Journal of Economics and Sustainable Development
ISSN 2222-1700 (Paper) ISSN 2222-2855 (Online)
Vol.3, No.12, 2012

Population Dynamics, Labour and Small-Holder Farmers' Productivity in Southeast Nigeria

Osugiri, I.I,[1] Albert I. Ugochukwu,[2*] Onyaguocha, S.U.O.[1] Onyemauwa, C.S.[1] and Ben-Chendo, G.N.[1]
[1] Department of Agricultural Economics, Federal University of Technology, P.M.B. 1526 Owerri, Imo State, Nigeria.
[2]Department of Bioresource Policy, Business and Economics, University of Saskatchewan, 51 Campus Drive, Saskatoon, SK, S7N 0Z3, Canada.
*Email of Corresponding Author: a.ugochukwu@usask.ca

Abstract
The study analyzed the population dynamics, labour use and food productivity of small holder farmers in Southeastern Nigeria. A total of 120 farmer respondents involved in Cassava-based mixed cropping randomly selected (40 each), from three out of the six States that made up the Southeast geo-political zones, was used for the study. Both primary and secondary sources of data were used. Simple statistical tools, gross and net margins as well as regression analysis were used to analyze the data collected. The result of the analysis revealed that farming though profitable is still at subsistence level with a net margin of N28,360 ($US180.64) per hectare, about 46% of the farmers could not afford or access the use of fertilizers and modern inputs required for agricultural intensification prevalent in the area.. The tenure arrangement was by inheritance (64%), which caused much land fragmentations and pressure on limited arable land. Labour had the highest average factor cost (40.86%), due to high cost of hired labour. The regression result showed that farm size (X_2) and fertilizer application (X_4), are significant (P=0.01), and positively correlated with crop production. Conversely, population density (X_1) and cropping density (X_3) and labour X_7) were significant (P=0.01), but negatively correlated with crop output. To ensure higher productivity and net profit, the study recommends that farmers should be provided with required farm inputs at affordable prices by government and land use act decree of 1978 should be reviewed to make land available to genuine farmers for commercial and mechanized farming. Birth control should be encouraged.
Key words: Population, Labour, Productivity, Small-holder farmers

1. Introduction

Nigeria is one of the developing countries in sub-Saharan Africa. The nation has a total land mass of 923,766km^2 and a projected population of more than 170 million individuals (FRN, 2006). The country is divided into six geo-political zones based on their diverse culture, language, ethnicity and socio-economic activities prevalent in each zone. The zones include: North-west, Northeast, North-central (Middle belt), South-east, South-west and south-south. However all the zones have agricultural production as a major occupation and main source of national income till 1970s (Oyejide, 1986). Within the period 1960-1970, agriculture contributed more than 60% of Nigeria's gross domestic product (GDP), which has currently declined to less than 40%. In addition, the Nation's share of export earnings has fallen from 75% to 3% over the same period (Nwankwo, Nwajiuba and Eze, 2010).

The food problem which started in the mid 1960s has continued to deepen several years after her independence. Agricultural share of GDP and export earnings has been low and Nigeria has shifted from a major food exporting country to a food importing nation. However, food imports continued to rise in value from ₦34.7 billion in 1990 to ₦113.63 in 2006 (CBN, 2006). Though there had been appreciable increase in productivity and gains in income, but much of which had been used up with the increasing population (Lipsey, 1989). Thus (Meier, 1970), observed that growth in population that "treats close on the heels of agricultural improvement effaces its effect as fast as they are produced."

Nigeria has a total of 92.4 million hectares of land out of which about 57% (52.668 million hectares) is under crop and pasture production. Although the aggregate production from these lands has sustained the population and the economy in the time past, the rapid increase in population and the need to diversify the economy in other non-agricultural sectors, has necessitated much pressure on the resources (Osuji, 2011). Thus, population growth has been a detrimental dynamic to the use and cultivation of land, leading to changes in cropping patterns; basically continuous cropping. This poses serious problem due to the fragile nature of soils in the humid tropics as well as high dependency on vegetative cover for moisture and stability (Osugiri, 1996).

The inhabitants of southeast Nigeria are predominantly farmers and crop production is centered on food crops such as cassava, yam, maize, rice, beans and cash crops such as oil palm, groundnut, cocoa and bananas. Over 80% of the area allotted to agricultural production is occupied by food crops (Akinyosoye, 1996). The

rapid growth of population in the area over the past three decades results to more demands on arable land, which has adversely affected its resource base. Consequently, there is a breakdown of the old traditional land management practices, causing pressure on land and agricultural intensification with reduced fallow periods. In the absence of adequate soil management practices or the economic use of fertilizer and other additives (inputs), declining fallow periods result to accelerated leaching of nutrients, increased weed production, erosion and decreased moisture (Lal, 1983; IITA, 1992; Spore, 1994). Thus, population pressure on limited arable land leads to less efficient method of production and decrease food productivity.

In as much as 75 percent of the workforce is engaged in agriculture, productivity is mainly on subsistence level. Thus, there is wide spread of poverty, malnutrition and diseases militating the ability of the farmers to realize their objective of food sustenance. Population pressure has affected output due to increased consumption. The farm size had been on the decrease as well as the fallow lengths, which had adversely affected the resource base. Analysis of agricultural productivity in the past was based on scarce labour and abundant land. Then population densities were low, capital inputs were scarce and technology was simple as the predominant land management system was shifting cultivation (Binswanger and Mcentire, 1987). This system allows fallow for 10-25 years. The purpose of this system was to replenish the soil fertility through gradual accumulation of nutrients supplied by the decay of organic matter from secondary growth or natural vegetation. Moreover, the soil was protected from erosion by the ground cover (IITA, 1992).

The rapid growth of population in the study area over the past three decades has resulted to more demands on limited arable land and a break down of the old traditional land management practices. Population pressure with attendant wrong agricultural practices (habits); such as deforestation causes land degradation, decline in biodiversity, ecological damage, among others (Carter, 2004; FAOSTAT, 2003; Spore, 1994). The human population is expected to double again within the coming half century. All forms of conflict and environmental pressure will potentially increase proportionally. The increase is expected to occur more in poorer countries with fewer resources and less favourable condition for production (FAOSTAT, 2003).

A range of socio-economic and demographic factors determine the efficiency of agricultural productivity in an area. Some of the identified factors are land use patterns, credit availability, farm size, age of farmers, farming experience, literacy level of the farmers and household size (Coelli and Battese, 1996). This study aims at examining some of these factors and determines the extent they have affected agricultural productivity in the study area.

2. Material and Methods

The study was conducted in Southeastern Nigeria. Three States out of the five States that made up the Southeastern region were randomly selected. These are, Abia, Ebonyi, and Imo States. Through the assistance of the Extension Officer representing each State, 40 farmers were randomly selected from a list of registered Cassava-based mixed crop farmers collected from the Agricultural Development Programme (ADP), office headquarters of each State. Thus, a total of 120 farmers were used for the study. Primary data were collected through a well structured questionnaire administered to the farmers, aided with oral interview schedule, farm visits and observations. Secondary data were collected from relevant research works and publications. Data were analyzed with the use of simple statistical tools such as means, percentages, frequency distributions and cost benefit analysis, as well as ordinary least square (OLS) regression analysis.

The cost benefit analysis was derived by the use of gross margin and net returns analyses, which are specified as follows:

$$GM = EP_i Q_i - P_j X_j \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where,
GM = Gross margin
EP_iQ_i = TR= total revenue
P_jX_j = TVC = total variable cost
P_i = unit price of i^{th} input
Q_i = quantity of i^{th} output
P_j = unit price of j^{th} input
X_j = quantity of j^{th} input

$$Net\ returns = GM - TFC \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

GM is as defined above while TFC = Total Fixed Cost (18).

The production function model is specified implicitly according to (24) as:

$$Y = a + b_1X_1 + b_2X_2 + \cdots + b_7X_7 + \varepsilon \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

Where:
Y = Agricultural output (kg/ton)
X_1 = Population density (No of persons per km^2)
X_2 = Farm size (hectares)
X_3 = Cropping density (crop stands per ha.)
X_4 = Fertilizer application (kg/ha).
X_5 = Pesticides application (Liters/ha)
X_6 = Agricultural intensification (Fallow length in years)
X_7 = Labour used (man-day/ha)
a = intercept
b_i = Elasticity of response of the X_i^{th} variable factor
ε = stochastic error term with OLS properties.

3. Results and Discussion

Table 1 shows the socio-economic characteristics of the respondent farmers. The table stated that 80 percent of the respondents were males, while 20 percent were females. Though the population of the female citizens in the study area as well as the entire country are more than that of males (FRN, 2006), but women due to differing production system, socio-cultural and ecological factors (3), were not allowed any title (property right) on land despite of their overwhelm contributions to food production. They can only hold land at the death of their husbands, even at that, they are marginalized. Majority of the farmers (82%), were married and few (20%) were single, while the average household size was seven and the average age of the farmers was 47 years. These are indications that population of the household farmers are increasing. Though, it may provide the required household family labour in agricultural activities, but increases consumption. It also shows that youths have drifted from involvement in agricultural production, abandoning the sector to elderly men who produce on small scale; mainly for household subsistence.

The increasing neglect of the agricultural sector by the youths in search of "greener pasture," according to the respondents, was mainly due to the crude farming method. Farmers still use crude farming implements such as hoes and cutlasses, which make the job tedious and un-attractive to the younger generation. Moreover, the efforts put by the farmers were not commensurate with the output as marginal output is far below the marginal input of especially labour. This has grossly eroded the former farming habit where farmers used to marry many wives to provide the much-needed household labour in agricultural activities (Osugiri, *et al.*, 2007)

The average years of farming, experience was 13 years and level of educational attainment was 6 years. The implications of these results are that the farmers have acquired many years of farming experience, however, majority of the farmers were not literate enough to understand and/or implement modern system of farming and adopt new technological innovation in agriculture to enhance productivity. The incidence of high level of illiteracy among the farmers in the study area is quite detrimental to agricultural productivity. This is especially deplorable considering the prevailing intensive farming method, which requires modern farm inputs and technology to enhance productivity. The table revealed that tenure arrangement in the study area was based mainly on land inheritance (64%), then communal land ownership (20%) and lease/rented land (10.10%), while land purchase was only 6.40 percent. This type of tenure arrangement leads to land fragmentations among the male members (heirs) of the farm household. With increase in family size and land fragmentations, and the indigenous land tenure system (family inheritance) prevalent in the area, land is highly fragmented causing static constraints on agricultural development (Godwin *et al.,* 2004; Deal, 2004). Thus, farm size reduces as well as fallow length. This caused agricultural intensification. However, the farmers could not cope with the requirements of intensive agricultural practice such as the purchases of much quantities of fertilizers, improved planting materials/modern tools involved due to reported cash squeeze and little or no access to credit facilities facing the farmers. Hence, the declining agricultural output recorded by the farmers. This was reported by some other scholars (Datoo, 1976; Bachman and Winch, 1979; Ruthernberg, 1980) that increase in population density decreases the number of hectarage per farmer as well as reduction in fallow length and labour productivity. Similar result was presented by (Alston, Libecap and Mueller, 2001), that farmers' yield are typically less than one third of potential yield found on research stations and yield f most major crops have been stagnant or declining

The hard fact was also shown in the table where 92.50 percent of the respondents could only allow 1-2

years fallow on land and none of the farmers could allow land fallow above 4 years. In addition, majority of the farmers (44.2%) could only allow a planting distance of 0-0.25m, leading to high crop densities and over-crowding of crops on the farm. Considering the fact that majority of the respondent farmers (45.83%) could not afford the use of fertilizers on their farms and only 18.33% and 25% could use up to 25kg and 50kg of fertilizer respectively per hectare of arable land, farming is at a subsistence level and majority of the farmers are very poor. This was also reflected on the low level of pesticides application.

Table 2 showed that the gross profit of the respondent farmers was N32, 620 (US$217.47) and the net profit was N28, 360 (US$189.07) per hectare of farmland. This amount realized by the respondent farmers from the sale of their farm produce is quite small when compared with what is obtained from standard farms (Alston, Libecap and Mueller, 2001). An indication that farming in the study area is still producing on a small scale, and possibly, farming to the farmers is more of a way of life than business.

Labour contributed to the highest factor cost, which shows that labour was expensive in the study area despite the population increase. This phenomenon was attributed (by the farmers) to drift of the work force to urban centers for white collar jobs to the neglect of the agricultural sector. However, residents/inhabitants of the urban areas depend on the output (produce) of farmers in the neglected rural areas for sustenance. This has adversely affected price of food items leading to reduced standard of living for the people. The table also showed that the rate of fertilizers and pesticides applications were low in the study area. This contributed to reduced crop productivity and high incidence of pests and diseases that affected the crops.

Table 3 shows the summary of the regression result. At 1 percent (0.01) level of significance, five out of the seven independent variables estimated under the double-log functional form were statistically significant. The high R2 of 0.924 (92.4%), and F-ratio of (175.64) and low standard errors (SE), are indications that the variables were well fitted and analyzed. The coefficients of the variables X1 (population density), X3 (cropping density) and X7 (Labour used), showed negative correlation, though significant. These implies that population increase was causing pressure on land leading to agricultural intensification and reduction in planting distances of crops, which resulted to high crop density (number of crop stands per hectare).

Consequently, there were competitions for available nutrients and low productivity. Similarly, increased labour demand and the high cost per man-day, increases cost of production which reduces profitability in the study area. The other two significant variables; X2 (Farm size) and X_4 (Fertilizer application), were positively related to output. This shows that increase in farm size and use of fertilizer would enhance agricultural productivity. These results are consistent with *a priori* expectations. However, the coefficients of the remaining two variables; X_5 (pesticides application) and X_6 (fallow length), were not significant at 1 percent, possibly due to the fact that their involvement in agricultural production were occasional.

4. Conclusion and Recommendations

Nigeria is a country where more than 75 percent of the workforce is engaged in agriculture mainly on subsistence level. It has a total land mass of 923,766km^2 and a projected population of more than 170 million. Like any other developing country, the population would continue to increase over the years and the need for urbanization, industrialization and expansion would generate some pressures on the available land. The study found that access to land is more of a birth right due to the prevailing tenure arrangements. Hence, land acquisition is more of a right than a privilege; and people hold tenaciously to their land. Land is highly prized and regarded second in value only to human life in the study area. The prevailing methods of mixed and continuous cropping with low availability of fertilizer and improved inputs to the smallholder farmers; have affected the resource base of the land.

The study, therefore, recommends that; Nigerian government should review the land use decree act of 1978 to enable genuine farmers have access to land. This would encourage expansion and large-scale production. Farmers should be assisted by government to obtain improved farm inputs especially fertilizers at affordable price and at appropriate time to improve output under present agricultural intensification. Finally, birth control measures should be encouraged. This would reduce population pressure on land, reduce consumption and increase investment in agriculture. Thus, agricultural activities would be more capital intensive rather than labour intensive for higher productivity. Therefore, if agriculture in Nigeria should be on large scales or commercialized, modern inputs provided, literacy level improved through extension training and adequate incentives made available to farmers; these would make farming attractive to youth, encourage professionalization in agriculture and enhance productivity.

References

Akinyosoye, V.O. (1996). An Introduction to Senior Tropical Agriculture for West Africa. Macmillan Lagos, Nigeria Press.

Alston, L.J. Libecap, G.P. and Mueller, B (2001). Titles, Conflict and Land Use; The Development of Property Right and Land Reforms on the Brazilian Amazon Frontier. University of Michigan Press.

Arene, C.J. and Omoregie, E.M. (1991). The Place of Women in Agricultural Labour Force In Nigeria. *Beitrage zur tropischen landwirt schaft und. Veterinarmedizin* 29, H3, pp. 282.

Bachman, E and Winch, F.E (1979). Yam-based Farming Systems in the Humid Tropics of Southern Nigeria; Discussion paper No. 2/79, Agricultural Economics Programme, IITA, Ibadan.

Binswanger, H. and Mcentire, J. (1987). Behavioural and Material Determinantso of Production Relations in Land Abundant Tropical Africa. *Journal of Economics Development and Cultural changes.* Vol. 1. No 36. pp 73-99.

Carter, M.P. (2004). Rural Poverty in Latin America. Analytics, New Empirical Evidence and Policy. Macmillan Press. pp. 10-14

C.B.N (2006). Central Bank of Nigeria; 2006 Annual Year Report.

Coelli, T and Battese, G. (1996). Identification of Factors Which Influence the Technical Inefficiency of Indian Farmers. *Australian Journal of Agricultural Economics*, pp. 103-112.

Datoo, B. (1976). Relationship Between Population Density and Agricultural Systems in the Iluguru Mountains-Tanzania. *Journal of Tropical Geography* No. 42, pp.1-12.

Deal, O.O. (2004). The Empirical Relationship Between Federal Subsidized Crop Insurance and Soil Erosion. Unpublished Ph.D Dissertation, North Caroline State University; Raleighi,NC.

Ezeogwu, N.C. (2006). Agricultural Science for School and Colleges. A.C. Global publishing Co. Nigeria.

FAOSTAT, (2003). Data-Base Food and Agricultural Productivity of the United Nations. Pp. 169.

Federal Republic of Nigeria (FRN, 2006). Provisional Result, Population Census 2006; NPCAbuja, Nigeria.

Godwin, F.O. Brry, K.B. Smith, H.J. and Vincent, M. (2004). What is Wrong With our Models of Agricultural and Land Values? *American Journal of Agricultural Economics*, 85(3):pp.744-752.

IITA (1992). Sustainable Food Production in Sub-Saharan Africa. Ibadan.

Lipsey, J.R (1989). Introduction to Positive Economics. Hamper and Row Publishers, London.

Lal, R. (1983). Erosion caused Productivity Decline in Soils of the Humid Tropics. *Soil Taxonomy News* No. 5 pp 4-11.

Mbanasor, J.A. and Obioha, L.O. (2003). Resource Productivity under Fadama Cropping System in Umuahia North L.G.A., Abia State. *Journal of Tropical and Subtropical Agriculture* (2) 81-96.

Meier, G.M. (1970).Issues in Economic Development in International Poverty. Oxford University Press, pp. 587.

Nwankwo, O.O. Nwajiuba, C.U. and Eze, C.C. (2010). Margin Analysis of Mechanized Cassava Flour Processing in Abia and Imo States; Proceedings of A.S.N Conference LAUTECH 2010. *Nigerian Agricultural Journal*.

Osugiri, I.I. (1996). Effect of Population Pressure on Agricultural Productivity in Imo State, Nigeria. Unpublished M.Sc. Thesis, Dept of Agric. Economics University of Nigeria Nsukka.

Osugiri, I.I. Nwosu, F.O. and Ibeawuchi, I.I. (2007). *Effect of population pressure on pattern of cultivation, Output, Marketing and Prices of Major Food crops in Imo State.* International Journal of Agriculture and Rural Development vol. 10, pp.58-53.

Osugiri, I.I. Oguoma, N.N.O. Odii, M.A.C.A and Onyemauwa, C.S. (2007). Empowering Women Participation in Rural Development through Palm Fruits Processing in Imo State. *Proceedings of the 41st Annual ASN Conference ABU, Zaria Nigeria,* pp. 641-643.

Osuji, E.E. (2011). Land Use Patterns and Effects on Agricultural Productivity in Ikeduru Local Government Area, Imo State. Unpublished M.Sc. Thesis, Department of Agricultural Economics, FUTO, Owerri, Nigeria.

Oyejide, T.A.(1986). The Effects of Trade and Exchange Rate Policies on Agriculture in Nigeria. IFPRI Research Report No. 55, Washington, D.C. USA, pp. 9-51.

Ruthernberg, H. (1980). Farming Systems in the Tropics. Oxford University Press, Clarendon.

Spore (2007). Restoring the Fertility of Africa's Degraded Land, the Process Approach. Bi-monthly Bulletin of the Technical Centre for Agriculture and Rural Co-operation Vol. 6. No (2); 49-51.

Spore (1994) Sustaining Soil Productivity in Intensive African Agriculture. CTA Bi- monthly Bulletin No.49, Pp. 1-2

Table 1: Computed Percentage and Average Socio-economic Characteristics of Respondents

Variables	Percentage	Mean
Gender		
Male	80.00	n/a
Female	20.00	n/a
Marital Status		
Married	82.00	n/a
Single	18.00	n/a
Socioeconomic		
Household size	n/a	7
Level of education (years)	n/a	6
Age of household head (years)	n/a	47
Farming experience (years)	n/a	13
Farm size (hectares)	n/a	1.02
Tenure System		
Inherited land	63.50	n/a
Communal Land	20.00	n/a
Lease/rented	10.10	n/a
Purchased	6.40	n/a
Source of Farm Labour		
Family	41.30	n/a
Hired	20.20	n/a
Both	38.5	
Planting Distance		
0-0.25	44.20	n/a
0.26-0.50	24.17	n/a
0.51-1.00	31.63	n/a
Fallow Length (years)		
1-2	92.50	n/a
3-4	7.50	n/a
>4	0.00	n/a
Quantity of Fertilizer Applied (kg)		
None	45.83	n/a
1-25	18.33	n/a
26-50	25.00	n/a
51-100	10.84	n/a
Pesticide Application (litres)		
None	36.67	n/a
1-5	20.83	n/a
6-10	23.33	n/a
11-15	14.17	n/a
	5.00	n/a

Source: Field survey data, 2011.
n/a = Not Applicable

Table 2: Estimated Average Costs/Returns of farm output in the study Area per Hectare

Item	Quantity/Unit	Price Per Unit (N'000)	Total (N'000
Revenue[1]	(tons)		
Crop sales	2.86	5.24	14.99
Crop consumed by household	6.52	5.24	34.16
Crops used as gift	1.75	5.24	9.17
Total Revenue	11.13	5.24	58.32
Variable Costs			
Farm land rent/lease	1 ha	4.00	4.00
Labour	70 man-days	0.15	10.50
Planting materials	1.50 tons	2.50	3.75
Fertilizer	50 kg	0.06	3.00
Pesticides	5.2 kg	0.24	1.25
Transportation	n/a	n/a	3.20
Total Variable Costs			**25.70**
Gross Margin (TR-TVC)	**n/a**	**n/a**	**32.62**
Depreciation on fixed assets	**n/a**	**n/a**	**4.26**
Net farm income (NFI)	n/a	n/a	**28.36**

Source: Field survey data, 2011.
NB*: Net Profit = Gross margin – Total depreciation
US$1=N150
n/a = Not Applicable

Table 3: Summary of Regression Analysis Results (Double-Log)

Variable	X_1	X_2	X_3	X_4	X_5	X_6	X_7
Coefficient	-0.018***	1.650***	-0.0001	0.0009***	0.0003	0.200	0.020***
t-Value	6.14	10.50	indeterminate	4.50	0.18	1.05	2.86
SE	0.003	0.162	0.000	0.002	0.020	0.190	0.007
Constant	19.720	n/a	n/a	n/a	n/a	n/a	n/a
R2	0.924	n/a	n/a	n/a	n/a	n/a	n/a
F-ratio	175.64	n/a	n/a	n/a	n/a	n/a	n/a

Source: Field survey data, 2011.
N = 120
***Significant @ 1% (0.01)

[1] Under the local subsistence method of farming where farmers show gratification to friends, relatives and neighbours by granting them part of their farm output. However, in calculating total revenue, the market values of such gifts are used as inputted values.