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ECONOMICS OF TOMATO PRODUCTION IN YEWA NORTH LOCAL GOVERNMENT AREA OF OGUN STATE, NIGERIA

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ABSTRACT

This study was carried out in Yewa North Local Government Area of Ogun State, in 1995. Survey method was used to collect data from 70 respondents randomly chosen from a sample frame of tomato farmers obtained from National Agricultural Land Development Authority (NALDA), for the study area. Questions relating to the socio-economic characteristics of the tomato farmers, tomato outputs, output prices and cost of resources viz. labour, seed, fertilizer and land used in production, as well as constraints to tomato production were asked in the questionnaire. Production function analysis was used to show the equilibrium or disequilibrium of resource use from the optimum. Analysis of costs and return was used to establish the profit level of tomato production in the study area. The study revealed that most of the tomato farmers are married males with an average of 9 people in the household. Most of the tomato farmers were literate with an average of secondary school education, and their average age of 35 years fall within the active age group. The study also revealed that tomato production is a profitable venture, but the levels of resource use with respect to fertilizer, land and seed were below optimum. The problems militating against tomato production were identified to be high cost of fertilizer, pest and disease problems, and inefficient transportation network resulting in spoilage of output and inadequate credit facilities. To bring about sustainable production for an enhanced level of profit and resource use efficiency in tomato production, it was suggested among others in the short-run, that the road network should be improved. This will facilitate easy evacuation of tomato to urban centres where demand is high. The possibility of processing the tomato close to the production site should be explored in the long run, if the excess supply can justify putting in place a tomato processing plant of an appropriate plant size. In addition, farmers should be educated on the appropriate combination of inputs for economic optimum output. There is need for an increase in the levels of seeds, fertilizer and land allocation to tomato production than hither-to done for an achievement of economic optimum, which would make tomato production an attractive enterprise.

Key words: Tomato, enterprise profitability, and resource use efficiency.

INTRODUCTION

Vegetables are generally regarded as essential herbaceous plants having high moisture content in their fresh forms with considerable quantities of vitamin A, B, C, D, E, and K, which help to protect the body against diseases and contribute in no small measures to good health (Agusiobo, 1984). The daily need of vegetables as reported by (Wainjemberg, 1981) is normally 150 – 250g per person. This is expected to provide a balanced diet needed by people particularly in a diet characterized by low inclusion of meat and other animal proteins.

The production of fruit vegetable crops in the tropics is 100 million tonnes per annum, with about 13 per cent of these being derived from tomato (Komolafe et al, 1980). Tomato contains 71 per cent water, 3 per cent protein, 5 per cent carbohydrate, 10 per cent vitamin and

1 per cent ash. The protein content of tomato is nearer to that of cereal grains (McColum, 1975).

Tomato has a great potential and the fruits are in high demand though production is declining in many areas because of increasing cost of inputs and low yield (IITA, 1984). For an increase in the level of agricultural productivity, a combination of measures designed to increase available farm resources and efficiency in the use of existing resources is necessary (Heady, 1962). Afolami (1982), was of the opinion that resources are generally used below profit maximization level by rural households because of their low capital base. Other reasons are due to risk aversion and inadequate knowledge about the efficient and optimum combination of these resources by the farmers. Therefore this study is aimed at studying the economics of tomato production among tomato producers in Ogun State.

Specifically, the objectives of this study are to determine the profit level in tomato production, identify whether the various resources used in tomato production are being efficiently utilized, find out the constraints to utilization, identify the problems faced by tomato farmers and make policy recommendations that will boost tomato production.

MATERIALS AND METHOD

(a) Data and Analytical Techniques

The socio-economic variables of age, marital status, level of education, household size and sex of the respondents were analyzed using descriptive statistics of frequency and percentages (Table 1).

Production functions were estimated in order to analyze for resource productivity and use efficiency. This allows for the computation of marginal value productivity (MVP) from the estimated coefficients of the production functions.

The implicit form of the production function is given as:

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

where,

Y = output of tomato in kilogrammes

X_1 = fertilizer use in Naira

X_2 = hired labour use in Naira

X_3 = farm size in hectares

X_4 = value of tomato seeds in Naira

U = random error.

The production function was fitted using three functional forms, which are linear, semi log and Cobb-Douglas.

These are expressed explicitly in order of listing as follows:

$$Y = \beta o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + U \quad .(2)$$

$$Y = In\beta o + \beta_1 InX_1 + \beta_2 InX_2 + \beta_3 InX_3 + \beta_4 InX_4 + InU \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

$$InY = In\beta o + \beta_1 InX_1 + \beta_2 InX_2 + \beta_3 InX_3 + \beta_4 InX_4 + InU \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (4)$$

Using ordinary least square regression model, observations on the variables in the model were imputed into the computer, to determine the least square regression estimates of the βi's, their standard errors and the models' coefficient of multiple determination (R^2), (Table 2).

The *a priori* expectation of the parameters is given as: $\beta_1>0$, $\beta_2>0$, $\beta_3>0$, $\beta_4>0$. That is, the null hypothesis (H_0) and the alternative hypothesis (H_A) are:

H_0: β_0, β_1, β_2, β_3 and $\beta_4 = 0$

H_A: β_0, β_1, β_2, β_3 and $\beta_4 > 0$

The significance of the parameters from zero, high magnitude of the F-value and relatively large coefficient of multiple determination (R^2) attests to the overall goodness of fit of the relationship between the regressand and the regressors.

The lead equation from the three functional forms was chosen based on the agreement with *a priori* expectations of the parameters, statistical as well as econometric criteria.

Thus, Cobb-Douglas function was chosen because apart from having four parameter estimates to be significantly different from zero

Table 1: Distribution of Tomato Farmers According to Socio-Economic characteristics.

Variable	Frequency	Percentage	Mean/Mode
(a) **Age**			
16 – 30	25	35.72	
31 – 45	32	45.71	35years
46 – 60	13	18.57	
(b) **Marital status**			
Married			
Single	62	88.57	
	8	11.43	Married
(c) **Level of**			
Education	18	25.71	
Primary School	23	32.86	
Secondary School	17	24.29	
Tertiary Education	12	17.14	Secondary School
Adult Education			
(d) Sex	45	64.29	
Male	25	35.71	
Female			Male
(e) **Household**	18	25.71	
Size	43	61.42	
1 – 15	9	12.87	9 people
6 – 10			
11 - 15			

Source: Field Survey, 1995

Table 2: Multiple regression analysis results for tomato Production

Functional Forms	$\hat{\beta}_0$	$\hat{\beta}_1$	$\hat{\beta}_2$	$\hat{\beta}_3$	$\hat{\beta}_4$	R^2	F
LINEAR	572 *	0.45*	0.03	1.98	3.11**	0.98	1028.1
t-statistics	(5.87)	(3.04)	(0.64)	(0.26)	(22.16)		
SEMILOG-	9384*	-1198.1*	2418.3*	2094.6*	2687.5 **	0.93	232.9
t-statistics	(3.92)	(-2.57)	(3.44)	(3.08)	(10.94)		
COBB-DOUGLAS	1.39*	0.25*	0.04	0.16*	0.44**	0.97	551.3
t-statistics	(5.29)	(4.61)	(0.45)	(2.14)	(16.21)		

Source: Field Survey, 1995.

** Coefficient significant at 1% level *Coefficient significant at 5% level.

at 5% level, the fit of the model was good and the coefficients are direct elasticities of the inputs.

(b) Marginal value productivities and marginal factor costs

The marginal value productivity (MVP) of any resource is the product of the marginal physical product (MPP) and the unit price of output (P_y), assuming constant output price and given that the dependent variable is in physical unit (kilogrammes).

For the Cobb-Douglas function, the marginal value productivity for resource X_i ,($MVPx_i$) is given by,

$$MVPxi = \hat{\beta}_i(\bar{Y} / \bar{X}_i)P_y$$

where:

$\bar{Y}$ = mean tomato output

$\bar{X}_i$= mean of the variable resource X_i (i = 1 ...4)

P_y = price per kilogramme of tomato output, since elasticity of resource X_i in tomato production is βi_i

In order to determine resource use efficiency, the marginal factor costs (MFCs), which are the opportunity costs of the various inputs used, were compared with their respective resource MVPs (Table 5). The prevailing market prices of the resources used during the tomato production season were used in this regard as their opportunity cost, given the deregulation of Nigerian economy during the study period. Fertilizer was sold for N4.00 per kg, land rent was N650.00 per hectare, hired labour was N60.00 per man day while tomato seed was N5.00 per kg. The price per kilogramme of tomato was N7.00.

Efficiency of resource use was based on the following decision criteria:

When:

MVP / MFC > 1, the resource use is below optimum, implying under-utilization of resource.

MVP/ MFC < 1, the resource use is above optimum, implying over-utilization of resource.

MVP/ MFC = 1, the resource use is at its optimum level.

(c) Analysis of costs and returns

This was used to determine the profit level of tomato enterprise.

Total revenue (TR) = product of output and unit price of output.

Total cost (TC) = addition of total variable costs (TVC) and total fixed costs (TFC).

The variable costs identified, are the costs of hired labour, fertilizer, as well as seed. The fixed costs are the rent on land, depreciation on farm implements (hoe, cutlass, and basket).

Pronouncement on whether enterprise is profitable was guided by the following decision criteria:

When TR >TC, there is profit

When TR<TC, there is loss

When TR=TC, break – even point in the business is reached.

RESULTS AND DISCUSSION

The socio-economic characteristics of the farmers show that 46 percent of the farmers are between the ages of 31 and 45 years with the average age being 35 years. Eighty-nine percent of the farmers are married with an average household size of 9 persons. Farmers have spent an average of 11 years in school.

The lead equation chosen is the Cobb-Douglas (Double logarithmic) function because it has three input variables with significant coefficients apart from having a relatively higher R^2 and F value. The linear function though has the highest R^2 and F value; only two independent variables have parameters that are significantly different from zero. The semi-logarithmic function has a negative sign for the estimated coefficient of the variable input, fertilizer, which contradicted the *a priori* expectation with respect to the sign of the parameter for the input, hence it was rejected.

The result in the Cobb-Douglas equation shows that the estimated coefficients for fertilizer, cultivated land and seed are significantly different from zero at 5% level of

significance. Table 3 shows very strong correlation between the independent variables in the model and explains why the coefficient of hired labour was not significantly different from zero, which is contrary to expectation. There is the problem of multi-colinearity in the model. The estimates of the parameters though unbiased, their standard errors might be large, thus making one to accept the null hypothesis.

Table 5 shows that for hired labour, the ratio of MVP to MFC is less than one. This indicates an over-utilization of hired labour for tomato production in the study area. We should however recall that the parameter estimate was not significantly different from zero.

However, land, seeds and fertilizer have ratios of MVP to MFC that are greater than one, showing that they were under-utilized.

The ratio of MVP to MFC is not equal to one for all the inputs considered. This shows dis-equilibrium from the optimum in resource use and it implies that the resources are not used at the economic optimum level.

The reasons adduced for under utilization of fertilizer range from low capital base of farmers, un-timeliness in its supply, high cost, to non-availability while that of seed is due to lack of knowledge on optimum plant population. For land, under utilization was due to competition for land between tomato cultivation and other crops, which the farmers require for subsistence.

The tomato farmers can increase output and profit by expanding land area allocated to tomato, as well as increase their investment levels on seeds and fertilizer.

The quantity of hired labour used in tomato production though shown by our analysis not to be significantly different from zero, one can say that it was well below optimum given the high wage rate for labour that prevailed during the cropping season. There is the need for more labour use (both hired and family labour) in the enterprise for thoroughness of all activities because the enterprise is labour intensive.

The cost structure shown in Table 4 indicates that hired labour represented the greatest percentage of the total variable cost, this being 66%, closely followed by the cost of fertilizer 20% while seed cost was 14%. Fixed cost is relatively of lower magnitude to the variable cost. Fixed cost, as a percentage of total cost is 32 percent while variable cost is 68 percent. The components of variable cost – hired labour, fertilizer and seed costs as percentage of total cost were 45.0, 13.7 and 9.6 respectively. The components of fixed cost are rent on land, costs of hoe, cutlass and basket. These as percentage of total cost were 8.4, 6.5, 9.1 and 7.8 respectively. This confirms labour to be the single most important factor in tomato production.

Generally, tomato production is ascertained to be profitable in Yewa North Local Government Area of Ogun State as returns to management was N7, 902.70 per hectare, and production activity is for about 24 weeks.

Problems Militating Against Tomato Production

The problems identified to be militating against tomato production in the study area are:

(a) Destruction of tomato crop by pests and diseases, which brings about considerable output loss.

(b) Inefficient transportation network to facilitate easy evacuation of tomato after harvesting to the market. This led to spoilage of some of the product.

(c) Inadequate credit facilities to procure essential farm inputs e.g. fertilizer and seeds, required in the adoption of improved technological practices necessary to improve yield level.

(d) Depletion of soil fertility, which also brings about yield reduction.

CONCLUSION

The study revealed that an additional use of an extra one-naira worth of seed and fertilizer, would increase tomato output by N14.47, and N5.69, while an additional hectare use will increase output value by N 1849.00 *ceteris paribus*. Given that the marginal factor costs of

Table 3: Correlation matrix of the dependent and independent variables in the production function for tomato.

	Y	X_1	X_2	X_3	X_4	Log_Y	$LogX_1$	$LogX_2$	$LogX_3$	$Log X_4$
Y	1									
X_1	0.986	1								
X_2	0.877	0.847	1							
X_3	0.887	0.857	0.891	1						
X_4	0.990	0.877	0.869	0.881	1					
Log_Y	0.949	0.900	0.813	0.828	0.916	1				
$LogX_1$	0.788	0.939	0.736	0.766	0.740	0.887	1			
$LogX_2$	0.881	0.882	0.981	0.879	0.861	0.863	0.815	1		
$LogX_3$	0.866	0.892	0.839	0.950	0.839	0.889	0.889	0.874	1	
$LogX_4$	0.945	0.870	0.791	0.798	0.942	0.966	0.801	0.826	0.821	1

Source: Field Survey, 1995.

Table 4: Analysis of costs and returns for tomato production per hectare.

Items		₦	
1. REVENUE			
Output value = 1,650.90kg at ₦ 7.00/kg			
TOTAL REVENUE			**11,556.29**
2. COSTS			
i) Variable Costs			
a)	124 kg of fertilizer at ₦ 4/kg	499.39	
b)	27.4 mandays of hired labour at ₦ 60/manday	1,646.17	
c)	69.8 kg of seeds at ₦ 5/kg	349.10	
	Total Variable Cost	**2,494.66**	
ii) **Fixed Costs**			
a)	Land (rent)	307.47	
b)	6 Hoes at ₦ 51.25 each	236.52	
c)	7Cutlasses at ₦ 47.30	331.12	
d)	14Baskets at ₦ 20.27 each	283.82	
	Total Fixed Cost		
TOTAL COST			**1,158.93**
NET INCOME			**3,653.59**
			7,902.70

Source: Field Survey, 1995.

Table 5: Marginal value productivity (at output price of ₦7.kg), marginal factor costs of inputs and their ratios.

Inputs	Mean Value	MFC	MVP(₦)	MVP/MFC
Fertilizer	₦1,055.70	₦ 4.00/kg	5.693	1.42
Hired Labour	₦ 3,480.00	₦ 60.00	0.221	0.004
Land	2.114 Ha	650.00	1849	2.84
Seed	₦ 738.00	₦ 5.00/kg	14.47	2.89

Source: Field Survey, 1995.

the resources are N5.00, N4.00 and N650.00 respectively, these resources will contribute more to tomato output if their use is increased. Though production took place in stage two of production function, the rational stage (given the sum of the resource elasticities of production of 0.89 which is between zero and one- the boundaries of stages one and two), the optimum level of use of the resources has not been reached.

This reveals that there is disequilibrium in resource use efficiency in tomato production in Yewa North Local Government Area, with regard to land and investment in seeds and fertilizer. Therefore, in order to boost production, government should extend credit facilities to the farmers, to acquire more of these inputs.

Despite the non-significance of the hired labour in our model, our observation shows that more labour in tomato production is required. This is because tomato production is labour intensive. I.I.T.A. (1984) opined that this is because large quantities of planted materials are required and large number of man-days is needed for staking and harvesting.

For protection of tomato from attack of pests and diseases, efforts should be intensified through provision of pesticides to the farmers, as well as technological know-how in the use of the chemicals.

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