking raises a question on the transportation situation in the countryside of the State.

Generally, one would expect the ruralites not to have serious need for transportation facilities since they would sell their farm produce either at farm gate, home or village markets. The high priority rating of transportation could arise from the deplorable situation of rural roads in the state, which has been reported to hinder evacuation of farm produce from the rural to urban areas. This may have created high demand for means of transport and therefore, the desire to invest in the area.

Table 4: Investment Priority on Basic Needs

Basic Needs	Urban		Rural		Total	
	Frequency	%	Frequency	%	Frequency	%
Education	22	10.2	48	29.72	70	18.4
Politics	10	4.6	4	2.28	14	3.7
Housing	121	55.7	37	22.8	158	41.6
Transport	64	29.5	74	45.2	138	36.3
Total	217	100	163	100	380	100

Source: Field survey, 1998

On the basis of information and the data obtained on the NHF Loan from Federal Mortgage Bank and Akwa Savings and Loan Ltd, attempt is made to estimate how many households in the State can afford the NHF loan. The housing affordability ('a') was estimated using the affordability equation earlier presented in the methodology.

Thus:

$$a = \frac{L \times r^n (1-r)}{(1-r^n)}$$

L = 500,000.00

n = 25 years

r = 1 + 9%

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$$\begin{aligned}\therefore a &= \frac{500,000 \times (+0.9)^{25} (1 - 1 + 0.9)}{1 - (1 + 0.9)} \\ &= \frac{500,000 + 0.776}{1 - 8.623} \\ &= \text{N } 50,898.59 \text{ per annum, that is N4,241.50 monthly.}\end{aligned}$$

This means that an NHF beneficiary will repay monthly above N4,241.50 or N50,898.59 per annum. Thus he/she will be expected to pay N1.3 million (N1,272,464.75) at the end of the 25 years

To determine how many households or individual in the state can afford the loan we must first calculate for a reference household earning N5,000.00 monthly.

Monthly income	=	N5,000.00
r	=	9% or 0.9
n	=	25years
i	=	N4,241 (that is, 84.8% of his income)

If this household has been contributing 2.5% or N125.00 monthly at 12% interest rate to the NHF, it can assume to have the following:

From January, 1993 to June, 1997

Interest = N15.00 monthly on contribution

Contribution in one year = N (12 x 125 + 180)
= N 1, 680.00

In five years (that is, 1992 – 1997)

= N (1680 x 5)

N 8, 400.00 on the average

Within the next 5 years or moratorium, the household will contribute N16,800.00. By the year 2002 AD the total loan amount interest to be paid would be N483,200.00 (N500,000 – N16,800). In the year 2002 AD when the household will start repayment, the monthly repayment amount will be N4, 099.03 or 81.98% of its monthly income.

NOTE: We are assuming that the households' monthly income will remain constant throughout the duration of the mortgage.

In the State how many households can afford this NHF loan? The results on distribution of household income table 1, shows that only 17% with income above N6,000.00 per month may afford. Household with N6,000

RECOMMENDATIONS AND CONCLUSION

From the above, it may be worthwhile to advise that instead of embarking on housing production, the policy which has recorded failure over the years, the government should rather play an enabling role in housing production for the low-income. Since land ownership or Certificate of Occupancy is the main collateral for a contributor to be considered for the NHF loan, the government should pursue site – and- service programme whereby serviced plots will be allocated to contributors for sole purpose of erecting residential houses. Also loans provided on the basis of affordable House Cost should be in addition to site-and-service programme for all beneficiaries to meet up with the goal of poverty alleviation.

Since housing affordability can be estimated in relation to income level of the prospective owners, efforts were made to compute Housing Cost (HC) or loan amount which are affordable to the household with income between N15,000-N40,000.00 per annum as shown in table 5. The loan worth, however, appears small but for the poor it may mean so much especially if they are organized into co-operatives and encouraged to use their personal labour.

Finally, for the NHF or any housing loan to be affordable to all contributors, especially low-income, there is need to review is stringent lending procedure. Also giving a flat rate of N500,000.00 do not make the scheme feasible, rather consideration should be given to income levels of contributors.

In conclusion, therefore, it is suggested that the current efforts on poverty alleviation be geared towards the provision of affordable housing. This is because housing as noted above is a single determinant of personal security, autonomy, comfort, well-being and status. More so, it is a crucial symbol of progress and a form of stored wealth both for the individual, state and country at large.

REFERENCES

- Agbola, T. (1990) Affordability and cost-Recovery in shelter projects: The case of Nigeria. *Third World Planning Review*, 12 (1) 59-74.
- Arimah, B. C (1994) Income Elasticity of Demand in a Sub-Saharan African Housing Market: Evidence from Ibadan. *Environment and Planning*, Vol. 26: 107-117
- Ebong, M. O. (1986). The structure of Urban Poverty in Nigeria: The Calabar Municipality Experience. *Geojournal* 12(1) 95-102.
- Grants, T. O. (1994). Occupation and Housing of Akwa Ibomites. *The Land of Promise: A compendium*. Gabumo, publications Ltd. Lagos.
- Keare, D. H and Emmanuel Jimenez (1983) *Progressive Development and Affordability in the Design of Urban Shelter Projects*. The World Bank staff working papers, No. 560, U. S. A.
- McNamara, R. S. (1975) Address to the Board of Government and President, World Bank Group, Wahsington D. C.
- Roger *et al* (1995) *What can low-income Families Afford for Housing*: Habitat International, 6(4) 441-458.
- Satterhwaite, D. (1995) The underestimation and Misrepresentation of Urban poverty, *Environment and Urbanization*, 7 (1) 3-10
- United Nation Development Programme (1996) *Human Development Report*, Working paper.
- World bank (1996) *Development in Practice Towards Environmentally Sustainable Development in Sub-Saharan Africa*. A world Bank Agenda.
- Wahab, K. A. (1995) Adequate and Affordable Housing for Nigeria in the 21st century. A paper presented at the National Workshop on **Habitat II**: in preparation for the second United Nations Conference on **human Settlements**; habitat II, Abuja, Nigeria 26-28th July, 1995.

Technical efficiency among small holder cassava farmers in Imo State

used for livestock feeding and as an industrial raw material. More than 95% of total cassava production is primarily used for human consumption, leaving only a small proportion for non-food uses (NRCRI, 1988). However, of recent much of its use has been diverted for industrial purposes and livestock feeding (Durodola, 2002). The competition between humans, livestock and industries for this major staple food crop has led to increases in the demand for cassava and its products, while its production has been on the decline in recent times. This decline in production in the presence of vast croppable land, improved varieties and techniques of production is attributed to inefficient use of resources (Onyenweaku, 1986).

As the population density increases, cassava farmers must produce more of this staple food crop than before. One of the enormous challenges in the drive to increase food to feed the growing population will be to raise productivity and efficiency of the cassava farmers.

Given the various agricultural programmes and policies implemented over the years to raise farmers' productivity and efficiency in Imo State, it then becomes imperative to quantitatively measure the current level of and determinants of technical efficiency of cassava farmers in the state. The knowledge of this would make for increased productivity which is the most efficient means of alleviating poverty and protecting the environment. A good number of studies in Nigeria have been carried out on technical efficiency of farmers. Using either the production or flexible functional forms. Such studies includes, Mijindadi and Norman (1982), Abdulkadri *et al* (1999), Ajibefun and Abdulkadri (1999), Ajibefun *et al* (1996), Mohammed and Agbo (1991), Olagoke (1991), Onyenweaku (1986), Onyenweaku and Fabiyi, (1991), Ohajianya and Onyenweaku (2001, 2002), and Onu *et al* (2000). None of these studies investigated the Technical efficiency of cassava farmers in Imo State, which is the focus of this study. This study uses a stochastic approach to determine the technical efficiency of cassava farmers. Any errors in the production decision translate into higher costs and inefficiency for the producer. At the same time, the stochastic nature of production implies that the theoretical production function is stochastic. Two distinct approaches are used. First, is the stochastic frontier approach in which stochastic production function is specified and estimated without using inefficiency effects. The derived measure of inefficiency is then related to socio economic, demographic and farm size variables.

METHODS AND DATA

Farm level data were collected on 180 small holder cassava farmers in Imo State. Imo State is made up of three distinct agricultural zones namely:

Owerri, Orlu and Okigwe further subdivided into 27 Local Government Areas (LGAs). The state is well suited for production of crops such as cassava, maize, yam and cocoyam. The bulk of the agricultural produces comes from manually cultivated rain-fed crops. Mixed cropping system of farming is common in the state, as in other parts of the country. Respondents for this study were selected through a multi-stage stratified sampling technique. The state was stratified into the existing three agricultural zones, and three LGAs were purposively selected from each agricultural zone, based on farmers' socioeconomic and geographical considerations. In each selected LGA, the list of small holder cassava farmers (cassava farmers that own aggregate cassava plots of less than 4 hectares) was compiled with the assistance of resident extension agents and key informants. Small holder farmers are those that cultivate aggregate plots of less than 4 hectares (Ohajianya and Onyenweaku, 2002). From this sampling frame, 20 small holder cassava farmers were randomly selected, given a sample size of 180 small holder cassava farmers. Data were collected with structured and validated questionnaire from the selected respondents on production resources as; land, labour, capital, planting materials, fertilizers and other inputs, as well as on variables as; age, level of education, farming experience, farm size, gender, extension visits, household size and credit availability. Data were analyzed using the stochastic frontier production model. The model has the advantage of allowing simultaneous estimation of individual technical efficiency of the respondent farmers as well as the determinants of technical efficiency (Battese and Coelli, 1995). Technical efficiency of an individual farmer is defined in terms of the ratio of the observed output to the corresponding frontier output, given the available technology.

$$\begin{aligned}\text{Technical efficiency (TE)} &= Y_i / Y_i^* \\ &= f(X_i, \beta) \exp (V_i - U_i) / f(X_i, \beta) \exp. (V_i) \\ &= \exp (-U_i) \quad \dots \quad (1)\end{aligned}$$

Where Y_i is the observed output and Y_i^* is the frontier output. Technically efficient farms are those that operate on the production frontier and the level by which a farm lies below its production frontier is regarded as the measure of technical inefficiency.

For this study, the production technology of small holder cassava farmers is assumed to be specified by the Cobb-Douglas frontier production function specified as;

$$\ln Y_i = \beta_0 + \beta_1 \ln X_1 + \beta_2 \ln X_2 + \beta_3 \ln X_3 + \beta_4 \ln X_4 + \beta_5 \ln X_5 + \beta_6 \ln X_6 + V_i - U_i \dots (2)$$

where, Y_i = Cassava output of ith farmer (Kg)

X_1 = total area of land (Ha) on which cassava were planted

X_2 = labour (Mandays)

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X_3	=	depreciated value of capital items (Naira)
X_4	=	value of planting materials (Naira)
X_5	=	quantity of fertilizer used (kg)
X_6	=	value of other inputs (Naira)
L_n	=	natural logarithm
β_0	=	intercept
β_i 's	=	Coefficients to be estimated

V_i 's are assumed to be independent and identically distributed normal random errors, having zero mean and unknown variance, $\sigma^2 V$.

The U_i 's are the technical inefficiency effects, which are assumed to be independent of V_i 's such that U_i 's is the non-negative truncation (at zero) of the normal distribution with mean, U_i and variance, σ^2 , where U_i 's is specified as;

$$U_i = \delta_0 + \delta_1 D + \delta_2 \ln Z_{1i} + \delta_3 \ln Z_{2i} + \delta_4 \ln Z_{3i} + \delta_5 \ln Z_{4i} + \delta_6 \ln Z_{5i} + \delta_7 \ln Z_{6i} + \delta_8 \ln Z_{7i} \dots (3)$$

Where,

U_i	=	technical efficiency of the ith farmer
D	=	dummy variable for gender of the farmer, where one denotes male and zero is female
Z_1	=	Age of ith farmer (years)
Z_2	=	level of education of the ith farmer (years)
Z_3	=	farming experience of the ith farmer in cassava production (years)
Z_4	=	farm size of the ith farmer (Ha)
Z_5	=	extension contact (No. of visits)
Z_6	=	household size of the ith farmer (no of people)
Z_7	=	amount of credit available to the ith farmer (naira)

δ_i 's are unknown scalar parameters to be estimated

RESULTS

Summary Statistics

Table 1 presents the summary statistics of variables used in the stochastic frontier production function. The cassava farmers have relatively small farm holdings ranging between 0.42 and 3.25 hectares.

Table 1. Summary statistics for variables in the stochastic production model for the small holder cassava farmers.

Variables	Mean	Minimum	Maximum
Cassava output (Kg)	6206.2	1807.3	18760.9
Land (Ha)	2.84	0.42	3.25
Labour (Mandays)	123	21	196
Capital (Naira)	2849.7	906.5	4158
Planting materials (Naira)	3064.9	1450	7495
Fertilizers (kg)	316.9	190.2	812.7
Other inputs (Naira)	305.6	146	1649
Age (years)	33	29	55
Education (years)	3.22	0	12
Farming experience (years)	15.4	3	23.6
Extension (No of visits)	2.9	1	6.7
Household size (no of people)	5	2	11
Credit (naira)	26159.4	5000	50000

Source: Computed from survey data, 2003

Maximum Likelihood Estimates

Based on the models, the ordinary least squares (OLS) estimates provided a similar slope parameters with the maximum likelihood estimates (Table 2) which shows an upward shift of average production, and this is consistent with the findings of Bravo-Ureta and Prineiro (1993). All parameter estimates of the production factors, except land and capital are statistically significant at either 5 or 1 percent. The sum of the variable coefficient for the OLS is 1.78 while that of MLE is 1.98, implying increasing returns to scale.

The ratio of standard error of U (du) to that of V (dv) called lamda is given as 1.47 while gamma is derived as 0.83, implying that 83% of the total variation on cassava output is due to technical inefficiency.

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Table 2. Maximum Likelihood Estimates of the Parameters of the Stochastic Frontier Production Model

Variables	Parameter	Coefficient (OLS)	Coefficient (MLE)
Production Factors			
Constant	β_0	6.39 (3.27)**	8.19 (4.12)**
Land	β_1	0.22 (4.13)**	0.24 (4.43)**
Labour	β_2	0.34 (2.91)**	0.38 (3.11)**
Capital	β_3	0.24 (1.23)	0.29 (1.67)
Planting Materials	β_4	0.54 (3.26)**	0.59 (3.46)**
Fertilizer	β_5	0.31 (2.43)*	0.34 (2.55)*
Other inputs	β_6	0.13 (2.27)*	0.14 (2.49)*
Inefficiency effects			
Constant	δ_0	-8.15 (-3.02)**	-10.22 (-4.19)**
Gender	δ_1	-0.65 (-1.11)	-0.82 (-1.47)
Age	δ_2	0.44 (1.06)	0.57 (0.92)
Education	δ_3	-0.39 (-3.18)**	-0.43 (-3.66)**
Farming experience	δ_4	-0.21 (-2.67)**	-0.33 (-3.12)**
Farm size	δ_5	0.18 (1.16)	0.25 (1.35)
Extension	δ_6	-0.53 (-3.08)**	-0.61 (-2.96)**
Household size	δ_7	0.42 (1.32)	0.39 (1.16)
Credit	δ_8	-0.47 (-3.39)**	-0.52 (-3.46)**
Diagnostic statistics			
Likelihood ratio			-112.41
Sigma squared (σ^2)			37.09 (4.17)**
Gamma (γ)			0.83 (3.27)*
Lamda (λ)			1.47 (4.18)**

t-ratios are in parentheses. * significant at the 0.05 level, ** significant at the 0.01 level.

Source: Summarized from Computer Output, 2003.

Technical Efficiency Estimates

Given the specification of the Cobb-Douglas stochastic frontier model in equation (2), the estimated technical efficiency vary widely among the investigated cassava farmers, with minimum and maximum values of 0.09 and 0.95 respectively and mean technical efficiency value of 0.56 (Table 3). The results of the inefficiency model reveal that level of education, farming experience, extension contact and credit use are significant determinants of technical inefficiency at the 1% level, implying that these variables significantly affect the level of technical efficiency of the cassava farmers. Age of farmer, farm size and household size did not significantly influence technical inefficiency. The negative coefficients of level of education, farming experience, extension and credit imply that an increase in any of these variables would lead to increase in the level of technical efficiency. An increase in the value of the variables with positive coefficients would lead to increase in the level of technical efficiency. The coefficient of gender is negative and not statistical significant at 0.05 level, suggesting that male farmers are equally technically efficient with female farmers in cassava production.

Table 3. Distribution of Cassava farmers by their Technical Efficiency Estimates

Technical Efficiency Range	Frequency	Relative Frequency
0.09 - 0.29	10	5.6
0.30 - 0.50	52	28.9
0.51 - 0.71	93	51.6
0.72 - 0.92	25	13.9
Total	180	100

Mean 0.56

Source: Computed from Survey data, 2003.

The distribution of the technical efficiency in Table 3 shows that majority of the farmers had technical efficiency skewed to the right in the 0.51 and 0.71 range, representing 53% of the sample farmers. The wide variation in technical efficiency estimates suggest that most of the farmers are inefficient in the use of resource inputs and there still exists opportunities for improving current level of technical efficiency.

CONCLUSION

Cassava production has been on the decline in Imo State for about a decade now, despite various Government agricultural programmes and policies implemented over the years to raise farmers' productivity and

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efficiency. This study investigated the level of technical efficiency of the cassava farmers in the State using the stochastic frontier approach. The study found that most of the cassava farmers are inefficient in the use of the resource inputs and that there still exists opportunities for improving the current level of technical efficiency of the farmers. Agricultural policy makers should take into consideration variables as level of education, farming experience, extension contact and credit availability that significantly affect technical efficiency, when formulating policies aimed at improving productivity and efficiency of cassava farmers in Imo State.

REFERENCES

- Abdulkadri, A.O, Ajibefun, I.A. and Ogundare, F.N (1999). "Technical Efficiency of Small Scale Oil Palm Processors, in Nigeria". *American Journal of Agricultural Economics*, vol. 81, no.5, pp.1328.
- Ajibefun, I.A; Battese, G.E and Daramola, A.G (1996). "Investigation of Factors Influencing the Technical Efficiencies of Small holder croppers in Nigeria. CEPA Working Papers No.10/96, Department of Econometrics, University of New England, Armidale, Australia, pp.19.
- Ajibefun, I.A; and Abdulkadri A.O. (1999). "An Investigation of Technical Inefficiency of Production of farmers under the National Directorate of Employment in Ondo State, Nigeria". *Applied Economics Letter*, Routledge, London. Vol.6, pp.111-114,
- Amon, B.O and Adetunji, S.A (1993). "Response of maize, yam and cassava to fertilizers in a rotation experiment in the savannah zone of Western Nigeria " *Niser Agric. Publication* 10 pp. 91 –105.
- Battese, G.E. and Coelli, T.J (1995). "A Model for Technical Inefficiency Effect in a stochastic Frontier Production Function for Panel data". *Empirical Economics*, vol.20, pp.325-332.
- Bravo-Ureta, B and Pinheiro, A.E. (1993). "Efficiency Analysis of Developing Country Agriculture. A Review of the Frontier Function Literature". *Agricultural Resource Economics Review*, vol.22, pp.88-101.
- Cock, J.H (1985). *Cassava: New Potential for a Neglected Crop*. Westview Press, Boulders, Colorado.
- Durodola, E (2002). *Enhancing Agricultural Resource base for youth employment, industrial development and export*, Proceeding of the 35th annual conference of the Agricultural society of Nigeria. University of Agriculture, Abeokuta, Nigeria. Pp.42 – 44.

Technical efficiency among small holder cassava farmers in Imo State

- Mijindadi, M.B and Norman, D.W (1982) Determinants of Technical Efficiency in Traditional farms in Zaria Area of Northern Nigeria. *Journal of Agricultural Economics*, vol.11, no.1, pp.41-45.
- Mohammed, I and Agbo, C.I. (1991). **Resource Use efficiency** in large scale irrigated wheat and maize production. *Nigerian Journal of Basic and Applied Science*, vol.3:pp71-78.
- NRCRI (1988) Annual Report. National Root Crops Research Institute Umudike, Nigeria.
- Ohajianya, D.O and Onyenweaku, C.E. (2001). **Gender and Relative Efficiency** of rice farmers in Ebonyi State, Nigeria. *International Journal of Agriculture and Environment*, Umudike, Nigeria. Vol.2, no.1, pp.380 – 385.
- Ohajianya, D.O. and Onyenweaku, C.E. (2002). Farm size and Relative Efficiency of Rice Farmers in Ebonyi State, Nigeria. *Journal of Association of Modelling and Simulation Techniques in Enterprises*, France vol.2, no.2, pp.25-30.
- Olagoke, M.A (1991). Efficiency of Resource Use in Rice Production systems in Anambra State, Nigeria. In *Issues in Africa Rural Development* (editors); C.R. Doss and C. Olson, Winrock International, Arlington, Virginia, U.S.A. pp.319 – 342.
- Onu, J.I; Amaza, P.S. and Okunmadewa, F.Y (2000). Determinants of Cotton Production and Economic Efficiency in Nigeria. *African Journal of Business and Economics*.
- Onyenweaku, C.E. (1986). “Resource Use Efficiency in food Production in Nigeria”. A case study of Anambra – Imo River Basin Development Authority. *Journal of Applied Science in Southern Africa*, vol.2, no.1 pp.15 – 20.
- Onyenweaku, C.E. and Fabiyi (1991). Relative Efficiency of Co-operative and Individual farmers in food production in Imo State. *AMSE Transactions*, vol.8, no.4, pp.23-32.