

Resource Productivity in Food Crop Production in Some Selected Villages in Oyi Local Government Area, Kwara State, Nigeria.

O. A. OMOTESHO, J. OLUFE AND S. O. OLADEJI

*Department of Agricultural Economics and Farm Management,
University of Ilorin, Ilorin, Nigeria.*

Abstract

This study was designed to evaluate the efficiency with which the peasant farmers use their resources in crop production activities. This was done by computing Marginal Value Productivities and production elasticities of selected inputs from the best fitting production function.

The study shows that labour and seeds were both inefficiently used: The labour input was over-used while seeds were under-used. Agrochemicals, however, were relatively efficiently used. Land was found to be the most significant factor of production determining the value of output.

It is therefore economical for farmers to reduce the amount of labour input and use more improved planting seeds on their farms. But the efficiency of some of these resources, could not be improved due to the crudity of farm tools, lack of improved planting seeds, insufficient supply of chemicals like herbicides, insecticides and seed dressing.

Introduction

One of the major problems in developing countries is that of food crisis. This is particularly true of Nigeria where, despite the huge funds allocated to agricultural projects and programmes by successive governments, the agricultural sector has not been able to provide adequate food for the ever increasing population, sufficient growth for rural incomes and raw material base for Nigeria's industrialization.

It is however, generally acknowledged that increased agricultural productivity would help in attaining the needed goal of self-sufficiency in food crop production. One of the often suggested strategies for increasing this productivity is a combination of measures designed to increase the level of farm resources as well as make efficient use of resources already committed to the farm sector (Ogunfowora et al, 1974).

It is against this background that it is necessary to look into the extent to which peasant farmers use their existing resources. Such a study could reveal whether their resources are used efficiently and suggest how to improve their productivity.

This paper evaluates the efficiency with which farmers in some selected villages in Oyi L.G.A. of Kwara State use their resources in food crop production. It also examines the cropping pattern of food crop farmers and analyses the cost and returns to various crop enterprises. It is structured as follows: The following section review concisely relevant literature. The third section presents the source of data and methodology used for the study. The fourth section highlights the socio-economic

characteristics of the respondents. The fifth section discusses the results. Finally, the last section suggests measures for improving resource productivity.

Methodology

The data used for this study were generated through a cross-sectional survey of 100 purposively selected farmers. Care was taken to reflect the relative number of each group of farmers in the various villages in the L.G.A. Information was collected on various aspects of farm business, including size of operation, types of crop planted, resources used, cost incurred and revenue obtained during the production period 1986 - 1987.

The collected data were subject to descriptive and inferential statistical analysis. Different forms of production functions were fitted to the data, using the method of least squares and estimates of marginal value productivity of selected resources were derived from the best fitting production function, as well as the elasticities of production.

The model relating output with inputs is given by:

$$Y = F(x_1, x_2, x_3, x_4, U) \text{ where}$$

Y = value of output in Naira (N). The value of output was estimated in monetary terms by multiplying the physical output value by the unit price of the crop concerned.

- x_1 = Area of land cultivated in hectares.
- x_2 = Labour input measured in Mandays.
- x_3 = value of planting seeds measured in N
- x_4 = value of Agrochemicals used in N
- U = error term.

The value of output was estimated as specified in equations 1, 2, 3, 4, as a linear, Cobb-Douglas, exponential and semi-log functions of the input respectively.

$$Y = a_0 + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 + U \dots\dots\dots 1$$

$$\text{Log} Y = a_0 + b_1 \text{Log} x_1 + b_2 \text{Log} x_2 + b_3 \text{Log} x_3 + b_4 \text{Log} x_4 + \text{Log} U \dots\dots\dots 2$$

$$\text{Log} Y = a_0 + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 + U \dots\dots\dots 3$$

$$Y = a_0 + b_1 \text{Log} x_1 + b_2 \text{Log} x_2 + b_3 \text{Log} x_3 + b_4 \text{Log} x_4 + U \dots\dots\dots 4$$

The best fitting equation will be chosen according to the following econometric and statistical criteria:

- (a) The magnitude of the coefficient of multiple determination (R^2)
- (b) The significance of the individual explanatory variables as expressed by their t-values;
- (c) The significance of the overall production function as judged by the F-value;
- (d) The appropriateness of the signs of the regression coefficients based on a priori expectations.

The MVP of resource provides a framework for policy decision on resource

adjustment. When the MVP value is positive, it is an indication that output could be raised by using more of the given factor input. But the magnitude of the MVP has to be compared with acquisition price (MFC) of the input in the order of determine how worthwhile it is to increase the level of the factor use. The divergence between the acquisition price of the input and its MVP indicates the scope of resource adjustment necessary to attain economic optimum (Ogunforowora *et al op. cit*). A given resource is optimally allocated when there is no divergence between its MVP and the MFC of the resource input.

$$\begin{aligned} \text{That is } MVP_{X_i} &= P_{X_i} \text{ where} \\ MVP_{X_i} &= \text{Marginal value productivity of input } X_i \\ P_{X_i} &= \text{Price of input } X_i = \text{MFC} \end{aligned}$$

A t-statistic was used to determine if there is divergence between MVP and MFC.

$$\frac{\left(b_i \frac{Y}{X_i} \right) - \text{MFC of } X_i}{Y/X_i \sqrt{\text{Variance } (b_i)}}$$

where Y and X_i are held at their geometric means (Ladipo, 1979).

The acquisition price (or MFC) for all resources used is the average market price prevailing in the area. However, where resources are measured in value terms, efficiency in the use of such resources was assessed by equating their MVP to one Naira plus some interest rate (Heady and Dillon 1964).

The elasticities of production indicate the change in output relative to a unit change in input if other levels are held constant. Mathematically, the elasticity of production is expressed

$$E_p = \frac{dy}{dx} \frac{X}{Y}$$

where: E_p = elasticity of production
 Y = aggregate value of output
 X = resource input

and $\frac{dy}{dx}$ = derivative of Y with respect to X

When the ratio is greater than one, this means that the increase in output outpaces the increase in input and production is elastic. When it is less than one, this indicates that the percentage increase in output is less than the percentage increase in input and the production is said to be inelastic. When the ratio is equal to one, then output increases by the same rate as input and elasticity is said to be unitary.

Socio-Economic Characteristics of Respondents

The age distribution of the respondents in the survey indicates that the majority of them (45%) were between 46 - 60 years of age; only 2% of the respondents were

between 16 - 30 years of age: 31% were aged between 31 - 45 years while the remaining 22% were aged above 61 years.

The majority of the sampled farmers were found to be illiterate; 66% of the respondents have never gone to school; only 27% have primary education while the remaining 7% attended secondary or post-secondary education.

The average family size was found to be 11 individuals per farmer. This high number should be an advantage to the farmer since majority of farmers mentioned family labour as their most important source of labour input. However, this source of labour is supplemented, in most cases, by hired labour.

Different types of crop enterprises are produced by the respondents. The enterprises were classified based on dominant crops found on their farms and other crops; 66% of the farmers in the survey produced the Yam/Cassava/Maize/Pepper (YCMP) enterprise; 24% were engaged in Yam/Cassava/Guinea-Corn (YCC) enterprise; while the remaining 10% were engaged in Yam/Cassava/Cowpea (YCCW) enterprise.

The farmers predominantly operated small farm sizes. Fifty seven per cent of the respondents cultivated between 0.51 - 1.50 ha of farmland, 30% cultivated below 0.50ha; 10% and 2% of the respondents cultivated respectively, farmlands in the range of 1.51 - 2.50 and 2.51 - 3.50 hectares. Only 1% of respondents had a farmland in the range of 3.50 - 4.50 ha. The average land hectrage cultivated per farmer was 0.88 ha.

The average Net revenue per ha of farmland was estimated to be ₦3,769.21/ha. The average net return per hectare of YCCW enterprise was the highest. It was estimated at ₦6,640.20 per ha as against ₦3,011.28/ha for the YCMP enterprise. The average net revenue per ha of YCC was estimated at ₦4,657.26/ha

Results and Discussion

Analysis of the determinants of farm output:

The general regression results of the four functional forms in equations 1, 2, 3, and 4 are shown in equation 5, 6, 7 and 8 presented on table 1.

Based on the criteria mentioned earlier, Cobb-Douglas (equation 6) function is the "lead" equation.

This equation 6 indicates that land area cultivate (X_1) and cost of seed (X_3) are highly significant explanatory variables of farm output (Y): their respective t-values are significant at 1% level. Agrochemicals' cost (X_2) is another, but rather less, significant explanatory variable of farm output.

The labour input used (X_4), although a relevant explanatory variable, is not statistically significant. Its t-value is not significant at all levels tested.

Meanwhile, the land area cultivated (X_1), the labour input (X_4), the cost of planting seeds (X_3) and the cost of agrochemicals (X_2), together explain about 61%

of the total variation in value of output (Y) as indicated by the value of R^2 ($R^2 = 0.61$).

Table 1: regression Coefficients

Regression Coefficients (b's)								
Equation No.	Form of Equation	Constant Term	X_1	X_2	X_3	X_4	R^2	F
5.	Linear	-960.82	57.09 (0.07)	10.02 (2.57***)	5.87 (5.05***)	25.79 (2.02)	0.55	29.15+++
6.	Cobb-Dauglas	6.30	0.59 (5.18***)	0.02 (0.11)	0.34 (4.38***)	0.03 (1.57*)	0.61	37.17+++
7.	Exponential	7.19	0.26 (5.18***)	0.00 (0.86)	0.01 (3.85***)	0.01 (1.90**)	0.48	27.74+++
8.	Semi-Log	-4280.46	282.20 (3.62***)	1064.40 (1.10)	859.4 (1.65**)	149.8 (1.39*)	0.40	16.11+++

Source: Computer Print out

Note: Figures in Parenthesis represent t-values:

*** t-value significant at 1% level

** t-value significant at 5% level

* t-value significant at 10% level

+++ F-value significant at 1% level

++ F-value significant at 5% level

+ F-value significant at 10% level.

Analysis of Resource use Efficiency

Marginal Value Productivities (MVPs)

The Marginal Value productivity is the yardstick for judging the efficiency of resource used at a given level of technology and prices of both input and output.

The Cobb-Doughlas function is used to calculate the MVP of individual inputs. The estimates of the MVPs, ratios of the MVP to MFC and the calculated t-values are presented in table 2.

Table 2: MVPs; Ratios of the MVP to MFC and Calculated T-Values

Resource	MVP (N)	MVP/MFC Ratio	Calculated t-value
Land x_1	3.349	—	—
Labour X_2	0.334	0.07	-1.50*
Seed X_3	2.851	2.28	2.35***
Agrochemicals X_4	1.872	1.10	0.85

* t-value significant at 10% level

*** t-value significant at 1% level.

The significant difference between MVPs, and MFC of labour (as revealed by its calculated t-value = -1.50 and its MVP/MFC ratio = 0.07) indicates that labour is inefficiently used by Farmers in the study area. This is probably due to the crude implements used in farming. It may also result from the category of farmers involved in farming operations as majority of them are old and hence may spend more time than younger farmers performing the same tasks.

There is also a significant difference between the MVP and MFC of seed (X_3), indicating its inefficient use. Productivity of planting seeds could be improved by using more improved seed varieties.

The calculated t-value of agrochemicals' cost reveals that there is no significant difference between its MVP and MFC, which points at a relatively efficient use of this input.

In the study area agricultural land is not sold or rented. Therefore its MFC could not be compared to its MVP. And, its efficiency could not, thus, be evaluated.

Elasticities of Production

For Cobb-Douglas production function, the elasticity of production corresponds to the regression coefficients (b's). The production elasticities of inputs at the mean levels of output and input and the return to scale are shown in table 3.

Table 3: Production Elasticities and Return to Scale of Inputs

Variable	Production Elasticity
Land X_1	0.590
Labour X_2	0.015
Seed X_3	0.335
Agrochemicals X_4	0.025
Return to Scale	0.965

The computed production elasticities ranged from 0.015 for labour to 0.590 for land, implying that an increase in the level of these input will increase the aggregate value of output.

The sum of elasticity coefficients, that is the return to scale (0.97) is less than one but greater than zero, implying that the respondents were producing within the rational zone of production, that is stage II.

Summary and Recommendations

This study was designed to evaluate the efficiency with which the peasant farmers use their resources in crop production activities. This was done by computing Marginal Value Productivities and production elasticities of selected inputs from the best fitting production function.

The study shows that labour and seeds were both inefficiently used: The labour input was over-used while seeds were under-used. Agrochemicals, however, were relatively efficiently used. Land was found to be the most significant factor of production determining the value of output.

It is therefore economical for farmers in the study area to reduce the amount of labour input and use more improved planting seeds on their farms. But the efficiency of some of these resources, in the study area, could not be improved due to the crudity of farm tools, lack of improved planting seeds, insufficient supply of chemicals like herbicides, insecticides and seed dressing. This also due to the category of farmers involved in farming in terms of age and lack of basic education that can enhance farming activities. This later remark is particularly true, when the labour input in the study area is considered.

Policies should therefore be directed towards adequate supply of improved farm inputs to farmers, extension of mass literacy programme to the area of study, this should aim at teaching the farmers the proper type, quantity and best time to apply the improved inputs.

It is also recommended that formal credit through public or private financial institutions, should be provided to farmers in the study area. It is believed that, since capital forms the basic bedrock for the procurement of necessary improved inputs plus payment of labour, this will go a long way in increasing the standard of living of the farmers and the nation at large.

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