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Economic analysis of selected food crops in Ile-Ife of Osun State, Nigeria

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Studies showed that young farmers are not attracted to the production of food crops which is central to the reduction of poverty and food security among poverty ridden populace of Osun State. This study analyzes the economic factors responsible for productivity of selected food crops in Osun State. Factors influencing the level of production as well as problems militating against the production of the selected food crops in the study area were examined. Purposively, sampled data were collected from 100 farming households. Budgetary analysis and four functional forms of ordinary least square (OLS) were fitted to the data. Results showed that farm size allocated to crops imposes a positive and significant influence on return. The cost-benefit ratio to food crops are 0.65, 1.22 and 0.44 for cassava, maize and yam, respectively. Capital was the major constraints to food crop production in the study area for all the crops studied. It was concluded that yam production was more profitable but less cultivated compared to cassava. Farmers especially the young ones need to be financially encouraged to cultivate more of these crops and reduce the family size in order to sustain the productivity of these food crops.

Key words: Food crops, food security, productivity.

INTRODUCTION

Over 90% of Nigeria's agricultural output is produced by resource poor farmers who have, for centuries, sustained the national food supply by harnessing both natural and socio-economic factors of production (Adedipe et al., 2004). These small farmers produce about 80% of the total food in the country (IFAD, 2009). Despite the wide areas of arable land, productivity is still restricted (Mohammed, 2008). Decline in agricultural production in Nigeria began with the advent of the petroleum boom in the early 1970s which brought about a distortion of the labor market. The distortion in turn produced adverse effects on the production levels of the food crops. Idachaba (2004) argued that the dwindling agricultural production is a confirmation of the unattractiveness of agriculture as a result of low returns and compensation being paid to the farmers, which tend to discourage increased production. Over 90% of Nigeria's agricultural output is produced by resource poor farmers who have, for centuries, sustained the national food supply by harnessing both natural and socio-economic factors of production (Adedipe et al., 2004). These small farmers produce about 80% of the total food in the country (IFAD, 2009). Despite the wide areas of arable land, productivity is still restricted (Mohammed, 2008). Decline in agricultural production in Nigeria began with the advent of the petroleum boom in the early 1970s increased production. Government attitude to agriculture and adverse climatic change such as erratic rainfall, worsened the low productivity, both per unit of land and per farmer which in turn, made agricultural work unattractive. The problems also lead to loss of interest in farming and enhanced the lure of the cities for the young

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and able bodied. The interaction of these factors has heightened the problem of food insecurity in the country (Babatunde and Oyatoye, 2005; DFID, 2009).

As the food situation and the performance of the agricultural sector got worsened, a number of agricultural development institutions were set up to improve the performance of the sector to increase agricultural and food productivity. These institutions are National Accelerated Food Production (NAFPP), Agricultural Development Projects (ADPs), River Basin Development Authorities (RBDAs), National Seed Service (NSS), National Centre For Agricultural Mechanisation (NCAM), Agricultural And Rural Management Training Institute (ARMTI) and Agricultural Credit Guarantee Scheme Fund (ACGSF). Others were the Nigerian Agricultural Cooperative and Rural Development Bank (NACRDB)/agricultural bank, Operation Feed the Nation (OFN), Green Revolution Programme, Directorate of Foods, Roads and Rural Infrastructure (DFFRI), Nigerian agricultural insurance company (NAIC), National Agricultural Land Development Authority (NALDA), Specialized Universities for Agriculture, Root and Tuber Expansion Programme (RTEP) and rural banking scheme, etc. Despite all these, there is loss of interest in farming and consequently a reduction in food production (Babatunde and Oyatoye, 2005). This study therefore examines the economic factors responsible food production of selected food crops in Osun State. Specifically, the study seeks to:

i) Describe the socio-economic characteristics of selected food crop farmers in the study area;
ii) Examine the factors influencing the level of returns to selected food crops farmers;
iii) Identify the problems militating against the production of selected food crops in the study area.

MATERIALS AND METHODS

Study area

The study was carried out in Osun state, located in southwestern Nigeria, between latitudes 7.0° and 9.0°N, and longitudes 2.8° and 6.8°E. The topography is rolling hills and lies between 300 and 600 m above sea level. Average rainfall decreases from 1475 mm in the forest belt in the southern sections of the state to 1125 mm in the savannah section to the north. Mean annual temperature ranges from 27.2°C in June to 39.0°C in December. Soil types are varied but most contain a high proportion of clay and sand and are mainly dominated by the lateritic series.

The State is mainly agrarian. Food crops grown in the area include maize (*Zea mays*), yam (*Dioscorea* spp), cassava (*Manihot esculenta*), cocoyam (*colocasia* spp), rice (*Oryza sativa*) and vegetables (*Amaranthus* spp). The permanent crops cultivated include cocoa (*Theobroma cacao*), kolanut (*Cola nitida*) and oil palm (*Elaeis guinensis*). These crops are usually mixed or intercropped.

Data collection

The primary data used for this study were obtained from a cross sectional survey of farmers and was conducted in 2008/2009 cropping season. Data were collected using a well structured questionnaire to obtain data on the socio-economic characteristics of the respondents, scale of farming, inputs used, output and prices.

Sampling procedure and sample size

Multistage sampling technique was employed. Rural communities notable for agricultural activities in Ife central local government were purposively selected. The communities were stratified into major food and tree crop production zones. Out of the food crop producing communities, Kajola and Agbogbo villages were selected. 40 cassava farmers, 30 maize farmers and 30 yam farmers were randomly selected among the identified food crop farmers in the study area. Thus, a total of 100 farmers were sampled.

Methods of analysis

Data collected were analyzed using descriptive statistics (mean, frequency counts, and percentage), budgetary analysis and four functional forms of ordinary least square (OLS) regression analysis. The different forms of OLS regression analysis were used following the experimental approach to analysis to determine which model provides the best fit to the data (www.statpac.com/surveys/sampling.htm).

Descriptive statistics

Frequency counts, mean and percentage were used to analyze the socio-economic characteristics of the respondents such as age, educational level, farm size and problems militating against the food crop production.

Budgetary technique

An enterprise budget approach was undertaken to estimate costs and returns to each of the three enterprises. According to Alimi and Manyong (2000), a budget is a quantitative expression of total farm plan summarizing the income, costs and profit (a residue of total cost from total revenue). Revenue was computed as monetary value of the total farm output sold/consumed by the farmer's household, given out as gifts or used for other purposes. Costs and returns were computed on per hectare basis. Variable costs change with level of production and included fees, fertilizer, labor, interest charge and supervision charges. Fixed costs, which do not vary with level of production, included rent and cost of hand tools. The budgetary technique was used to evaluate levels of profitability of the enterprise by estimating the revenue, gross margin and net farm income at the end of the production process. The difference between the two parameters is a measure of net profit or return in food production. The following were computed for each category of food crop farmers:

1) Gross revenue (GR): $GR = P \times Y$
Where: P = output price and Y = yield,

2) Gross margin (GM): $GM = GR - TVC$
Where: GM = gross margin, TVC = total variable costs and GR = gross revenue,

3) Net farm income (NFI) = GM - Total Fixed Cost (TFC) or GR - TC,

4) Operating expense ratio = $\frac{TVC}{GR}$,

5) Net farm income ratio = $\frac{NFI}{GM}$,

6) Return/Naira outlay = $\frac{NFI}{TC}$

Where: TC = TVC + TFC and TC = Total cost.

Regression analysis

For this study, the OLS method of regression was employed to analyze each enterprise. Four functional forms (linear, semi-log, double log, and exponential forms) were used in order to determine which model provides the best fit to the data for each of the enterprises.

The implicit general from of the OLS is defined as:

Linear:

$$Q = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + \mu \quad (1)$$

Exponential

Log $Q = a + b_1 X_1 + b_2 X_2 + b_3 X_3 + \mu$ (2)

Semi-log

$$Q = a + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + \mu \quad (3)$$

Double-log

Log $Q = Loga + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + \mu$ (4)

Where Y = output (₦); X_1= Age (years); X_2= Household size (number); X_3= Farm size (Ha); μ = error term.

The choice of a working functional equation was based on statistical measure of performance such as the adjusted R^2, the F-statistics, significance of the individual coefficients and the signs of the regression coefficients whether or not they conform to the a priori expectation. The higher the adjusted R^2, the better the equation fits the observed data.

The *a-priori* expectations of the signs of the coefficients are:

b_1: As a farmer grows older, it is expected that resource use and allocation would have been mastered for an optimum benefit. However, old age may also mean inability to manage resources beyond a little capacity that can be expected to cope with current market request. Hence, the variable can be positive or negative. Age is not necessarily synonymous with experience.

b_2: Larger family size is generally associated with a greater family labour being available to the household for the timely operation of farm activities. According to Akinbode (1973), as more labour is utilized, output is expected to increase and hence increase profit. However, as more family labour is used, increase in household expenditure is incurred. It is therefore difficult to predict this variable 'a priori' in this study.

b_3: The more the land area allocated to food crops production, the greater the expected output which translates to increased profit (Omotesho et al., 1993). Hence, the coefficient of farm size is expected to be positive.

RESULTS AND DISCUSSION

Demographic characteristics of the respondents indicated differences between respondents (Table 1). The result showed that most (77.5%) of the cassava farmers, 77.3% of the maize farmers and 83.3% of the yam farmers aged between of 30 and 50 years, respectively, showing that they are in active age brackets. The mean age was 42.4 years (cassava farmers), 40.9 years (maize farmers) and 41.3 years (yam farmers), respectively. Younger farmers may be more knowledgeable about better practices and may be more willing to bear risk and adopt improved technology because of their longer planning horizons. Older farmers may be less likely to understand inherent benefits in a given innovation.

The household size depicts that most of the farmers had a mean household size of 7.8 (cassava farmers), 7.3 (maize farmers) and 6 (yam farmers), respectively. The importance of this finding is that the large nature of household size could affect their food intake and food security of the household. This corroborates with the findings of Owu (1995) that the larger the sizes of the household, the more the food required within the household, this will in turn have a negative relationship with returns as a substantial portion of farm output is used to feed the family members.

Area of land cultivated to the food crops showed that 2.1, 0.9 and 0.4 acres were cultivated to cassava, maize and yam, respectively. The more the land area allocated to food crops production, the greater the expected yield which translates to increased profit (Omotesho et al., 1993). But as indicated, the land area allocated to the food crops is small which could translate into low aggregate output of food output hence, food insecurity for the people.

Literacy level analysis revealed that 70% of cassava farmers had no formal and incomplete basic primary education. Less than 30% of the maize farmers had basic education with the rest being illiterate. Fifty percent (50%) of the yam farmers had basic education.

Education plays important role in the optimal use of resources by farmers. As farmers acquire more education, their ability to obtain, analyze, interpret and use information improves. Education increases the ability of farmers to use their resources efficiently. Literacy level analysis revealed that 70% of cassava farmers had no formal and incomplete basic primary education. Less than 30% of the maize farmers had basic education with the rest being illiterate. 50% of the yam farmers had basic education.

The analysis of the problems (Table 4) militating against the food production showed that about (57.5%) of the cassava farmers had problems with capital. The main problems of the maize farmers were drought (43.3%) and labour cost (30%). For the yam farmers, theft and labour scarcity constituted the main problem. Access to capital enhances farmers' readiness to adopt technological innovations and increase production of food. It is hypothesized that the variable has a positive influence on the probability of adoption of land enhancing technologies (Bekele and Drake, 2003).

Table 1. Distribution of respondents by their socio-economic characteristics.

Variable	Cassava (n= 40)		Maize (n =30)		Yam (n = 30)	
	Frequency	%	Frequency	%	Frequency	%
Age (years)						
Below 30	3	7.50	3	10.00	4	13.33
31 - 40	12	30.00	12	40.00	11	36.67
41 - 50	16	40.00	7	23.34	7	33.33
Above 50	9	15.00	8	26.66	8	26.67
Mean	42.40		40.93		41.33	
Household size						
Below 6	14	35.00	12	40.00	15	50.00
7 - 9	14	35.00	12	40.00	11	36.67
Above 10	12	30.00	6	20.00	4	13.33
Mean	7.8		7.3		6	
Area of land cultivated (acre)						
Less than 2	28	70.00	28	93.34	15	50.00
2 - 3	11	27.00	2	6.66	8	26.67
Above 3	1	2.50	-	-	7	23.34
Mean	2.1		0.89		0.40	
Educational level (years)						
No schooling	17	42.50	12	40.00	11	36.67
Pry school incomplete	11	27.50	10	33.33	4	13.33
Secondary school incomplete	8	20.00	6	20.00	8	26.66
Post secondary	4	10.00	2	6.67	7	23.33

Source: Field survey (2011).

Table 2. Estimated costs and returns per hectare of selected food crops.

Source	Cassava (n = 40)	Maize (n = 30)	Yam (n = 30)
Total revenue	180, 655	81,467	236,400
Variable costs (₦)			
Labour	60,699.40	47,427	92,325
Fertilizer	10,714.28	14,158	39,583
Cuttings, seeds, setts	15,386.90	4,483	13,688
Supervision	8,746	6,639	20,531
Interest charge	13,125.60	12,208	-
Total variable cost	91,280	31,146	159,482
Fixed costs (₦)			
Tools	663.69	4,778	2,880
Rent on land	-	10,461	2,083
Total fixed cost	557.50	5486	4763
Total cost (TVC + TFC)	109,330.40	36,632	164,247
Net farm income (TR - TC)	71,324.60	44,835	72,153

Source: Computed with data obtained from field survey (2011).

Table 3. Profitability measures of the selected food crops.

Variable	Cassava	Maize	Yam
Profit (₦)[a]	71,324.60	44,835	72,153
Gross margin (₦)	89,325	50,321	76,918
Rate of return	0.65	1.22	0.44
Operating expenses ratio	0.51	0.38	0.67
Net income ratio	0.79	0.89	0.94

Source: Computed with data obtained from field survey (2011).

Table 4. Constraints to food production in the study area.

Problem	Cassava		Maize		Yam	
	Frequency	%	Frequency	%	Frequency	%
Capital	23	57.50	-	-	-	-
Low market value	7	17.50	-	-	-	-
Poor access road	2	2.50	-	-	-	-
High labour cost	8	20.00	9	30.00	10	33.33
Drought			13	43.33		
marketing			5	16.67		
Pests and diseases			3	10.00		
Theft	-	-	-	-	11	36.67
Yam sett	-	-	-	-	6	20.00
Harsh weather	-	-	-	-	3	10.00

Source: Computed with data obtained from field survey (2011).

Factors influencing level of return to food production

The regression results of the analysis (Table 5) showed that the double logarithm model gave the best fit for the analysis. For the cassava production, the result is explicitly stated as;

$$\text{Log } Q = Loga + b_1 \log X_1 + b_2 \log X_2 + b_3 \log X_3 + \mu$$

Ln (TR) = 4.87 - 0.00778Ln age - 0.02773Ln household size + 0.843Ln farm size
(8.225) (-0.251) (-0.103) (4.086)*

Adjusted R^2 = 0.282

The results showed that 28.2% of the variations in total revenue were explained by the explanatory variables included in the model. One of the three explanatory variables (farm size) was significant at 5% level. This means that a unit change in farm size has a strong influence on revenue. The positive sign of the coefficient of farm size conforms to *a priori* expectation that an increase in farm size leads to increased output and hence increased revenue. The negative sign of the coefficient of household size leads to a decrease in total revenue. This shows that a unit increase in family size decreases the revenue of the farmers.

The regression results of maize production showed that a large family size will cause a reduction to total revenue due to large consumption of what should have been sold.

The result is explicitly stated as:

Ln (TR) = 4.93 - 0.0533Ln age - 0.071Lnhousehold size + 0.882Ln farm size
(42.72) (0.702) (-1.062) (21.013)*

Adjusted R^2 = 94.0; F =151.96

The regression result of yam production is explicitly stated as:

Ln (TR) = 7.57 + 0.0256Ln age - 0.0120Lnhousehold size + 0.515Ln farm size
(16.799)* (3.811)* (-0.595) (14.416)*

Adjusted R^2 = 94.0; F =151.96

The positive sign of the coefficient of farm size conforms to the *a priori* expectation that an increase in farm size leads to increased output and hence increased revenue. The negative sign of the coefficient of household size leads to a decrease in total revenue. This shows that a unit increase in family size decreases the revenue of the yam farmers.

Table 5. Estimated OLS regression function of the selected food crops production.

Variable	Cassava (n = 40)				Maize (n = 30)				Yam (n = 30)			
(Code/Name)	Linear	Exponential	Semi-log	Double-log	Linear	Exponential	Semi-log	Double-log	Linear	Exponential	Semi-log	Double-log
Constant	8274.45 (0.223)	4.55 (18.672)*	96960.54 (1.054)	4.87 (8.225)*	9572.84 (1.187)	4.48 (68.016)	53809.57 (1.638)	4.93 (42.72)	101398.7 (1.324)	7.65 (16.658)*	-142009.3 (-2.710)*	7.57 (16.799)*
X_1- Age (years)	-204.03 (-0.397)	-3.15E-05 (-0.009)	-35531.91 (-0.737)	-7.78E-02 (-0.251)	115.06 (0.774)	-1.083E-03 (-0.891)	36707.66 (1.697)	5.33E-02 (0.702)	145.7 (0.983)	-3.15E-03 (-0.943)	1887.95 (0.522)	2.565E-02 (3.811)
X_2-Household size (No.)	1622.15 (0.668)	1.904E-03 (0.119)	10439.73 (0.252)	-2.73E-02 (-0.103)	-1110.45 (-1.377)	-3.55E-03 (0.538)	-21936.07 (-1.141)	-7.17E-02 (-1.062)	-1983.6 (-1.412)	2.04E-02 (0.919)	-3007.02 (-0.784)	-1.209E-02 (0.595)
X_3-Farm size (ha)	43575.23 (6.095)*	0.189 (4.015)*	188113.76 (5.863)*	0.843 (4.086)*	84396.18 (17.47)*	0.517 (13.093)	131597.87 (11.021)	0.882 (21.013)*	72577.3 (15.32)	0.514 (14.368)*	33761.04 (17.355)*	0.515 (14.416)*
Adj. R^2	47.9	27.4	40.0	28.2	92.1	86.1	43.60	94.0	84.9	88.4	91.8	84.8
F	12.95	5.89	12.09	6.12	114.15	61.12	81.5	151.96	37.8	56.24	81.96	75.01

Source: Computed with data obtained from field survey (2011). *Significant at 0.05%. Figures in parentheses are t-ratio.

Results of the budgetary analysis

Table 2 shows that net income was ₦59,912.5 for cassava farmers, ₦ 44,835 for maize farmers and ₦72,153 for yam farmers, respectively. The net income from the yam farmers was higher. There was a difference in cost of production for the different crop farmers. The cost-benefit ratio indicated that for every ₦1 spent by yam farmers, ₦0.55 profit was returned. For the maize farmers, for every ₦1 spent, ₦1.2 was returned. For the cassava farmers, for every ₦1 spent, ₦0.65 was returned (Table 3).

The operating expense ratio for cassava farmers indicated that 51% of gross revenue was used for operating expenses. The operating expenses ratio for maize farmers indicated that 38% of gross revenue was used for operating expenses, while 67% of gross revenue was used for operating expenses by the yam farmers. Net income ratio indicated that 94, 89 and 79% of gross revenue went to farmer equity for yam, maize and cassava farmers, respectively. Yam production was more profitable.

CONCLUSION AND RECOMMENDATION

Several factors are responsible for the decline in food crop production in Nigeria. Low farm size allocated to food production and high family size of the farming household negatively affects the return to food production in the study area. This has consequently led to loss of interest in farming activities, insufficient food production and food insecurity in the nation. Increased labour cost and scarcity, poor access to credit and theft are the other contributing factors.

It is therefore, recommended that farmers especially the young ones should be motivated financially, supported with farm machinery to reduce the labour problems. Institutions should also facilitate access to more cultivable land with adequate security to protect the effort of the farming household. The young farmers should be encouraged to add educational value to themselves and reduce their family size to benefit maximally and optimally from their farming activities. It is recommended that farmers should cultivate more of yam.

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