RESOURCE USE EFFICIENCY IN FOOD CROP PRODUCTION IN EKITI STATE, NIGERIA.

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ABSTRACT

This study was designed to examine resource use efficiency in food crop production in Ekiti State of Nigeria. Primary data were collected from 110 food crop farmers selected using multi-stage random sampling technique. Data analysis was done using both inferential statistics and regression analysis. Marginal value productivity of resources were computed and compared with the acquisition/prices of these resources. Result of regression analysis indicates that farm size, fertilizer and purchased inputs were significant inputs that accounted for variation in the output of food crops. The Marginal Value Product (MVP) of all the resources were positive but land was more productive than others inputs. The use of operating credit and fertilizer were efficient. Farmland and purchased inputs were under-utilized while labour was over-utilized. Increasing the farm size and purchased inputs used and decreasing the level of labour use would increase food crop production in the area.

Keywords: Food Crops; Resource Use Efficiency; Marginal Value Product; Unit Factor Cost.

INTRODUCTION

Recent happenings in Nigeria have shown that the country is in need to expand its agricultural Production especially food crop production. This becomes necessary to meet the rising demand for food caused by the increasing population growth rate. According to FAO (1996), the per-capita food production in Nigeria has been on a downward trend. Food production has failed to respond adequately to increase in the demand for food. The

annual population growth rate was put between 3-5 percent while the Domestic food growth rate was about 2 percent (FAO, 1996).

It has been argued that given the Nigerian land area of 923,768km^2 and an estimated population of over 100 million people (with an estimated 70% of the population engaged in agriculture) there is no justification for continuous importation of staple food into the country (Adegbite, 1998). The government is aware of these potentials and recently placed a ban on the importation of some staple food crops that can be produced locally. The ban has given serious challenges to the food crop farmers in Nigeria. Some of the identified constraints to increase food production are inadequate resources and inefficient utilization of available resources. Given the fact that agricultural production is a function of the quantity and quality of resources employed in production. In order to achieve increase production, these resources must be available and whatever quantities of available resources must be used efficiently. Increase in resource efficiency is therefore a prerequisite for increased agricultural production (Ogunfowora et al, 1975).

One of the measures often suggested for increasing food production is to make efficient utilization of resources already committed to the farm sector. To achieve this, requires the knowledge of resources productivity and efficiency, which would indicate the direction of possible adjustment in resource use and allocation (Heady, 1966). Several studies on resource productivity have shown the inefficient allocation of resources by food crop farmers in Nigeria. Osuntogun (1980), observed that land and capital resources were under-utilized and labour was over-utilized in cooperative group farming in Imo state of Nigeria. Olufe (1988), in a study of resource productivity in food crop production in selected villages of Oyi local government area of Kwara State noted that labour and planting seed were inefficiently use but agrochemicals was used efficiently. Alimi (2000), in a study of resources use efficiency in food crop production in Oyo state of Nigeria concluded that land, family labour and capital resources were inefficiently utilized in food crop production. A study by Olatundun (2002), on resource productivity in small-scale farming in selected local government

areas of Kwara state, concluded that land, labour (family and hired) and operating capital were over-utilized and their quantity should be reduced to increase production.

In order to suggest ways of increasing food production in Nigeria, similar study like this study becomes necessary especially in one of the states where agriculture is the predominant occupation. Information provided by this kind of study would assist food crop farmers to determine how available resources could be put to optimal utilization thereby meeting the challenges of increasing demand for food crops in Nigeria. This paper examines resources use efficiency in food crop production in Ekiti state of Nigeria and it suggests measures, which could be adopted to achieve increase in the food crop output.

METHODOLOGY

This study was carried out in Ekiti state in Nigeria. The study covered Ikere, Ise-Orun and Emure Local Government Areas. Ekiti state enjoys tropical climate that has the wet and dry seasons. Mean annual temperature ranges between 21° C to 28° C and mean annual rainfall ranges between 1200mm to 1800mm. The state is divided into two agro-ecological zones (northern savannah and southern forest zones) for the purpose of agricultural planning. The area covered by this study fall under the northern savannah zone, which is blessed with deep loamy soil, and the zone is often regarded as the food basket of the state. Major food crops grown in the area include Maize, Rice, Yam, Cocoyam, Plantain, Banana, Cassava and Vegetables. Cash crops like Cocoa, Citrus, Kola and Oil palm are also grown in the area.

Sources of Data and Sampling Procedure

Primary data were collected from randomly selected food crop farmers in Ekiti state during the 2001-farming season. Secondary data were obtained from Ekiti state Agricultural Development Project (ESADP). Three-stages

sampling method was used for this study. Three local government areas were selected from the northern savannah zone of the state. Five villages were randomly selected from each local government areas. Ten food crop farmers were finally selected from each of the fifteen selected villages using the Ekiti State's Agricultural Development Project household listing as the sampling frame.

A total of 150 food crop farmers were interviewed using a structured questionnaire. Only 110 questionnaires were adequately completed and found suitable for analysis. The data collected included among others the socio-economic background of food crop farmers, types of food crops grown, farm size, crop yield, the various inputs used and the prices of inputs and output in the area for 2001 farming season. The data collected from the 110 food crop farmers were analyzed using inferential statistics and regression techniques.

Model Specification and Estimating Procedure

The implicit form of the production function model used in this study is given as;

$$Y = f(X_1, X_2, X_3, X_4, X_5, U) \quad \ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where:

Y = total value of food crop output in naira

X_1 = farm size in hectare

X_2 = labour used in man-days

X_3 = Operating credit in naira

X_4 = value of fertilizer input in naira

X_5 = value of purchased inputs in naira

U = the error term

All the assumption of the ordinary least square regression method about the dependent and independent variables were made. The error term was assumed to be normally and independently distributed with zero mean and constant variance.

Measurement of Variables.

The output from individual food crops whether in sole cropping or in crop mixture in the entire farmers field was obtained in physical quantities. The physical units were then weighted by the average ruling prices paid for individual food crop and they were added together to obtain the total value of food crop output. Inotherwords the naira value and not the physical quantity was used as the dependent variable in equation (1) because farmers produced more than one food crops that could not be aggregated in physical unit but in monetary term.

Land planted to the various food crops were measured in hectares. The farm size for any farmer is the addition of all the hectares cultivated to the various food crops either as sole crops or in crop mixtures. It was difficult to determine land quality variability within the villages. Thus land quality and the managerial input for all the sample farmers were assumed to be equal. Labour input, provided by family and hired persons was measured in man-days. A man-day was taken to be the work done by an adult male for a total of 8 hours. The numbers of days worked by women and child labour were converted to adult man-day equivalent using Norman's conversion formula (Norman, 1974). These were added to obtain total labour input.

Operating credit in Naira was measured by the amount of agricultural credit obtained from both formal and informal sources, which are used in food crop production. Fertilizer used was collected in kilogram. 50kg of fertilizer for example is equivalent of one bag. The quantity used by each food crop farmers in kg was converted to naira value based on the market price of fertilizer in the area. Purchased inputs such as agrochemical and seeds were measured in quantities, and the quantities were converted to their naira value based on average ruling price in the area. On *a priori* basis, it is expected that each of the independent variables in equation (1) will be positively related to the dependent variable, i.e food crop output will increase with increases in each of the farm inputs (Oladunni, 1987)

Three forms of production function were fitted to the data using the regression method of ordinary least square estimation. The lead equation was selected based on the magnitude of the coefficient of multiple determination (R^2), the significance of the t-values and the appropriateness of the signs of the estimated coefficient. The marginal value productivity (MVP) of each input was calculated using regression coefficients of the lead equation. Resources use efficiency in food crop production was examined by comparing the MVP with the acquisition price of the inputs (i.e. Unit Factor Cost of input). The unit factor cost was taken to be the market price when such input is purchased from a competitive input market or it is taken as one naira plus the ruling interest rate if it is a capital input (Omotesho et al, 1993)

Kay (1981) submitted that a resource is efficiently utilized if the ratio of its MVP to UFC is one. A ratio less than one indicates over-utilization and a ratio greater than one shows under-utilization of the resource. Test of significant differences between the MVP and UFC was carried out using the formula given by Ladipo (1977).

RESULTS AND DISCUSSION

The estimated regression coefficients and the related statistics for the regression equations are presented in table 1. Based on econometric and statistical criteria mentioned earlier, the Cobb-Douglas function was chosen as the lead equation and was used in determining resource productivity and resources use efficiency. The coefficient of multiple determination (R^2), for the lead equation shows that the included variables accounted for about 56%of the total variation in the output of food crops in the area. All the coefficient have positive signs indicating that by increasing the quantity use of each input individually or collectively will increase the quantity of food crop output. This result agrees with *a priori* expectation (Oladunni, 1987). The summation of the regression coefficients was 1.09 indicating increasing returns to scale in food crop production. The regression coefficients for land (X_1), fertilizer (X_4) and purchased inputs (X_5) were significant at 5% level. This implies that other things being equal, land, fertilizer and purchased inputs play significant roles in explaining the variation in food crop output. The coefficient of labour (X_2) and operating credit (X_3) were not significant. The F-test, which is an overall test of significance for the fitted equation was significant at 1 percent. The non-significance of some of the individual coefficients (i.e. X_2 and X_3) therefore, could be accommodated within limits (Heady and Dillion, 1964).

Table 1: Regression coefficient for food crop Farmers in Ekiti state, 2001 Farming Season

Variables	Regression Coefficients		
Form of equation	Linear	Cobb-Douglas	Exponential
Constant	-11784.5	1.84	3.98
X_1	0.467 (3.98)**	0.39 (3.63)**	0.55 (4.48)**
X_2	-0.03 (-0.26)	0.11 (1.14)	0.16 (1.20)
X_3	0.366 (3.06)**	0.12 (1.22)	0.17 (1.35)
X_4	0.02 (0.15)	0.25 (2.60)**	0.09 (0.74)
X_5	0.17 (1.32)	0.22 (2.28)**	-0.003 (-0.002)
R^2	0.68	0.56	0.61
F-values	18.5	15.9	15.7

Source: From Survey data, 2001. Figures in parenthesis are t- values

**t -Values significant at 5 percent +F- values significant at 1 percent

The Marginal Value Productivity (MVP) has been described as the Yardstick for measuring the efficiency of resource used at a given level of technology and prices of both inputs and output (Ogunfowora et al, 1975). The MVP provides a framework for effecting resources adjustment on the farm. When the MVP is positive, it is an indication that using more of a given resource could increase output. However, the MVP must be compared with the UFC in order to determine how worthwhile it is to increase the level of

resources use. The difference between the MVP and UFC indicates the level of the resources use. The differences give the scope of resources adjustment necessary to attain economic optimum. Estimates of MVP of each resource are presented in table 2.

Table 2: Marginal value productivities of resources use in food crop production.

Resources	MVP
Land	4452.1
Labour	47.6
Operating Credit	0.33
Fertilizer	4.33
Purchased Inputs	4.72

Source: From survey data, 2001

The marginal value productivity of land, labours, fertilizers and purchased inputs were positive and greater than one. The MVP of operating credit was positive but less than one. The result in table 2 probably shows that land is the most productive resource followed by labour. The very high value of MVP for land may be due to the fact that food crop farmers cultivate high value crops like yam, maize and rice in the study area (Ogunfowora et al, 1975). The positive sign of the MVP for all the resources further confirm that increasing the level of use of the resources can increase food crop output.

RESOURCE USE EFFICIENCY

To assess the level of resources use efficiency, the ratio of MVP to UFC of each input was computed. A test of significance difference between MVP and

UFC was also carried out by calculating the t-values to determine if there is significant difference or not between the MVP and UFC. Food crop farmers were assumed to operate in a purely competitive input market, thus the market price per unit of input was used as the marginal factor cost. The UFC of farmland was taken to be the tribute paid by tenant farmers ('isakole'), which was on the average ₦1000 per hectare in the area. The UFC of labour was ₦300, which was the average wage rate of labour per day. The UFC of operating credit and purchased input was taken as one plus the interest rate of 28% and this gave 1.28. The UFC of fertilizer was ₦31.15, which represent the cost of 1kg of fertilizer in the area. The estimates of MVP, ratios MVP to UFC and the t- values are shown in table 3:

Table 3: Ratio of MVP to UFC and the t-values of inputs used by food crop Farmers.

Resources	MVP (₦)	UFC (₦)	MVP/UFC	T-Values
Land	4452	1000	4.45	12.7**
Labour	47.6	300	0.16	-5.29**
Operating Credit	0.33	1.28	0.26	-1.06
Fertilizer	4.33	31.2	0.14	-0.88
Purchased Input	4.72	1.28	3.69	6.01**

Source: Survey Data, 2001. **t-Values significant at 5 percent.

Table 3 shows that there was under-utilization of farmland in food crop production, as indicated by the t-value. This result agrees with that obtained by Alimi (2000). The under-utilization of farmland may be attributed to the cultivation of small farm size as a result of the use of crude farming implement. To increase the output of food crops, more land should be cultivated and this can be accomplished if farmer are provided with modern

farm tools and other production resources at affordable prices. There was over-utilization of labour input. The t-value indicates significant differences between the MVP and the UFC. The inefficient use of labour was probably due to excessive use of labour over what is required; it may also be as a result of farmers spending more man-days of labour performing the same tasks on repeated basis on food crop farms. This excessive use of labour tend to support the general belief of low labour productivity in agriculture which conforms with the finding of Ogunfowora et al (1975); Omotesho and Olawale (1991) and Omotesho et al (1997).

The calculated t-value for operating credit and fertilizer show that there were no significant difference between their MVP and UFC. This implies that operating credit and fertilizer were efficiently utilized in food crop production. Increase in food crop output may not be achieved by adjusting the level of use of these inputs but by the adoption of other measures such as improved farming techniques and increased farm size.

Purchased inputs were under-utilized. The t-value was significance at 5% indicating significant difference between MVP and UFC. The under-utilization of purchased inputs might be due to the non-existence of the use of agrochemical among food crop farmers and the use of seeds below the recommended rate. Arising from this is the need to sensitize farmers on the possible advantages of using agrochemicals and training them on the appropriate rate for planting seeds in the area.

SUMMARY AND CONCLUSION

This study provides some useful information on resources productivity and efficiency in food crop production in three selected local government areas of Ekiti State in Nigeria. The study attempts to find out whether food crop farmers are efficient or not in utilizing available farm resource. Structured questionnaire was used to collect data from one hundred and ten food crop farmers during the 2001 farming season. The data were analyzed using descriptive and regression techniques. The result of the regression analysis showed that even though all the identified inputs were used within rational

range, land, fertilizer and purchased inputs were significant in explaining the variation in the output of food crops. Resource use efficiency analysis shows that farm land and purchased inputs were under utilized but a labour input was over utilized. Operating credit and fertilizer were efficiently allocated in food production.

To achieve increase in the output of food crops and increased resources productivity, the following measures are suggested. Food crop farmers should acquire modern farm tools and equipment that would enable them increase the size of their farmland. They should take advantage of the various private and government credit scheme to enable them buy other production resources necessary to expand their farmland. The use of labour should be reduced probably by adopting farm mechanization and modern farming techniques. Finally, extension agents should sensitize and enlighten food crop farmers on the usefulness of adopting agrochemicals and also train them on recommended seed planting rate for the area.

REFERENCES

Adegbite, D. A (1998): *Role of Youth in Agriculture Development in Rural Children and the Future Food Security of Nigeria* eds Adedoyin S.T and D.O Tonimoro, CIAP Segeto and Co, Nigeria pp 192-205.

Alimi, T (2000): Resource Use Efficiency in Food Crop Production in Oyo State of Nigeria. *Journal of Agriculture and Environment,* 1(1) :1-7

Food and Agriculture Organization (1996) *FAO Year Book*, Rome, Italy

Heady E.O. (1966): "A Recipe for Meeting the World Food Crisis" CAED Report 28, Center For Agriculture and Economic Development, Ames, Iowa, USA.

Heady E.O and Dillon. J.L (1964): *Agricultural Production Function,* Iowa State University Press Iowa, PP 97-98

Kay, R. D. (1981): *Farm Management, Planning, Control and Implementation.* McGraw-Hill Books Company, New York PP 34

Ladipo, O.O. (1977): The Variance of Marginal Value Productivity Estimates Using Cobb-Douglas Function. *Journal of Rural Economics and Development*, 11(1): 57-68

Norman, D.W (1974): "An Economic Survey of Three Villages in Zaria Province 2. Input- Output Study," Samaru Miscellaneous Paper 37, Ahmadu Bello University, Zaria Nigeria.

Ogunfowora, O. ; Essang, S.M. and Olayide, S.O. (1975): Resource Productivity in Traditional Agriculture: A Case Study of Four Agriculture Division of Kwara State of Nigeria. *Journal of Rural Economics and Development*, 9 (1): 119-131

Oladunni. O.A (1987): Labour productivity of Tobacco farmers in Oyo State, Nigeria. Unpublished M.Sc Degree Thesis, University of Ife, Ile-Ife, Nigeria 96p

Olatundun, B.E (2002): Resource Productivity in Small Scale Farming: A Case Study of Selected Three Local Government Areas of Kwara State, Unpublished B.Agric Thesis, Department of Agric Economics, University of Ilorin, Ilorin.

Olufe, J. (1988): Resource Productivity in Food Crop Production in Some Selected Villages in Oyi Local Government Area of Kwara State, Nigeria. Unpublished B.Agric Thesis, Department of Agric Economics, University of Ilorin.

Omotesho O.A and Olawale, A.C (1991): Economics of Dry season Vegetable Production Along Asa River in Ilorin L.G.A. Kwara State. *Rural Development in Nigeria*, 4(1): 50-53

Omotesho, O. A; Olufe, J and S.O Oladeji (1993): Resource Productivity in Food Crop Production in Some Selected Villages in Oyi L.G.A of Kwara State, Nigeria. *Ife Journal of Agriculture,* 14: 90-97.

Omotesho O.A; Adewumi, M.O and Amao, F.O (1997): Resource Use Efficiency in Cassava Production in Oyo State of Nigeria. Centrepoint, Science Edition, 7(1): 55-65.

Osuntogun, A (1980): "A Study of Resource Productivity in Cooperative Group Farming in Imo State Nigeria" *Canadian Journal of Agricultural Economics*, 28(3): 80-85