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# 46- Persistence of Small Farms and Associated Poverty Levels in Nigeria: Case for Commercialization of Small Farms.

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## Abstract

Small farmers are one of the more disadvantaged and vulnerable groups in Nigeria. Studies shown that majority of people living in absolute poverty can be found on small farms with half in this group undernourished and three-quarters of small farmer's children malnourished. Small farms still dominate agricultural practices in terms of numbers of producers of agricultural commodities. It has been observed that, 74.5% Nigerians population is rural and derived their livelihood from small farms. The question is that these small farms are they going to be a prospering farms or vice-versa? This is the rationale behind this study. Specifically the study looks into heterogeneity in circumstances and diversity in rural livelihoods, the growth of small farms, poverty levels and institutional development facilities available for them was all explore. The index of heterogeneity at 29.1 indicated growth of small farms and about 42% of the respondents were categorized as very poor. The study identified that smallness of farms is not correlated to poverty but the traditionally tried and sometimes fool-proof farming systems. Size of the farms is not the problem, but the operationalization. Evidence from China and India revealed that smallholders are better off in times of productivity. These countries are better in terms of fertilizer consumption, tractor per 100 sq. Km of arable land use and agriculture value added per worker. Conversely, small holder and traditional farmers in Nigeria still use rudimentary production techniques, limited use of improved planting materials and fertilizer consumption, thus suggesting for commercialization of small farms.

Keywords: Heterogeneity index, Poverty differential, Institutional development, Structural constraints, Nigeria

## INTRODUCTION

The debate on the relationship between small farms and poverty in Sub-Saharan Africa (SSA) has gone through a complete circle (Spencer, 2002; Poulton *et al*, 2005; Lipton, 2005; Awokuse, 2011; Apata *et al*, 2011; Krishna, 2012). Evidence from literature and past studies have identified this region as one of the world's poorest, and the region's economies are heavily depended on agriculture as the primary source of income and food. Researchers have also shown that most of the poorest households in SSA are found in agriculture (Ikpi, 1989; Okunmadewa, 2002; Spencer, 2002; Alayande and Alayande, 2004; Apata, 2006; Makombe, *et al*, 2011). However, these farmers play an important role for food security with an average farm size ranges between 0.7-2.2 hectares. Among all the regions of the world, Sub-Saharan Africa (SSA) has the highest levels of poverty and hunger and the worst human development outcomes (WDR, 2008). Facts have shown that while proportion of the population living in poverty in smallholder farming is on the decrease in Asia, the proportion has increased in SSA (Johannesburg Summit, 2002; Chen and Ravallion, 2004, Omoke, 2007; Hassine *et al*, 2010). The persistence and even deepening of a type of small farming that is getting smaller all the time and that demonstrates an even greater orientation toward low-level subsistence than was the case 20 or 30 years ago should be of great concern.

Several studies in Nigeria have also investigated the persistence of small farms and poverty levels. Most of these studies were conducted at the Local Government level or at the State level, and these studies are useful because they help to identify the structure of income accruing to these farms. However, their application for policy formulation at the national level is limited due to small scope. This study therefore seeks to use national data, and will add to the already existing body of knowledge on agriculture and poverty levels. The knowledge of why small farms persisting and increase poverty will help to formulate policies that will ensure its reduction. Also the study will attempts to go a step further by using the regression-based decomposition to measure the factors that influences persistence in small farms as well as the addictive of socio-economic characteristics of the farming households. Thus, the outcome of this study will assist Nigerian policy makers particularly those in agricultural sector to select the best option for ensuring rapid economic growth and development of small farms, reduction of poverty levels amidst diverse competing options.

The size-distribution of farm holdings as defined by previous studies and evidenced in literature as; Small-scale farms, ranges from 0.10 to 5.99-hectares, medium scale, 6.0-9.99 and large scale above 10 hectares. These classes constituted 84.49 percent, 11.28 percent and 4.23 percent respectively in 2004 (NBS, 2006). When judged by international standards, whereby all farms less than 10.00 hectares are classed as small, then 95.77 percent of all farm holdings in Nigeria as at 2004 (or a total of 46.08 million holdings) must be classified as small-scale farms, while the remaining 4.23 percent of all holdings (or 2.033 million holdings) as medium-scale.

Table 1 revealed that marginal and small farms in Nigeria constitute about 80 percent of all the total farm holdings. Disaggregation analysis show that less than 2.5 percent of these farms

are under irrigation. A comparative analysis of the agricultural situation in Nigeria with what prevails in some selected developing and developed countries are presented in Table 2. The Table shows clearly how Nigerian small farms lag behind in terms of agricultural performance in the international community. Indicators used show that selected countries are ahead of Nigeria in terms of agricultural development. The low yield in Nigeria is attributable to low-level of farm technology employed and productivity (Table 2). The low agricultural labour productivity in Nigeria relative to other countries can be traced to the predominance of the use of traditional manual technology in which agricultural workers rely mainly on crude traditional tools and equipment in addition to limited use of improved planting materials and fertilizer consumption.

**Table 1: Farm Size Demographics, Nigeria**

| **Category** | **Size (ha)** | **Average Size (ha)** | **Total Holdings (%)** | **Area (%)** | **Irrigated Area (%)** |
|---|---|---|---|---|---|
| Marginal Farms | < 1 | 0.23 | 56 | 23 | 0.3 |
| Small Farms | 1-2 | 1.42 | 24 | 36 | 2.2 |
| Semi-medium | 2-4 | 2.69 | 11 | 21 | 21.8 |
| Medium | 4-10 | 4.87 | 06 | 11 | 33.7 |
| Large | > 10 | 13.51 | 03 | 9 | 42.2 |
| **All farms** | | **2.25** | **100** | **100** | **100.0** |

Source : Federal Ministry of Agriculture and Water Resources, F.C.T. Abuja, 2009
: National Bureau of Statistics, Abuja, Nigeria, 2009 (www.nigerianstat.gov.ng)
:Akinyosoye, 2006 : ANAP, 2005 :Olayide *et al*, 1980

**Table 2: Cereals Yield, Agricultural Input Utilization, Average Farm Size and Share of Farms under 2 Hectares (%) in Nigeria and other Selected Countries, 2004**

| Country | Cereals Yield 1000Tonnes & Share in the world (%) | Fertilizer Consumption (Tonnes/Ha) | Tractor per 1000 Agric. Worker | Tractor Per 100 Sq.Km. of Arable land | Agric. Value Added Per Worker (US$) | Average Farm Size in Hectares | Share of Farms under 2 Hectares (%)* |
|---|---|---|---|---|---|---|---|
| Nigeria | 22783 (1.00) | 6.1 | 2.0 | 11.0 | 672 | 1.2 | 74.5 |
| South Africa | 12352 (0.54) | 52.1 | 53.0 | 59.0 | 3866 | 22.2 | 24.52 |
| Brazil | 63812 (2.81) | 109.9 | 59.0 | 151.0 | 4356 | 35.6 | 15.40 |
| Argentina | 34212 (1.51) | 32.2 | 191.0 | 112.0 | 10243 | 43.2 | 4.53 |
| Indonesia | 65314 (2.88) | 141.5 | 1.0 | 39.0 | 736 | 1.1 | 10.08 |
| Malaysia | 2268 (0.10) | - | 24.0 | 238.0 | 6638 | 34.4 | 6.28 |
| Netherlands | 1754 0.08) | 537.4 | 596.0 | 1712.0 | 53,819 | 48.1 | 2.15 |
| United Kingdom | 22030 (0.97) | 345.4 | 914.0 | 810.0 | 34,938 | 55.1 | 5.27 |
| Canada | 52684 (2.32) | 58.2 | 1717.0 | 156.0 | 36,597 | 97.4 | 2.28 |
| USA | 389066 (17.4) | 112.7 | 1546.0 | 271.0 | 47,146 | 157.6 | 1.75 |
| China | 413166 (18.20) | 55.3 | 58.3 | 225.2 | 12,010 | 0.4 | 98.0 |
| India | 232360 (10.23) | 43.3 | 46.1 | 156.3 | 9418 | 2.3 | 80.0 |

Source: UNDP (2006) World Development Report, Washington, D.C.
National Bureau of Statistics (www.nigerianstat.gov.ng)
World Economic Outlook (WEO) database, April 2008

:* Calculated by author based on FAO Production Year Book (2008, and 2012)

Table 3 revealed that those households in agriculture constitute the poorest and are mostly found in the rural areas. In addition, neglect of rural infrastructure has also increased the cost of doing business, as Nigeria's rural road network is one of the least developed in sub-Saharan Africa (Akinyosoye, 2006). The poor tend to live in isolated villages that can become virtually inaccessible during the rainy seasons. When there is a post-harvest marketable surplus, it is not always easy to reach the markets. Limited accessibility has also cut off small-scale farmers from sources of inputs, equipment and new technology. Crop yields are low because farmers lack these inputs. In particular, inadequate access to fertilizer is a real problem in many parts of the country where farmers have to cope with diminishing soil fertility. The situation is aggravated by the fact that many farmers have access only to small parcels of land for cultivation.

Facts from Table 2 revealed that China has about 98 percent shares of farms less than 2 hectares. So also, India with about 80 percent, compare to Nigeria of 74.5 percent. These countries are better in terms of fertilizer consumption, tractor per 100 sq. Km of arable land use and agriculture value added per worker (Table 2). These evidenced thus show that size of the farms is not the problem, but the operationalization. Why this poor state of agricultural development in Nigeria? Past studies have shown that failure of public sector administration in the agricultural management of the country may be partly responsible for the sub-optimal performance (ANAP, 2005). It is obvious that public institutions and programmes have not done less for Nigeria small farmers than in China, India, Argentina, South Africa, European countries, the United States which has one of the best agricultural public support system in the world (Akinyosoye, 2006).

**Table 3 Relative Poverty Trend By Occupation of Head of Household**

| **Occupation** | **1980** | **1985** | **1992** | **1996** | **2004** |
|---|---|---|---|---|---|
| Professional and Technical | 17.3 | 35.6 | 35.7 | 51.8 | 34.2 |
| Administration | 45.0 | 25.3 | 22.3 | 33.5 | 45.3 |
| Clerical and Related | 10.0 | 29.1 | 34.4 | 60.1 | 39.2 |
| Sales Workers | 15.0 | 36.6 | 33.5 | 56.7 | 44.2 |
| Service Industry | 21.3 | 38.0 | 38.2 | 41.4 | 43.0 |
| **Agriculture and Forestry** | **31.5** | **53.5** | **47.9** | **71.0** | **67.0** |
| Production and Transport | 23.2 | 46.6 | 40.8 | 65.8 | 42.5 |
| Manufacturing and Processing | 12.4 | 31.7 | 33.2 | 49.4 | 44.2 |
| Others | 1.5 | 36.8 | 42.8 | 61.2 | 49.1 |
| Students and Apprentices | 15.6 | 40.5 | 41.8 | 52.4 | 41.6 |
| All Occupations | 27.2 | 46.3 | 42.7 | 65.6 | 54.4 |

Source: National Bureau of Statistics, 2009 (www.nigerianstat.gov.ng)

The above analysis therefore indicates that small farms are persisting and poverty levels increasing. Despite the problems and challenges confronting small farms in Nigeria, they have remained a significant food provider for majority of Nigerians and significant value of agricultural exports (Oyeranti and Olayiwola, 2005; NBS Economic indicators, 2007; Sanusi,

2010; NBS, 2011). The question is that; are these small farms going to be persistence and a parking lot for the poor or vice-versa? This is the rationale behind this study. The study will look into heterogeneity in circumstances and diversity in rural agriculture, the persistence of small farms, poverty levels and institutional development and facilities. In addition, studies have shown that there is a rising share of farmland in small farms among the poor and the evidence on how output per hectare varies with farm size. In addition, the levels of operation, of small farms are efficient and competitive. The question is what factors influence this decision? And how can research lead to more of the helpful policy that can influence growth in small farms and hence poverty reduction?

## METHODOLOGY.

### Area of Study

Nigeria is one of the Sub-Saharan Africa (SSA) nations located approximately between latitude 4° and 14° North of the Equator, and between longitudes 2° 2' and 14° 30' East of the Greenwich meridian in the western part of Africa with total geographical area of 923,768 square kilometres and an estimated population of about 140 million (2006 estimate) (FRN, 2007). The country has 36 states plus the Federal Capital Territory (FCT)-Abuja. Nigeria shares its boundary with the Republic of Benin to the west, the Niger republic to the north, the republic of Cameroon and Chad republic to the east. Nigeria has a highly diversified agro ecological condition, which makes possible for the production of a wide range of agricultural products.

### Sampling Procedures

Data for this study came from Nigerian living Standard Survey (NLSS) and National Consumer Survey collected for two periods 1994 and 2004. The selection of the sample size was based on a two-stage stratified sampling with the 1$^{st}$ stage involving clusters of housing units called Enumeration areas (EAs), and the 2$^{nd}$ stage involves the housing unit. The sample size is determined from 120 EAs selected in each of the 36 states of the nation and Abuja which is the Federal Capital Territory (FCT). Out of these, 4 housing units were selected randomly from each of the EAs. A total of 480 households were randomly chosen in each of the state, implying that 17,280 households were selected in all (FOS, 1994 and 2004). Nonetheless, data used in this study were from 9550 respondents' collected in each of the survey administration (there is however efforts in keeping track of the same households) and were selected from all the six zones in Nigeria. These are those whose income sources were provided, information on livelihood activities, livelihood diversification activities and other relevant information that are useful to the study. However, those households with insufficient information were removed, leaving us with 8264 sample sizes that were used for this study.

### Method of Data Analysis

From a methodological point of view, this paper uses a linear specification similar to that used in the classic Lillard and Willis (1978) study and Sosa-escudaro (2006) to capture the factors influencing small farms persistence. A methodological contribution of this paper is to

show that this particular specification is a valid restriction of a general dynamic panel linear model. The main advantage of adopting this simplification is the considerable savings in terms of degrees of freedom arising from the fact that the dynamic covariance structure can be handled by a simple method-of-moments (Greene 2000). The paper uses the framework proposed by Bera *et al* (2001) and Sosa-escudaro (2006) to formally test the relevance of the dynamic covariance model.

Income here is used to measure the flow of benefits accrues to households from small farms and non-farm livelihood activities. These incomes are thus used to determine such household poverty levels. Friedman and Kuznets (1954) first proposed the decomposition of the determination of incomes over time into permanent and transitory components, which became later embedded in Friedman's permanent income hypothesis. Since then the intergenerational income mobility literature has focused on the role of assets and their returns to explain long-term income persistence (Newhouse, 2005; Jayne *et al*, 2005).
In this paper attempts are made to examine the question of persistence of small farms income and factors influencing this. Also poverty levels of the small farms holder are examined by exploiting the advantages of the longer-span of panel data (1994-2004) using poverty decomposition of Foster-Greer-Thorbecke (1984).

**Poverty Decomposition**
Poverty decomposition measure that was used for this study was borrowed from the work of Foster-Greer-Thorbecke (FGT) (1984). The FGT weighted poverty index was considered because of its additive decomposability into subgroups. The FGT measure the $l^{th}$ subgroup ($P_{ij}$) and is given below.

$$P\alpha = \frac{I}{N}\sum_{I=1}^{q}\left(\frac{Z - Yi}{Z}\right)^{\alpha} \quad (1)$$

Where Z = poverty line
Yi = Income of the household i ( i = 1, 2, …., q)
q = No of household below the poverty line
N = total number of sampled households
$\alpha$ = parameters of the FGT index ($P\alpha$). a > 0 and it can take three values of 0,1 and 2. These values give different implications.

This FGT measure for the whole group or population was obtained using

$$P\alpha \sum_{i=1}^{m} P\alpha i \, ni/n \quad (2)$$

Where $P\alpha$ is the weighted poverty index for the whole group,
m is the number of subgroups and
n and ni are the number of households in the whole group and $i^{th}$ subgroup respectively.
The introduction of K is to capture each sub-group's weighted poverty index and this is measure as

$$K = ni \, P\alpha i / nP\alpha \quad (3)$$

The poverty line was obtained using two-thirds of the mean per capita income of the population.

**Regression Model**

This section discusses a convenient simplification that, under valid restrictions, can be informative about the questions raised by this paper while using the available information efficiently. Let y*i,t* denote income of household *i* in period *t*. When incomes are stationary, a simple measure of short term persistence is the (unconditional) correlation of incomes between adjacent periods, *Cor(yi,t, yi,t-1)*. A standard specification that accommodates all these factors is the linear dynamic equation:

$$yi = \gamma\, yi,t-1 + xi,t'\, \beta_0 + xi,t-1'\beta_1 + \mu i + \varepsilon it \qquad (4)$$

where *i=1,…,N* households, and *t=1,…,t,* periods, *xi,t* is a *K* vector of observed exogenous determinants of income which include farm size, μi is a zero mean random variable representing unobserved, family specific terms, and εit is a white noise process representing family and time specific unobserved shocks.

Estimates of (4) can provide a measure of what part of total income persistence remains when various sources of persistence are accounted for since γ is a *partial* correlation. Consistent estimation of the parameters γ, $\beta_0$ and $\beta_1$ has been well studied in the econometrics literature. The case when γ is different from zero renders standard estimators inconsistent requiring alternative strategies like GMM methods as advocated by Arellano and Bond (1991).
Moreover, there is ample evidence on the poor sample performance of GMM based estimators (e.g., Judson and Owen 1999) in terms of bias and efficiency when t is small.

Consider a simple linear panel data model with first order autocorrelation:

$$yit = xit'\delta + \mu i + vit \qquad (5)$$

$$vit = \varphi\, vi,t-1 + \varepsilon it,\ |\varphi| < 1 \qquad (6)$$

where *μi ~ iid (0, σ2 μ), εit ~ iid (0, σ2ε),* independent of each other and of *xit*. In this specification the potential sources of persistence are xit, μi and the presence of serial correlation in the observation specific error process. The vector μi represents in our case family-specific unobserved heterogeneity, and the serially correlated structure in the error term represents 'state dependence' of the shocks to family incomes. The parameters of this model can be estimated by maximum-likelihood methods under suitable distributional assumptions as evidenced from the works of Lillard and Willis (1978), and Baltagi (2001).

It can be readily verified that the serially correlated model in (5)-(6) is a particular, testable restriction of the linear dynamic model in (4). Substract *φ yi,t-1* in both sides of (5) and simplify using (6) to get:

$$yit = \varphi\, yi,t-1 + xit'\delta - \varphi\, xi,t-1'\delta + (1-\varphi)\,\mu i + \varepsilon it \qquad (7)$$

This is a basic model (4) with the non-linear restrictions:

$$-\beta_1 k / \beta_0 k = \gamma,\ k=1,\ldots,K \qquad (8)$$

A convenient advantage of the simple structure implicit in (5)-(6) is that measures of the variation and persistence of incomes can be conveniently summarized in a simple parametric fashion. Let the composite unobservable error terms be *uit ≡ μi + vit*, and let *σ2v* denote the variance of *vit*, which, given the structure of *v*, is given by

$$\sigma_2 v = \sigma_2\, \varepsilon / (1 - \sigma_2).$$

Hence the total variation in incomes arising from unobservable factors is $\sigma 2$

$u = \sigma_2 \mu + \sigma_2$, $v = \sigma_2 \mu + \sigma_2 \varepsilon / (1 - \varphi_2)$. Also $\lambda \equiv \sigma_2 \mu / \sigma_2$, (9)

Where μ measures the relative importance of the family specific components in the overall variance of the error term. Another magnitude of interest is the autocorrelation of the overall error term, which can be easily verified to be given by:

$\rho s \equiv Cor(uit, ui, t-s) = \lambda + (1 - \lambda)\, \varphi s$ (10)

Hence, income persistence arising from unobservable is an average of the persistence induced by family-specific time invariant factors and period specific shocks, weighted by their relative importance in explaining income variations.

**The Two-Stage Least Square Regression Model**

To establish whether there is a causal relationship between persistence of small farms and poverty, the use of simultaneous equation model was adopted using a two-stage methodology. This is necessary because small farm persistence and poverty are found by studies to be jointly depended on similar household socio-economic variables. Moreover, effects of small farm persistence on income have been used previously as dependent variable in equation (4). The use of 2SLS has the advantage of estimating all parameters of the structural equation in the model simultaneously (Olayemi, 1998). The objective of using 2SLS is to facilitate the use of Ordinary Least Square (OLS) method to each equation of the structural model (Olayemi, 1998).

**Model specification**

$P\alpha = X\delta + \epsilon$ (11)

Pα is the weighted poverty index for the whole group and

where one of the X's is yi *t*

$yi\ t = b_o + b_1 + b_2 X_2 + , \ldots , + b_{12} X_{12} + \nu i$ (12)

$\overline{yi\ t}$ is an endogenous explanatory variable in eqn (12), it's assumed here that the small farms persistence as a result of the explanatory variables ($X_1$-$X_{15}$), and hence its estimated value from equation (12) is used in equation (11) as an explanatory variable. According to Olayemi, (1998), an endogenous independent/explanatory variable has two components a systematic component $\overline{yi\ t}$ and a random component V. Hence,

That is $yi\ t = \overline{yi\ t} + V$ (13)

Substituting yi *t* eqn (12) with eqn (11) we have

$P\alpha = d_o + d_1(\overline{yi\ t}\, i + Vi) + d_2 (X_2) + , \ldots\ldots , + d_{12} X_{12} + \varepsilon i$

It becomes

$P\alpha = d_o + d_1\, \overline{yi\ t}\ i + d_2 X_2 + , \ldots\ldots , + d_{12} X_{12} + (\varepsilon i + d_1 V)$ (14)

OLS method can then be used to estimate equation (14)

.

**Econometric Estimation Issues**

Even though the structural equation presented in expression 14 is theoretically valid, estimating the model by a single equation of ordinary least square (OLS) regression procedure would likely result in biased estimates of elasticity coefficients for income. Theoretically income is considered endogenous to poverty measurement for two reasons.

First, since the income variable used in this model is basically labor-income, its value is largely an outcome of labor supply choices. Second, reverse causality is a potential source of bias in the OLS estimate of the coefficients of income.

Furthermore, given the difficulty in getting accurate information on income of individuals and household in developing countries, classical measurement error bias (or attenuation bias) may also be a very important source of bias in this study. A number of steps are taken to address the potential biases of the OLS estimates of per capita income and quality of farmer's income share elasticity as discussed earlier. In order to reduce classical measurement error bias, the averages of income data through accurate measurements and use of quality data source were adopted. In order to reduce the non-classical measurement error and aggregation bias, the instrumental variable of two stage least square (2SLS) estimation procedure was used to address the problems of bias due to measurement error, omitted variable and reverse causality which is likely to occur if the OLS procedure is used to estimate farmer's income share and per capita income elasticities.

**Table 4: Definition of Variables**

| Variables | Definition |
|---|---|
| Log Income (Dep. Variable) | Log of per capita household income |
| Education | Average years of education of members in the labour force (imputed) |
| Children and Elderly | Log of number of children and elderly (dependant) |
| Household size | Number of household members living under the same roof (no) |
| Sex of Household head | = 1 if male and 0 otherwise |
| Labour contribution | This is the number of days that household members worked on the farm |
| Age | Age of household in years |
| $Age^2$ | Age of household head square to capture the life cycle of household welfare |
| Heterogeneity index | This is an aggregation of the responses of each household to the question on diversity of the growth and persistence of farm size and the contribution of institution to increase in farm outputs and income. Hence, for each of the factors a yes and non yes response is coded. A maximum score of 10 for each response or diversity represents the highest level of heterogeneity. The scores of three factors for each household are then divided by maximum score of 30 to obtain an index. This index is then multiplied by hundred (a zero value represents complete homogeneity while 100 represents complete heterogeneity. |
| Agrarian | = 1 if main household activity is agriculture and zero otherwise |
| Microenterprises | Number of microenterprises (non-farm activities) |
| Paved Road | Distance to paved road (in Km) |
| Former credit | = 1 if household received formal credit |
| Other credit | = 1 if household received other credit |
| Remittances | Log of remittances |
| Institutional index | The institutional index that was used in the regression analysis include: access to subsidies, fertilizer, farm inputs, potable water, good roads and transportation facilities, telecommunication facilities and extension services. The intuitional index was obtained by summing up all the factors indicated above and relating to each factor. The responses (access to these factors) were averaged across the factors and multiplied by 100 for each household. |
| Farm size | The size of farms (hectares) |
| Interactions w/Education | and formal credit, Other credit, Remittances, Institutional index and Education |
| Interactions w/poverty indicators | and institutional index, heterogeneity index, non-farm activities, access to credit and poverty indicators (household size, income levels, farm size, children and elderly) |

## RESULT & DISCUSSION

### Poverty Status among Respondents

The threshold used for poverty categorization in this study was computed to be ₦3549.25 monthly (about $29.95, or less than $1 per day). Consequently any respondents below this figure categorized as poor. Table 5 provides the distribution of poverty according to economic status and place of dwelling. The over-all results indicated that about 42% (3448) of the respondents are categorized as very poor, 21% (1768) as poor and only 37% (3048) are categorized as non-poor (Table 5). The results also indicated that about 66% of the very-poor category lives in the rural areas of Nigeria, while the poor category is shown to be more

(60%) in the urban areas. As expected the non-poor are prevalence in the urban areas of Nigeria (64%). However, there are exceptions as the study discovered, for instance in the North West Zone of the country, the result show that there are more very-poor in the urban area than in the rural areas (Table 5)

Moreover, in the South east region, there are non-poor in the rural areas than in the urban areas. This implies that there are more business opportunities and flourishing livelihood that attracts a reasonable income for family/individual or that family/ individual spend less than their counterpart in the big cities, such as; maintaining of mobile phones, among others. Other factors are large number of family members and dependants that are not working coupled with a lot of heavy taxes that are paid in the urban areas which is non-existing in the rural areas. In addition the habit of eating varieties of food and consumables is more prevalence in the cities than in the rural areas. These food varieties and consumables chops off a large part of family income. However, this calls for future research to look at the determinants or factors that prompt propensity to spend in both rural and urban areas of Nigeria as this will elucidate facts and policy direction of what takes away family/individual income in urban areas than in the rural areas.

**Table 5: Cross Tabulation of Economic Status by Zone and Place of Dwelling**

| **Zone/Place of Dwelling** | **Very Poor $P_2$** | **Poor $P_1$** | **Non-poor $P_0$** | **Total** |
|---|---|---|---|---|
| **North Central** | **43.3% (541)** | **24.1% (302)** | **32.6% (408)** | **100.0% (1251)** |
| *Rural* | *71.7% (388)* | *57.3% (173)* | *21.8% ( 89)* | |
| *Urban* | *28.3% (153)* | *42.7% (129)* | *78.2% (319)* | |
| **North East** | **45.0% (834)** | **22.3% (413)** | **32.7% (608)** | **100.0% (1855)** |
| *Rural* | *74.9% (625)* | *32.0% (132)* | *31.4% (191)* | |
| *Urban* | *25.1%(209)* | *68.0% (281)* | *68.6% (417)* | |
| **North West** | **46.0% (710)** | **20.5% (316)** | **33.5% (518)** | **100.0% (1544)** |
| *Rural* | *44.5% (316)* | *52.9% (167)* | *24.1% (125)* | |
| *Urban* | *55.5% (394)* | *47.1% (149)* | *75.9% (393)* | |
| **South East** | **49.8% (618)** | **17.0% (211)** | **33.2% (413)** | **100.0% (1242)** |
| *Rural* | *62.9% (389)* | *42.2% ( 89)* | *60.3% (249)* | |
| *Urban* | *37.1% (229)* | *57.8% (122)* | *39.7% (164)* | |
| **South South** | **36.6% (405)** | **28.8% (319)** | **34.6% (383)** | **100.0% (1107)** |
| *Rural* | *72.4% (293)* | *46.7% (149)* | *45.7% (175)* | |
| *Urban* | *27.6% (112)* | *53.3% (170)* | *54.3% (208)* | |
| **South West** | **26.9% (340)** | **16.4% (207)** | **56.7% (718)** | **100.0% (1265)** |
| *Rural* | *70.9% (241)* | *33.3% ( 69)* | *31.3% (225)* | |
| *Urban* | *29.1% ( 99)* | *69.7% (138)* | *69.7% (493)* | |
| **Total** | **(3448)** | **(1768)** | **(3048)** | **(8264)** |

**Source: Poverty profile analysis results**

Table 6 shows the percentage distribution of head of households in different occupation. The Table shows that the percentage of head of households in agriculture is the highest (74.5%). This thus confirms past studies and literatures (Ayoola *et al*, 2000) that most Nigerians are into agriculture for income generation and household food needs. Findings from Table 7 also

show that agriculture and forestry increased by a difference of 57.27 percent, an evidence of small farms persistence.

**Table 6: Frequency distributions of occupation of head of households across Nigeria (N = 8264)**

| **Occupation** | **Frequency (%) 1994 Data** | **Frequency (%) 2004 Data** |
|---|---|---|
| Artisans | 2936 (35.52) | 1023 (12.38) |
| Trading of manufactured goods | 1669 (20.20) | 914 (11.06) |
| Clerical related (paid employment) | 1163 (14.07) | 502 ( 6.07) |
| Agriculture and Forestry | 3915 (47.37) | 6157 (74.50) |
| Manufacturing and processing | 1851 (22.40) | 413 ( 5.00) |
| Students and apprentices | 1024 (12.44) | 602 ( 7.28) |
| Others | 206 ( 2.49) | 612 ( 7.41) |
| **Total** | **12,764*** | **10,223*** |

Source: Author's computation from the 1994 and 2004 NLSS data

* Indication of Multiple responses.

**Descriptive Statistics of Association between Persistence of Small Farms and Poverty**

There exist a direct relationship between persistence of small farms and poverty as evidenced in Table 7. Table 7 revealed that persistence of small farms and poverty (r of 0.674) are closely related. As 45 percent of the variation in persistence of small farms is link to poverty. The results show that there is a strong connection between persistence of small farms and poverty. The continuing deepening of small farms as it is currently practised in Nigeria will continue to increase poverty. Consequently, there is need for number of policy options to help small farmers increase productivity. Reforming land policies, for example, land is crucial to secure property rights to farmers and to increase farm size. Equally important is the reform of public institution and serious commitment of policy makers to provide necessary infrastructural and coordinated service delivery to help small farmers have access to credit, marketing, and technology.

**Table 7: Regression results, Dependent variable: Log of per capita household income and Pooled OLS estimates**

| Variable | Model | Agrarian with additive non-farm activities | With additive non-farm activities and Institutional index | Interactions w/poverty indicators |
|---|---|---|---|---|
| Education | 0.004 (0.13) | 0.016 (2.45)* | 0.073 (4.51)** | -0.019 (5.51)** |
| Children and Elderly | 0.042 (2.08)* | -0.124 (2.16)* | -0.016 (1.76) | 0.027 (3.59)** |
| Household size | 0.006 (2.11)* | 0.014 (1.07) | 0.018 (0.84) | 0.112 (2.70)** |
| Labour contribution | 0.116 (2.24)* | 0.019 (4.01)** | 0.021 (1.59)** | -0.026 (5.54)** |
| Age | 0.012 (0.99) | 0.015 (1.24) | 0.017 (1.43) | 0.016 (1.41) |
| $Age^2$ | -0.011 (0.81) | -0.013 (1.05) - | -0.024 (1.29) | -0.019 (1.16) |
| Microenterprises' | 0.063 (1.70) | 0.029 (3.15)** | 0.042 (5.16)** | -0.038 (3.51)** |
| Sex of Household Head | 0.142 (1.54) | 0.130 (2.15)* | 0.173 (1.49) | -0.115 (1.11) |
| Paved road | -0.02(3.57)** | 0.025 (1.47) | - | - |
| Formal credit | 0.06 (0.40) | -0.024 (0.18) | - | -0.026 (3.91)** |
| Other credit | -0.080 (1.24) | -0.117 (214)* | - | -0.031 (2.31)* |
| Remittances | -0.03 (2.12)* | 0.037 (4.13)** | - | -0.031 (3.72)** |
| Institutional facilities index | -0.02 (2.25)* | - | -0.031 (4.04)** | -0.003 (2.29)* |
| Farm size | 0.14 (2.11)* | - | 0.015 (3.45)** | 0.012 (2.11)* |
| Heterogeneity index | - | - | 0.291 (3.87)** | 0.025 (2.70)** |
| Agrarian | - | - | 0.0015 (4.48)** | 0.0021 (0.68) |
| Interaction w/education | - | - | -0.018 (2.21)* | 0.003 (4.41)** |
| Interaction w/poverty indicators | - | - | 0.019 (2.14) | - |
| **Constant** | 8.59 (29.14)** | 8.21 (28.91)** | 8.06 (15.71)** | 7.83 (14.97)** |
| **Adjusted $R^2$** | 0.4128 | 0.4518 | 0.4911 | 0.3826 |
| **F-Statistics'** | 26.12 | 23.17 | 16.31 | 15.41 |

**Source**: Computer Printout of Regression Analysis,

Absolute value of t statistics in parentheses. * Significant at 5%; ** significant at 1%

**Simultaneous Equation Regression Model Results**

Tables 8 and 9 report the estimates of the empirical analysis of the simultaneous equation regression. Table 8 presents the pseudo effects of the regression results, while Table 10 presents the two-stage least-square (2SLS) model. These tables convey the estimated production function results with the pseudo-fixed-effect model and the 2SLS results respectively. In the 2SLS model, we explored alternative functional forms and found the linear specification to be stronger in terms of number of significant variables and the model predictors' indicator. The results show that the estimated coefficients for level of education ($X_1$), household size ($X_3$), access to formal credit ($X_8$), number of non-farm rural activities (microenterprises) ($X_9$), access to infrastructural/institutional facilities like access to subsidies, fertilizer, farm inputs, potable water, good roads and transportation facilities, telecommunication facilities and extension services, ($X_{11}$), and access to other source income like remittances, informal credit ($X_{12}$). These variables are positive and statistically significant on income improvement. On the other hand variables of dependency ratio (children and elderly), ($X_2$), labour contribution ($X_5$), and paved road (rough road) ($X_7$), are negative but statistically significant

(Table 8). This is because respondents who earn modest income with less dependent household size and have an active family labour to assist on the farm and also has access to good roads for ease of transport of farm produce to market or homes could possibly increased household income. In addition, all the convectional inputs exhibit signs consistent with predictions of economic theory and are all statistically significant. As expected, access to infrastructural/institutional facilities like access to subsidies, fertilizer, farm inputs, and microenterprises tended to increase household income. The predictor's estimators of the parameters estimates meant that values of plot-varying variables are significant. This fact justifies the robustness of our pseudo-fixed-effect model over a standard random effect.

**Table 8: The Income Growth Model: Pseudo-fixed-effects results**

| **Variables** | **Coefficients.** | **P-Value** |
|---|---|---|
| Education ($X_1$), | 34,1021 | 0.001 |
| Dependency ratio ($X_2$), | -2.6315 | 0.004 |
| Household size ($X_3$), | 0.8116 | 0.002 |
| Sex of household head ($X_4$) | 0.7116 | 0.021 |
| Labour contribution ($X_5$) | -0.9284 | 0.034 |
| Age ($X_6$) | 0.6212 | 0.065 |
| Paved road ($X_7$), | -0.5729 | 0.004 |
| Access to formal credit ($X_8$) | 0.7352 | 0.000 |
| Access to microenterprise ($X_9$) | 0.4936 | 0.005 |
| Farm size ($X_{10}$) | 0.8941 | 0.046 |
| Access to infrastructure facilities ($X_{11}$) | 37.0615 | 0.001 |
| Access to other sources of income ($X_{12}$) | 14.3204 | 0.053 |
| | | |
| Sigma_u | 164.521 | |
| Sigma_e | 748.356 | |
| Rho | 0.008 | |

Source: Computer result of regression analysis

**Table 9: The Income Growth Model: Two-Stage Least-Square (2SLS) results**

| **Variables** | **Coefficient** | **P-Value** |
|---|---|---|
| Education ($X_1$), | 5.2145 | 0.002 |
| Dependency ratio ($X_2$), | -0.8215 | 0.001 |
| Household size ($X_3$), | 0.6125 | 0.005 |
| Sex of household head ($X_4$), | 0.9174 | 0.062 |
| Labour contribution ($X_5$) | -0.4318 | 0.004 |
| Age ($X_6$) | -1.0523 | 0.429 |
| Paved road ($X_7$), | -5,0721 | 0.003 |
| Access to formal credit ($X_8$) | 0.5382 | 0.001 |
| Access to microenterprise ($X_9$) | 15.3118 | 0.004 |
| Farm size ($X_{10}$) | 0.0826 | 0.058 |
| Access to infrastructure facilities ($X_{11}$) | 0.2152 | 0.000 |
| Access to other sources of income ($X_{12}$) | 41.1926 | 0.002 |
| Partial R-squared of excluded instruments: 0.0314 | | |
| Test of excluded instruments: F (15,072) = 58.63; | | |
| Prob > F = 0.000; Adjusted $R^2$ = 0.4826 | | |

**Table 10: Elasticity Estimates from Persistence of Small Farms Growth and the Income Growth**

| Variable | Persistence of small farms Elasticity | The Income Growth Elasticity |
|---|---|---|
| Education ( $Z_1$) | -0.2417 | 0.6314 |
| Household size ($Z_3$) | 0.3417 | --------- |
| Access to microenterprise ($Z_9$) | --------- | 0.5217 |
| Farm size ($Z_{10}$ ) | 0.2116 | -------- |
| Access to infrastructure facilities ( $Z_{11}$ ) | -1.5218** | 2.2674* |
| Access to other sources of income ($Z_{12}$ ) | -3.2517** | 3.4116* |
| Adjusted $R^2$ = 0.4826, d = 3.21, p < 0.05 | | |

**Source: Computed from Multiple Regression Analysis Print out**

* Elastic variable, **Inelastic

Elasticities were computed for only six continuous variables in persistence of small farms and the income growth model. These variables were considered due to their influence on the models earlier used, and also as identified by similar studies. These included education ($Z_1$) for persistence of small farms and the income growth models respectively, household size ($Z_3$) access to microenterprise ($Z_9$), Farm size ($Z_{10}$), access to infrastructure facilities ($Z_{11}$), and access to other sources of income ($Z_{12}$) (Table 10).

Table 10 reveals that access to infrastructure facilities and access to other sources of income were elastic/inelastic for persistence of small farms and the income growth models respectively. The most important factors that significantly influence persistence of small farms in order of importance are access to other sources of income, access to infrastructural facilities, farm size, household size and education. While for the income growth in order of importance are access to other sources of income, access to infrastructural facilities, access to microenterprise and education.

Moreover, results from Table 10 reveals that 10 percent increase in access to other sources of income would decrease small farms persistence by 33 percent; also 10 percent increase in access to infrastructural facilities would decrease small farms persistence by 16 percent. Similarly an increase of the same magnitude in household size and farm size would increase small farms persistence by 34 percent and 2 percent respectively. For income growth model, 10 percent increase in sources of income and access to infrastructural facilities, would result in 34 and 23 in the level of income respectively. Similarly 10 percent increase in the level of education and access to microenterprises would lead to increase in income with 6 percent and 5 percent respectively.

The Growth of income has significant effect on small farms persistence at $p < 0.05$ and a deviation of (d) 3.21. This revealed that 10 percent increases in Growth of income will lead to 32.1 percent decreases in small farms persistence. This signifies an inelastic relationship. Based on the Growth of income analysis and taking into consideration the persistence of small farms analysis this outlet seems to be an effective policy measures that can help agricultural policy makers to improve on the growth of income by boosting alternative income source for rural households and improvement on the infrastructural facilities and coordinated services delivery to small farm holder..
The empirical analysis of persistence of small farms and the income growth models has thus shown that there exists a causal relationship.

**Conclusions**

The study identified that smallness of farms is not correlated to poverty but the traditionally tried and sometimes fool-proof farming systems. Size of the farms is not the problem, but the operationalization. Evidence from China and India revealed that smallholders are better off in times of productivity. These countries are better in terms of fertilizer consumption, tractor per 100 sq. Km of arable land use and agriculture value added per worker. Conversely, small holder and traditional farmers in Nigeria still use rudimentary production techniques, limited use of improved planting materials and fertilizer consumption. This calls for commercialization of small farms in Nigeria

There is a direct relationship between small farms persistence and poverty. The viability of small-farm persistence is now being questioned. A number of policy options have been proposed to help small farmers increase their productivity. Reforming land policies, for example, land is crucial to secure property rights to farmers and to increase farm size. Equally important is the reform of public institution and serious commitment of policy makers to help small farmers have access to credit, marketing, and technology. Moreover, promoting diversification toward production of high value commodities can play an important role in raising smallholders' income. In addition, identification of appropriate strategies for overcoming asset poverty and spatial poverty traps.

Finally, there is a need for policies that can facilitate efficient rural service delivery, inter-linkages between agricultural production systems and rural livelihoods. Similarly, policies that promote the development of the rural non-farm sector are essential to help increase

income available for farming and hence, improve smallholders' welfare and not a parking lot for the poor.

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