PRODUCTIVITY AND TECHNICAL EFFICIENCY OF CASSAVA PRODUCERS IN EWEKORO LOCAL GOVERNMENT AREA, OGUN STATE, NIGERIA

Ezekiel Olaoluwa Akerele
Department of Agricultural Economics and Farm Management
Olabisi Onabanjo University
Yewa Campus,
Ayetoro.

Abstract

This study examined the productivity and technical efficiency of cassava producers in Ewekoro Local Government Area of Ogun State, Nigeria, with a view of improving cassava production. Information on cassava production, relative importance to other crops, cassava land areas and constraints in cassava production were obtained with aid of structured and validated questionnaires from 80 cassava farmers. Data collected were analyzed using Descriptive Statistics, Budgetary Analysis, Ordinary Least Square Regression and the Stochastic Frontier Model. The result of the budgetary analysis showed that the mean total cost of producing cassava is ₦115,183.16, total revenue is ₦472,057.50, mean gross margin and net income are ₦461,281.86 and ₦356,869.34 per annum respectively, which implies that cassava production is a profitable business. Also, the Ordinary Least Square Regression Analysis showed that quantity of cassava produced and the farming experience are statistically significant at one percent which brought positive increase on the farm output. The mean technical efficiency in the stochastic frontier model is 0.8938 (89.38 percent) which implies high utilization of production resources, while there is about 11.7 percent technical efficiency gap to be achieved by the farmers. The study revealed that major constraints faced by cassava producers include: storage problems, lack of capital, transportation problem, pest and diseases. It is recommended that government should organize adult literacy education for the illiterate farmers and also provide financial assistance to cassava producers for maximum production in the study area.

Basically, all farmers are primarily concerned with what should be done to reach, maintain and surpass high levels of performance in cassava production; this implies giving appropriate attention to the farming system and the productivity of cassava. Cassava *(Manihot esculenta, Crantz)* is one of the most important food crops in Sub-Saharan African. This area accounts for most of the cassava production worldwide. Its roots and by-products are increasingly being used in industries, indicating that cassava can be converted into an industrial crop, planted in medium to large size in the study area. The commercial production of good quality cassava cultivar is therefore growing as the demand for health, vigorous and productive crop increases (Nassar and Ortiz, 2006).

In the past, cassava was never seen as cash crop (industrial crop), it has been seen as a food crop. According FAO (2000), over 600 million people depend on cassava as stable food in Africa, Asia and Latin America. However, this view has changed with the inauguration of the Presidential Initiative on cassava production in Nigeria. Its uses can be classified into two: The industrial use and the local food need use of cassava. It has greater attention because of its potential for the production of ethanol which can be used to complement petroleum.

Cassava production is generally thought to require less labour per unit of output than other major staple foods. Cassava is able to grow and give reasonable yields in low fertile soils. It is a good staple food whose cultivation, if encouraged can provide nationally the required food security with a minimum of 2400 calories per person per day, FAO/WHO (2003). However, production can be defined as the output derived per unit of input into the production process. It explains the amount of output that can be derived from the unit of input employed in an agricultural process. Agricultural productivity could be increased by several measures, these includes: (a) Re-allocation of resources from micro to macro productive input; (b) Improvement in labour input; (c) Improvement in quality of capital (Hussain and Perera, 2004).

The millennium development goals of halving hunger and poverty by 2015 is contrasted by the population of under nourished people which stood at 202 million people as at 2002, though cassava is a high yielding cash crop for both rural and urban consumers, (Nweke *et al* 2002). Three (3) different confirmations had been made about Nigeria being the highest producer of cassava, even with these confirmations, which are supposed to be food security indices, the technical inefficiency in cassava production in the study area has caused reduction in productivity; though it can be processed into secondary products of industrial value, such as chips, pellets, flowers, adhesives alcohol and starch.

But it must be noted that fresh cassava roots are highly perishable. Deterioration begins within 24-28 hours after harvest (Ngoddy, 1989). Loss of cassava roots to pests and diseases such as green mites or mealy bug on the leaves and stems of cassava reduces plants growth and ultimately the yield.

Objectives of the Study

The main objective of this study was to examine the productivity and technical efficiency Cassava Producers in Ewekoro Local Government Area of Ogun State.
The specific objectives of this study were to:

(i) Describe the socio-economic characteristics of cassava producers in the study area.
(ii) Estimate cost - return structure of the cassava production.

(iii) Examine the productivity and efficiency of resources used in cassava production.

Methodology

Study Area and Methods of Data Collection

This study was carried out in Ewekoro Local Government Area of Ogun State. Both primary and secondary data were used for this study. The primary data were collected using structured questionnaires with open and close ended questions to obtain information from cassava producers in the study area; while secondary data were obtained from journals, books, statistical reports and other relevant publications on cassava production.

Sampling Techniques

The multi-stage random sampling technique was employed in the study. The first stage involved random selection of 10 communities in the study area; while, the second stage involved random selection of 8 cassava farmers from each of the selected communities making a total sample size of 80 respondents.

Methods of Data Analysis

Both descriptive statistics and inferential analytical techniques were used in this study. Descriptive analytical tools used include: frequency tables, percentages and ratio which were used to describe the socio-economic characteristics; while, inferential statistics such as Budgetary Analysis and Stochastic Frontier Production Function were used to determine cost and return structures of the cassava producers and the technical efficiency of the resources used in cassava production in the study area.

Analytical Framework/Model Specification

In this study, the efficiency of the cassava producing farmers was determined using a model specified following the Cobb-Douglas Stochastic Frontier Production Function. The model is specified in the log-linearized forms as:

$$InQi = In\ \beta_0 + \beta_1 InX_1 + \beta_2 InX_2 + \beta_3 InX_3 + \beta_4 InX_4 + \beta_5 InX_5 + \beta_6 InX_6 + \beta_7 InX_7 + V_i - U_i$$

Where:

InQ	=	Total output in kilograms
X_1	=	Land under cultivation in hectares
X_2	=	Labour utilized in days
X_3	=	Agro-chemicals in naira
X_4	=	Cassava stem cuttings in naira
Z_1	=	Age (years)
Z_2	=	Sex (Male = 1, Otherwise = 0)
Z_3	=	Marital Status (Married = 1, Otherwise = 0)
Z_4	=	Household Size (no. of person)
Z_5	=	Educational Level (years)

Z_6 = Major Occupation (Farming = 1, Otherwise = 0)
Z_7 = Farming Experience (years)
β_0 = Constant term
$\beta_1 - \beta_4$ = Coefficient of independent variables to be estimated
e_1= error term defined by $e_1 = V_i - U_i$.

OLS Regression technique was used to analyze the determinants of agricultural production
The implicit form of the production function is:
$Y = \beta_o + \beta_i X_i + U$
$Y = \beta_o + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + \beta_6 X_6 + \beta_7 X_7 + \beta_8 X_8 + e_1$

Where:
Y = Net Income (₦)
X_1 = Farmer's Age (years)
X_2 = Marital Status (Single=0, Married=1, Divorced=2, Widowed=3)
X_3 = Years of formal education
X_4 = Years of experience in cassava production
X_5 = Quantity of cassava produced (kg)
X_6 = Household size (no. of person)
e_i = Error term

Results and Discussion

Socio-Economic Characteristics of the Respondents

Data in Table 1 revealed that the age distribution revealed that 72.6% of the respondents were within 30-60 years. It has a mean of 52.6 years. This indicates that majority of the respondents are still in their prime ages and very agile in faming activities and cassava production. Gender distribution of the respondents showed that 77.5% of the respondents are males. This means that males dominate the production of cassava more than the female counterparts. Gender is an important variable in determining the level of involvement of respondents in the production of cassava. The marital status of the respondents showed that 56.3% of the respondents were married. This implies that majority of the respondents were settled family people and have family responsibilities which increased their curiosity for cassava production so as to get more income. The household size of the respondents comprises of their wife (wives) or husband, children and their dependants. This result showed that 42.5% of the respondents had a household size that is 3 – 5 persons to help them during cassava production. This reduces their production cost and increases their involvement in cassava production.

Education is an important variable to cassava production improvement. The result revealed that only 23.8% had no formal education which implies that majority of the cassava producers are literate. This enhances their managerial planning and decision

concerning increase in cassava output. The finding showed that 30.0% of the respondents have farming as their main occupation while other respondents are involved in other non-farm activities. Production experience guides in farm management. The distribution showed that 36.2% of the respondents had below 10 years of farming experience. This indicates that majority of the respondents (63.8%) have rich and wealth of experience to guide their production activities. Majority of the respondents (57.5%) were motivated by their parents into cassava production, which means that cassava production is an inherited occupation from the parents of active cassava producers in the study area. Most of the farming activities were done on small-scale basis. This is evidence in the farm size cultivated by the respondents. Majority of them cultivated less than three hectares except about 8.84% farmers who cultivate between three to ten hectares. Mode of land acquisition distribution revealed that 52.5% of the respondents acquired their land through inheritance/family acquisition. This signifies that most of the lands acquired by the respondents were obtained through inheritance from parents and family lineage which enhances easy access to land for maximum cassava production. About 83.75% of the respondents have lack of capital as a major constraint to cassava production in the study area.

Table 1: Socio-Economic Characteristics of the Respondents

Variables	*Frequency*	*Percentage*	*Cumulative Percentage*
Age (years)			
Below 30	4	5.0	5.0
30-39	3	3.8	8.8
40-49	24	30.0	38.8
50-59	31	38.8	77.6
60-69	13	16.2	93.8
70 and above	5	6.2	100.0
Sex			
Male	62	77.5	77.5
Female	18	22.5	100.0
Marital Status			
Single	7	8.8	8.8
Married	45	56.3	65.1
Divorced	5	6.2	71.3
Widow/widower	20	25.0	96.3
Separated	3	3.7	100
Household Size			
Below 3	19	23.7	23.7
3-5	34	42.5	66.2

6 and above	27	33.8	100
Educational Level			
Primary	16	20.0	20.0
Secondary	26	32.4	52.4
Tertiary	19	23.8	76.2
No formal education	19	23.8	100
Occupation			
Farming	30	37.5	37.5
Hire Labour	2	2.5	40.0
Teaching	4	5.0	45.0
Civil servant	20	25.0	70.0
Trading	24	30	100
Farming Experience (years)			
Below 10	29	36.2	36.2
10-19	8	10.0	46.2
20-29	11	13.8	60
30-39	9	11.3	71.3
40-49	16	20.0	91.3
Above 50	7	8.7	100
Business Motivation			
Self interest	23	28.8	28.8
Parents	46	57.5	86.3
Friends and relative	5	6.3	92.6
Others	3	3.7	96.3
Self Interest/ Friends	3	3.7	100
Farm Size			
Below 10	73	91.2	91.2
10-19	4	5.0	96.2
20 and above	7	3.8	100
Land Acquisition			
Personal land	10	12.5	12.5
Inheritance/family land	42	52.5	65.0

Lease/rent	8	10.0	75.0
Purchase	9	11.3	86.3
Gift	11	13.7	100.0
Problem Encountered			
Storage problems	15	18.75	18.75
Lack of enough capital	43	53.75	72.50
Transportation	12	15.0	87.50
Pests and diseases	10	12.50	100
Total	80	100	

Source: Field Survey 2011

Cost and Return Structure of Cassava Productions

The analysis of the cost and return structure of cassava production on Table 2 shows that the mean total fixed cost is ₦104, 407.50 and the mean total variable cost is ₦10,775.64. The mean annual gross margin is ₦461, 281.86, while the net income is ₦356,869.34.

The net income and the gross margins are high, which depicts that cassava production is a very profitable crop in the study area.

Table 2: Cost and Return Structure of Cassava Production

Variables	**Mean**	**% Cost**
Total Variable Cost		
Cost of land clearing Male (₦)	1,976.25	18.33
Cost of stumping and raking Male (₦)	1,066.25	9.89
Cost of planting Male (₦)	750.0	6.96
Cost of weeding Male (₦)	822.50	7.63
Cost of fertilizer Male (₦)	1,051.25	9.75
Cost of harvesting Male (₦)	721.25	6.67
Cost of carriage Male (₦)	178.75	1.65
Cost of stumping and raking female (₦)	1,015.00	9.41
Cost of weeding female (₦)	312.50	2.90
Cost of carriage female (₦)	461.25	4.28
Cost of cassava cuttings (₦)	106.38	0.98
Cost of fertilizer female (₦)	776.88	7.20
Cost of herbicides (₦)	1,056.76	9.80
Cost of tractor (₦)	1,257.50	11.67
Total Variable Cost of Cassava Production	**10,775.64**	
Total Fixed Cost		
Cost of farming building (₦)	38,062.50	6.45

Cost of vehicle (₦)	47,043.13	45.05
Cost of cutlasses (₦)	1,210.63	1.15
Cost of hoe (₦)	672.50	0.64
Cost of spade (₦)	1,228.75	1.17
Cost of wheel barrow (₦)	3,191.25	3.05
Cost of basket (₦)	171.88	0.16
Cost of motorcycle (₦)	12,312.50	11.79
Cost of other material (₦)	514.38	0.49
Total Fixed Cost of Cassava Production (₦)	**104,407.52**	
Total Cost (TVC +TFC) (₦)	**115,183.16**	
Total Revenue of Cassava Produced (₦)	**472,057.50**	
Gross Margin (TR-TVC) (₦)	**461,281.86**	
Net Income (TR-TC) (₦)	**356,869.34**	

Source: Field Survey, 2010.

Productivity of Resource Used in Cassava Production

MLE Estimates of Cassava Production Using Stochastic Production Frontier

As shown in Table 3, the results indicate that the estimates of land, labour utilized, Agro- chemicals expense and cassava cuttings expense are paramount input for cassava production. The output elasticity of agro chemicals expense turned out to be negative and not significant. The estimates coefficient of land area, labour utilized and cassava cuttings had a positive coefficient, which implies a direct relationship with cassava output. This also indicates that as farmers continue to increase their cultivated area, it would lead to 13.5% increase in the amount of cassava produced; the higher the labour used, the more the output of cassava tubers realized and as more cassava cuttings are added, the overall total production would increase.

The estimates of the coefficients for the age, sex, marital status and major occupation are negative and significant, suggesting that they significantly and negatively influence inefficiency.

The estimates of the overall model variance (δ^2) and gamma (γ) give adequate information on the efficiency of the explanatory variables on farm output. The overall model variance (δ^2) is 0.0545, the gamma (γ) is 0.4193 and the mean Technical efficiency is 0.8938 (89.38%). It implies that the efficiency of the inputs used is high, that is, there high utilization of production resources. The technical efficiency gap of about 10.62% on the average exists among the farmers. It means that the current level of output can be increased by as much as 10%. This feat could be achieved if the relevant factors which affect the technical efficiency of the farmers are adjusted to make them more efficient.

Table 3: Maximum Likelihood Estimates (MLE) of the Stochastic Production Frontier for Cassava Production

Variable Name/Code	OLS	MLE
Production frontier		
Constant (β_0)	0.8132 (1.7539)	1.9102 (3.9176)
Land (β_1)	0.135 (1.3462)	0.4003 (3.4099)
Labour utilized (β_2)	0.4692 (3.8852)	0.3127 (2.4912)
Agro-chemicals expense (β_3)	-0.0472 (-1.6371)	-0.0522 (-1.5081)
Cassava cuttings expense (β_4)	0.5534 (5.9270)	0.3563 (3.4473)
Technical Inefficiency Equation		
Age (δ_1)		-0.0049 (-0.9007)
Sex (δ_2)		-0.0301 (-0.0970)
Marital status (δ_3)		-0.1726 (-0.0147)
Household size (δ_4)		0.0571 (1.6470)
Educational level (δ_5)		0.2474 (2.1923)
Major occupation (δ_6)		-0.1528 (-0.0350)
Farming experience (δ_7)		0.0086 (1.7562)
Variance parameters		
Sigma squared (δ^2)	0.640	0.0545 (3.4126)
Gamma (γ)		0.4193 (2.5597)
Log likelihood function (LLF)	-0.9904	13.4233
LR test		28.8274
Technical efficiency (Mean)		0.8938

Note: figures in parenthesis are t-values of estimates
Source: Field Survey, 2011

Determinants of Cassava Production

The result shown in Table 4 indicates that the explanatory variables significantly explained the effect of the socio-economic variables on the cassava production. The age of the farmers which was negatively significant at 10% shows that, as the producers grow older, the level of their production reduces which means they can increase production when they are young and physically fit. Quantity of cassava produced is significant at 1% meaning that the higher the level of cassava produced, the higher the profit earned. Also, the farming experience is significant at 1% which indicates that the more years spent in cassava production, the more the output and profit realized. The marital status of the respondents is significant at 10%, which means that increase in family responsibilities will increase their production activities in order to get more money to take care of the family. Educational Level of the respondents is significant at 1%, which implies that educational level of the respondents is also a major determinant;

the more the educational level of farmers increases, the more positive impact it will have on their productivity. Household size of the respondents is negatively significant at 1%. This implies that majority of the respondents households do not participate in the farming activities but depend on the produce of the farm which invariably reduced the farm output.

The adjusted R-Square is 0.765 which means 76.5% of the total variation was explained by the explanatory variables and the F value is 43.94 which is the overall equation model is significant at one percent.

Table 4: Effect of Socio-Economic Variables on Farm Output

Variable Code	Variable Name	Regression Coefficient	T-value
β_o	Constant	201895.17	0.592* *
X_1	Age	-0.108	-1.589*
X_2	Marital status	0.029	0.486* * *
X_3	Educational level	0.094	1.437*
X_4	Farming experience	0.354	5.132*
X_5	Quantity of fresh cassava sold	1.019	15.773*
X_6	Household size	-0.193	-3.120*

Adjusted R-square = 0.765
F-value = 43.942*

*Significant at 1%; ** Significant at 5%; *** Significant at 10%;
Source: Field Survey, 2011

Conclusion

In conclusion, the practice of cassava production in the study area, is however labour and capital intensive and production expansion increases as sources of finance increases. Cassava is commonly produced with other food crops, cassava production have resulted in the expansion of cassava land areas. The results indicate that cassava like other crops can be planted as sole crop and also intercropped with other crops like maize, yam, melon etc. The study also found out that 91.2% of the respondents cultivate on a small scale, this implies that majority of the respondents operates on a farm size below 10 hectares. The cassava production is found to be a profitable business as revealed by the study. There is high utilization of the production inputs though there is technical efficiency gap of 10 percent. The major problems confronting cassava farmers in the study area include: lack of enough capital, storage problem, bad roads, less attention from governments and lack of farm inputs. The consequences of all these could reduce the level of cassava production and returns for the farmers if not checked, which can inadvertently, affect the general standard of living of cassava producers.

Recommendations

Based on the findings of this study, the following recommendations are made:

1. Setting up of funding facilities and financial incentives for cassava enterprises development
2. There should be an effective road network that would allow the ease of transportation of cassava from the farms to the local markets.
3. Provision of credit facilities for the farmers to help improve and increase productivity and also modern equipment should be provided such as: tractors, harrowers, planters and ridgers
4. Storage facilities should be provided for farmers so that they can store their produce without the fear of losing them to diseases, rodents and pilfering.

References

Adewusi, S.R.A., Bradbury, J. H. (1993): Carotenoid in cassava: comparison of open column and HPLC methods of analysis. *J. Sci, Food Agric* 62: 375-83

Bellotti, A.C., Smith, L., Lapointe, S.L., (1999): Recent advances in cassava pest management. *Annual Review of Entomology* 44, 343-376.

FAO/WHO (2003): Energy and protein requirements: report of a joint FAO/WHO ad hoc committee. *W.H.O. Tech Rep Ser* 522:1-118

Food and Agricultural Organization (FAO), (2000): Agriculture towards 2015/30, technical interim report, April 2000, Rome.

Hussain, I and Perera, I.R., (2004): Improving Agricultural Productivity through Integrated Services Provision with Public and Private Sector Partnership Working. Paper 66. Columbia.

Ikpi, A.E.T., Gebremeskel, N.D., Hahn, H.C., Ezumat and Ekpere, J.A., (1986): Cassava a Crop for Household Food Security, A 1986 situation Analysis for Oyo Local Government Area, Nigeria,

Nassar, N.M.A., (1986): Genetic variation of wild Manihot species native to Brazil and its potential for cassava improvement. *Field Crops Research* 13, 177-184.

Nassar, N.M.A and Costa, C.P. (1977): Tubers formation and protein content in some wild cassava. *Experience* 33, 1304-1306.

Nassar, N.M.A and Dorea, G. (1982): Protein contents of cassava cultivars and its hybrid with Manihot species. *Turrialba 3*2, 429-432.

Nassar, N.M.A and Ortiz, R., (2006): *Cassava Improvement: Challenges and Impacts,* Universidade de Brasilia, Brasilia, Brazil; first published online 9 November 2006, pp 98.

Nassar, N.M.A and Teixeira, R.P. (1983): Seed germination of wild cassava species (Manihot spp) *Ciencia cultura* 35, 630-632.

Ngoddy, P. O. (1989): *Advanced opportunities in the utilization of roots tubers.* First meeting of the Raw Materials Research and Development Council (UNN). Nsukka, 139-143.

Nweke, F.L., Spencer, D.S.C, and Lynam, J.K., (2002): *The Cassava transformation,* Michigan State University Press, Michigan, pp 133.

Okigbo, B.N., (1992): Nutritional implications of projects giving high priority to the production of staples of low nutritive quality in the humid of West Africa. *Food Nutr Bull* 2: 1-10