EFFICIENCY OF RESOURCE USE IN TOMATO ENTERPRISE IN TARKA LOCAL GOVERNMENT AREA, BENUE STATE, NIGERIA

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Abstract

Efficiency of resource-use in tomato enterprise in Tarka Local Government Area of Benue State was carried out to identify the problems facing tomato farmers in the study area and to determine the productivity and efficiency of resource use in tomato production. One hundred respondents were randomly selected from ten council wards. The result show that the problems faced by tomato farmers in the study area are unavailability of improved seeds, inadequate labour supply, inadequate credit facilities, agrochemicals and inefficient extention services. The Cobb-Douglas production function used in estimating the relationship between input and output showed that land, labour and capital were significant at 5% level of probability. The estimated function showed diminishing return to scale, which suggest stage II of production process. The values of the average physical products were comparatively greater than those of the marginal physical products. These two conditions suggest that the farmers were technically efficient in tomato production. The values of the marginal products were compared with the marginal cost of input to determine whether the farmers were allocatively efficient. The MVP of land, labour and capital were greater than their marginal cost, implying that these inputs were not optimally utilized. The study recommend that input such as improved seeds, agrochemicals, credit as well as enough extension workers be provided by the government to assist resource-poor farmers..

Introduction

Agriculture is the backbone of the nation's economic and political sovereignty. This explains why successive governments in Nigeria have taken various steps to encourage food production in the country. The need to increase food production is emphasized in relation to the population explosion in the country from 55 million in 1963 to 88 million in 1991 (FOS.1994).

Both population increase and the general fall in the production of some staple food crops have worsened the food shortage situation such that the country experienced serious food crisis during the early eighties (1980s). Consequently, Food imports rose from 88.3million or 8.2% of total imports in 1985 (CBN, 1987).

Vegetables constitute essentials in the diet since vitamins, and minerals are obtained almost exclusively through them. However, the role of vegetables as major suppliers of these vitamins and minerals can only be achieved through optimum consumption by the people.

It holds *ipso facto* that anything, which hampers or reduces production of vegetables, invariably, reduces availability of the essential nutrients to deserving people. Tomato is one of the most important vegetables in most parts of the world. Tomato tends itself to a variety of domestic and industrial uses (Purseglove, 1972).

Since tomato is one of the most important vegetables and as the major supplier of vitamins, therefore, it is imperative to examine the efficiency of farm resources in its production. The general goal is to improve farmers' productivity and enhance income generation of tomato vegetable crop.

Problem Statement

Tomato production is dominated by large numbers of small-scale farmers who rely mainly on their unimproved method and poor farming techniques (Onwueme, 1979). The small-scale farmers do not measure their efficiency and elasticity of production, neither do they measure yields produced from other tomato farmers. Some factors identified as causing low domestic food production include emigration of productive hands from rural to urban areas. This has led to scarcity of productive hands on farms with consequent increase in the cost of farm labour. Also,

most of the tomatoes grown in Nigeria are local varieties whose yield and fruit quality are generally poor but whose resistance to disease is usually high (Owueme, 1978). Many of them have fruits that are wrinkled, crack easily, too acidic and easily destroyed before reaching the ultimate consumer.

The problem of land shortage caused by increasing farm population has resulted in frequent land disputes in the country. Other identified factors include declining soil fertility due to poor management, high population growth rate, and conflicting government policies both at federal and state levels. Hence, the dire need for farmers to expeditiously utilize farm resources.

Olayide and Heady, (1982) posits that inefficient resource use among small scale farmers is one of the major causes of poor agricultural production. Balasa (1965) contends that a sector or enterprise, which uses its resources inefficiently, characterized by low value of marginal product, is likely to loose its resources to those industries or sectors with high value marginal products (VMP).

There is need to intensify research into tomato enterprise in order to determine the productivity of resources used in its production. The study assesses the productivity of the resources employed by the farmers in tomato production.

Objectives of the Study

The broad objective of the study is to examine the productivity and efficiency of farm resources used in tomato production in the study area. Specifically, the study seeks to:

(i) Identify the problems facing tomato farmers;
(ii) Determine the productivity and efficiency of resource – use in tomato production; and
(iii) Make recommendations based on the findings of the study;

Hypothesis

In this study, it is hypothesized that;

(i) Output of tomatoes is independent of farm size.
(ii) Yield of tomatoes is independent of quantity of labour used.

Theoretical Framework

Product function is defined as the physical relationship between the output and the input used in the production of the product Olukosi and Ogungbile. (1989) asserts that production function is a pure technical relation; it describes the laws of proportion, that is, the transformation of factors into product (output) at any particular time period. The production function represents the technology of a firm or an industry or the economy as a whole.

Technical efficiency and allocative efficiency are two important concepts relating to production function. Technical efficiency refers to the ability of producers to obtain a certain level of outputs, while allocative efficiency is the ability to choose the level of inputs that maximizes profit, given factor cost (Olayide et al, 1982).

The optimum amount of input or efficient resource- use is determined by considering the profit equation as a function of input.

The profit equation is= $Y.P_y$ - ($\underline{K}$+X.Px.....(I)

Where Y = Output (yield)

P_y= Unit price of Output.

P_x=Unit price of Input.

X=Quantity of Input

$\underline{K}$= Fixed input.

$\delta = Y.P_y-(XP_x+K)$

$$\frac{d\lambda}{dx} = \frac{dy}{dX} py - Px \quad \text{.....(II)}$$

Also, MPP= $\frac{dy}{dx}$ where MPP= Marginal physical product.

"X

P_y MPP – P_x .....(III)

MVP =(P_y MPP=MVP).

Where MVP=marginal value product.

MVP=Px..... (IV)

MR=MC ..... (V)

(MR = Marginal Revenue, MC = Marginal Cost)

APP = $\frac{TPP}{X}$

Where APP= Average physical product
TPP= Total Physical product.
X= Units of input

$$Ep = \frac{MPP}{APP} \quad \text{.....(VI)}$$

The producer will use inputs as long as the marginal revenue (MR.) of the output is equal to or greater than the marginal cost (MC)

In the short run, the farmer will produce as long as he is able to cover the variable cost i.e. where the MC is equal to or greater than the average variable cost (AVC). In a single input case, the optimum point of resource – use is where the value of the marginal product is equal to input price (MVP=Px) Highest Price Point (HPP).

The typical production function depicts three stages of production. Stage 1 of production ends with the extensive margin. Hence in stage II, the TPP first increases at an increasing rate. In this stage MPP and increase and reaches maximum and begin to decrease. APP is also increasing till it reaches maximum and begin to decrease. APP is also increasing till it reaches a peak and lies above MPP. APP = MPP at the end of stage I and the beginning of stage II.

Extensive margin marks the beginning of stage II while the intensive margin marks its end. In stage II, TPP continues to increase at a decreasing rate. In stages II both MPP and APP are decreasing but MPP is decreasing faster. The point marks the beginning of stage II where MPP equals APP at its maximum and ends where MPP equals zero. Stage III of the production lies beyond the intensive margin where TPP is decreasing and MPP is negative.

APP remains positive and lies above MPP. In stage III the ratios of the variable inputs to fixed inputs are large and reach its maximum at the intensive margin. Therefore; the area of operation is stage 11 where the ratio of the variable input to fixed input is higher so much so that adjustment between the two extremes is possible. The maximum APP of a variable input occurs at the intensive margin whereas the maximum APP of fixed inputs is at the intensive margin. Stage II therefore, is the rational stage of production while stagel and III are irrational stages of production. As long as the MPP is greater than APP,one would continue to add more of the variable input. X_1 should be increased until MVP=MFC=Px_1 which is the economic optimum point (Olukosi and Ogungbile. 1989).

Methodology

The Study Area

The survey was conducted in Tarka Local Government Area of Benue State. Tarka Local Government is situated north of Gboko Local Government Area in the north – eatern part of Benue State. It has landmass of 60.00km2. based on the 1991 population census, the Local Government Area has a population of 152,984 people. Guma Local Government border it to the north; Gwer Local Government to the west and Buruku Local Government to the east.

Sample Selection

Tarka Local Government Area has ten Council Wards namely; Mbakyaa, Mbaayo, Mbakwenem, Mbaigba, Shitile, Mbaariyakaa. Tongov, Mbayagber, Mbacha – Verikondo and Mbaikyo.

A total of 100 respondents were randomly selected from a sample frame of tomato farmers. Ten (10) respondents were randomly selected from each of the ten (10) council wards.

Data Collection

Data for this study was generated from both primary and secondary sources. Primary sources include the use of quesitionaire and interviews while secondary data was obtained from existing literature relevant to the study.

Data Analysis

In this study, descriptive statistics and Cobb-Douglas production function analysis were used to realize stated objectives.

Specifically, the Cobb-Douglas production was explicitly specified as follows:

$Y = AX_1^{b1} X_2^{b2} X_3^{b3}$

Where A= Constant

X_1=Land (ha)

X_2=Labour

X_3 = Capital (Naira). The Cobb-Douglas function is a power function (Olukosi and Ogungbile. 1998). It is one of the most widely used functions in economic analysis, particularly, in empirical estimation in agriculture and industry.

It exhibits either constant, decreasing or increasing marginal productivity. Its function is easy to estimate in logarithmic form as:

$LogY=logA+b_1 Log X_1 + b_2 Log X_2 + b_3 Log X_3$.

Results and Discussion

The survey revealed that most of the farmers had between eleven to twenty (11 – 20) years of experience farming tomatoes.

Table 1: **Farming Experience in Tomato**

Years	**No. of Respondent**	**(%)**
1-10	43	43
11-20	44	44
21-30	6	6
31-40	7	7
Total	100	100

Source: Field Survey 2001.

The farmers opined profitability is the main factor that attracted them to engage into tomato production. 69% of the sampled farmers go into tomato production for profit reasons. Home consumption accounts for 27% of the reasons for growing tomato while 4% were engaged in tomato production as a result of Benue Agricultural and Rural Development Authority (BNARDA).

Table 2: **Reasons for Cultivating Tomato**

Factors	**No. of Respondent**	**(%)**
Profitability	69	69
Home Consumption	27	27
Promotion by BNARDA	4	4
Subsidy	-	-
Total	100	100

Source: Field Survey 2001.

The survey revealed that the most serious problem hindering increased tomato production in the study area is unavailability of

improved seeds, inadequate credit facilities and shortage of agrochemicals needed to control weeds, pest and diseases. Other problems in the opinion of farmers include inefficient extention services, inadequate irrigation facilities and inadequate labour supply.

Table 3: **Problems facing tomato farmers in the Study Area.**

Problem	**No. of Respondents**	**(%)**
Inadequate Credit	19	19
Unavailability of Improved Seeds	32	32
Inadequate Labour Supply	6	6
Inadequate Technical Knowledge	3	3
Unavailability of Fertilizers	5	5
Unavailability of Agrochemicals	15	15
Inefficient Extension Services	14	14
Inadequate Irrigation Facilities	6	6
Total	**100**	**100**

Resource Use Efficiency

Data collected from the respondents were analysed to determine the relationship between inputs (land, labour and capital) and output of tomato.

Results obtained are as follows:

CONSTANT	B1	B2	B3
343.283	0.465	0.307	0.216

$Y = 343{,}283\ X_1^{0.465}\ X_2^{0.307}\ X_3^{0.216}$ .....(1)

Linearized form of Equation (1) is given as follows:

Log Y=Log343.283+0.465 LogX_1 +0.307 Log X_2 +0.2+0.216 LogX_3

2.56	(6.48)	(4.20)	3.05

R2= 0.898 (89.9%).

Y= Estimated output of tomato in Kilogram (kg)

X_1= Cultivated land (ha)

X_2= Labour used.

X_3 Capital (Naira).

Land labour and capital were significant at 5% level of probability.

Hence the null hypotheses are rejected.

This implies that land, labour and capital have significant effect on the output of tomato. The above result is further confirmed by the value of the coefficient of determination (R2) which is 0.898.8% of output is as a result of X1, X2 and X3.

An average of 2471.75kg of tomato was produced by 100 farmers in the study area using a total of 141.6 hectares of land 7436 man days of labour and 298,758 Naira.

The average physical products of land labour and capital were estimated as follows:

$$APP\ x_1 = \frac{TPP}{x_1} = \frac{247175}{141.6}$$

$$APP\ x_1 = 1745.586$$

$$APP\ x_2 = \frac{247175}{7436}$$

$$APP\ x_2 = 33.12$$

$$APP\ x_3 = \frac{247175}{298758}$$

$$APP\ x_3 = 0.827$$

The average physical product (APPs) of land, labour and capital were given as 1745.586, 33.12 and 0.821 respestively.

The marginal physical products of land, labour and capital were estimated as follows:

$$Ep = \frac{MPP}{APP}$$

Ep = Elasticity of production,

$Ep = b_1 + b_2 + b_3$ (0.465+0.307+0.216)

Ep = 0.988

MPP= Ep.APP

$MPP\ x_1 = 0.988.1745.586$

$MPP\ x_1 = 1724.639$

$MPP\ x_2 = 0.988.33.12$

$MPP\ x_2 = 32.723$

$MPPx_3 = 0.988.(0.827)$

$MPPx_3 = 0.817$

The marginal physical products of inputs were valued at the prevailing product price of tomato i.e. N15.50 per kilogram weight of tomato. Thus it's MVPs of land, labour and capital were estimated to be N26,731.90, N497.86 and N12.66 respectively. Table 4 gives a clearer illustration.

Table 4: **Comparison of APP,MPP,MVP and MFC.**

Factor	APP	MPP	MVP	MFC
Land	1745.586	1724.639	26,731.90	775
Labour	33.12	32.723	497.86	150
Capital	0.827	0.817	12.66	0.20

Source: Authors own computation.

$$Ep = \frac{MPP}{APP}$$

Ep = Elasticity of production,

$Ep = b_1 + b_2 + b_3 (0.465 + 0.307 + 0.216)$

$Ep = 0.988$

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Table 4: **Comparison of APP, MPP, MVP and MFC.**

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Source: Authors own computation.

Return to scale which is the sum of elasticities in a Cobb – Douglas production suggests a diminishing return to scale, implying that tomato farmers were producing in stage two. The comparison of APP and MPP values also confirms that farmers were producing in stage two. That is, all values of APP are greater than those of MPP, while MPP value are all positive ($0 \leq MPP \leq APP$). This in other words implies that tomato farmers were technically efficient in their use of resources.

The marginal value products were compared with input prices to determine how close farmers were to the theoretical optimum of performance. (MVP = PI = MFC).

The MVPs of land, labour and capital given as N26.731.90,N497.86 and N12.66 respectively were greater than the cost of obtaining additional units of these inputs (N775.00, N150.00 and N0.20 respectively). This implies that an extra Naira spent on each of these inputs yields incremental revenue greater than the initial investment on such an input. This proved further that the inputs were under utilized. The tomato farmers could attain economic optimum by increasing the use of these inputs.

Conclusion

This study concludes that the problems militating against tomato production in the study area include unavailability of improved seeds, inadequate labour supply, inadequate credit facility, unavailability of agrochemicals, inefficient extension services, inadequate technical knowledge and lack of irrigation facilities.

Land labour and capital were found to be significant at 5% level of probability showing the importance of these factors in tomato production. The estimated function showed diminishing returns to scale which suggests stage II of the production process. The value of the average physical products were comparatively greater than those of the marginal physical products.

The MVPs of land labour and capital were greater than their marginal cost implying that these inputs were not optimally utilized.

The study recommends that:

1. Government through the Ministry of Agriculture should provide more extension staff to educate farmers on the skills involved in tomato production.

2. Government through Benue Agricultural and Rural Development Authority (BNARDA) should provide improved varieties, agrochemicals and irrigation facilities to farmers.

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