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Email: tajar2011@yahoo.com, tajar2011@gmail.com
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DETERMINANTS AND PROFITABILITY OF PRO -VITAMIN A CASSAVA PRODUCTION IN ENUGU STATE, NIGERIA

[1]Kaine, A.I. N., [2]Ume, S.I. and [3]Abojei, J.O.

[1]Department of Agricultural Economics and Extension, Faculty of Agricultural Sciences, National Open University of Nigeria, Kaduna Campus.
[2]Department of Agricultural Extension and Management, Federal College of Agriculture, Ishiagu, Ivo local Government Area, Ebonyi State, Nigeria
[3]Department of Agricultural Economics and Agribusness, Dennis Osadebay University,Anwai, Asaba, Nigeria.

Corresponding Author's Email Address: akaine@noun.edu.ng
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ABSTRACT
This study assessed the determinant and profitability of pro vitamin A cassava production in Enugu State of Nigeria. Multi-stage random sampling techniques were used to select 120 respondents for the study. A structured questionnaire and oral interview were used to collect the primary data. Percentage response, gross margin analysis and linear multi regression analysis were used to capture the objectives of the study. Results shows that pro vitamin A cassava farming was profitable in the study area with net farm income and benefit cost ratio of 855,000 and 1.59 respectively. Further, the determinants to the profitability of pro vitamin A cassava varieties were access to extension services, membership of organization and access to credit. Also, the constraints to pro vitamin A cassava production in the study area were access to credit, high cost of agrochemicals, access to land and high cost of labour. The need to enhance farmers' access to credit, extension and labour saving devices should be encouraged
Keywords: Determinant, Profitability, Pro Vitamin A, Cassava, Gross margin, Anambra State, Nigeria

INTRODUCTION

Cassava is rich in carbohydrate but deficient in vitamin and minerals, hence predisposing the perpetual consumers to Vitamin A deficiency (VAD) (Kaine 2011, FAO, 2015 and Nwaobiala and Kaine, 2016). Bio fortification is among efforts intended at addressing the problem of VAD in most tropics and sub tropics countries. Egesi and Eke-Okoro (2013), reported that bio fortification is targeted at enhancing the levels of carotenoids in cassava, with nutritional benefits such as contributing to improved functioning of visual and immune systems and possible inhibition of carcinogenic pathway.

In Nigeria, successive governments through collaboration with International Institute for Tropical Agriculture (IITA), Ibadan and National Root Crops Research Institute (NRCRI), Umudike to cushion the effects of vitamin A deficiency developed Pro vitamin A, cassava varieties (Onunka *et al*., 2020 and FAO 2021). These cultivars, apart from having above characteristic have features of being high in dry matter content, high leaf retention in dry season and possess high quality flour for confectionaries (Egesi and Eke-okoro, 2013). The common varieties are NR07/0326, NR07/0506, NR07/0497, NR07/0499, NR07/0427, NR07/0432(NRCRI, 2018). These varieties, when cultivated with its associated production recommendations (1m×1m spacing, timely weeding, timely harvesting, use of appropriate chemical fertilizer and other pesticides application) has boosted immensely the production and productivity of the crop (Egesi and Eke-Okoro, 2013; Ume, *et al*; 2017).

Currently, low yield has been reported by literatures in the production of the crop and this could be correlated to poor cultural practices and inefficient farm management, pests and diseases, inadequate fertilizer application, drought, late planting and poor weed control practices (FAO, 2015; Onunka, *et al*, 2017). Therefore, there is need to assess the farmers' socioeconomic characteristics as it affects their performances in the crop production and productivity in terms of profit accruing in the study area. This could lead to formulation and implementation of policies that will propel the farmers to improve on their productivity. Specifically, the study was conducted to:

(1) determine the socioeconomic characteristics of the farmers,

(2) estimate the profitability of Pro Vitamin A cassava production,

(3) determinant to the profitability of Pro Vitamin A cassava and

(4) constraints to cassava production in the study area.

METHODOLOGY

The study was conducted in Enugu State Nigeria. Enugu State lies between latitudes 6°30'N and 7°10'N of Equator and longitudes 6°35' E and 7°30' E of Greenwich Meridian. The state has an estimated population of about three million, two hundred and sixty seven thousand, eight hundred and thirty seven (3,267,837) people comprising of one million five hundred and ninety six thousand and forty two (1,596,042 – males) and one million six hundred and seventy one thousand seven hundred and ninety five (1,671,795 – females) (NPC, 2006). The total projected population figure as at 2021 at growth rate of 3.2% is percent is four million, two hundred and sixty three thousand, six hundred and sixty one (4,263,661) people. The study area has a land area of 16,727 square km^2. The inhabitants were mainly agrarians and still engage in non-agricultural activities.

Multi-stage random sampling technique was used to select communities' villages and respondents. In stage one (1), ten (10) communities were randomly selected out of fifteen (15) communities. Thereafter, six (6) villages were selected from each of the randomly selected communities given a total of sixty villages. The last stage was the selection of cassava farmers. Two (2) cassava farmers were randomly selected from each of the sixty (60) and were used for the study. One hundred and twenty (120) farmers that were used for the study forming the sample size.

A structured questionnaire and oral interview schedule were used to collect data for the study. The objectives of the study were determined using percentage responses, multiple regression, gross margin analysis and principal component analysis.

Model Specification

Gross margin analysis.

Determination of Gross Margin and Net Profit as postulated by Erhabor (2005) and Kaine *et al* (2021) was explicitly specified as:

GM = TR – TVC ---------- (1)

TC = TVC + TFC

NPM = GM – Depreciation

Where

GM = Gross Margin

TR = Total Revenue (N)

VC = Variable Cost (N)

NPM = Net Profit Margin

Ordinary Least Squared Regressions Method,

Four functional forms of the multiple regressions were employed in order to select the one that has provided the best fit. The functional forms tried were:

Linear function $Y = b_0 + b_1 x_1 b_2 x_2 + b_3 x_3 + b_4 x_4 + b_5 x_5 + ei$ …. (2)

Double log function: $\ln(y) = \ln b_0 + b_1 \ln x_1 + b_2 \ln x_2 + b_3 \ln x_3 + b_4 \ln x_4 + b_5 \ln x_5 + ei$ …(3)

Semi log ; $Y = \ln b_0 + b_1 \ln x_1 + b_2 \ln x_2 + b_3 \ln x_3 + b_4 \ln x_4 + b_5 \ln x_5 + ei$ … (4)

Exponential function; $\ln Y = b_0 + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 + b_5 x_5 + ei$… (5)

The choice of the best functional form was based on the magnitude of the R^2 value, the high number of significance, size and signs of the regression coefficients as they conform to *a priori expectation*

The ordinary least squared regressions method, explicit production function was estimated by

$Y = b_0 + b_1 x_1 + b_2 x_2 + b_3 x_3 + b_4 x_4 + b_5 x_5 + e$ … (6)

Where:

Y = value of cassava output (₦),

X_1 = Gender (Dummy),

X_2 = Age of the farmer (years)

X_3 = Educational level (Years),

X_4 = Farming experience (Years),

X_5 = Access to Credit (Access 1, otherwise; 0),

X_6 = Membership of Organization (Member; 1and otherwise; 0),

X_7 = Access to Extension Services (Access; 1 and otherwise; 0)

$X_1 – x_5$ = coefficient of the parameters to be estimated, while e_1 was the error term and b_0 was the coefficient.

RESULTS AND DISCUSSIONS

Result of the study as indicated in Table 1 showed that, sixty (60) (50%) of the respondents were within the age bracket of forty one (41) to sixty (60) (41 – 60) years of age. The result further showed that thirty five (35) (29.17%) of the cassava farmers were within the age bracket of twenty one (21) to forty (40) (21 – 40) years of age while twenty two (22) (18.33%) and three (3) (3.0%) were within the age brackets of sixty (60) years and above and less than twenty years respectively. The result indicated that most of the farmers were at the economically viable or active age of production. This however is not in consonance with the result obtained by Food and Agricultural Organization (FAO) (2015). The variable education was considered and discussed. The result obtained indicated that, eighty five (85) (71.93%) of the farmers had formal education while thirty five (35) (29.17%) had no formal education. This implied that the educational attainment of the Pro Vitamin A cassava pulling farmers in the study area was high. FAO, (2021) and Ume and Kaine (2021) opined that education enhances farmers' access to information in order to boost their farm yields. The authors further stated that high educational status of farmer facilitates adoption of new technologies as it makes one to be more objective in evaluating innovations, which would positively influence production.

Pro Vitamin A cassava farmer's access to credit was determined as indicated in Table 1. Ninety two (92) (77.00%) of the populations studied indicated that they no had access to credit facilities while only twenty eight (28.00) (23.33%) had access to credit facilities. Nzeakor and Ume, (2021) reported the importance of credit in boosting farmers' output through procuring of essential farm inputs needed in the production of the crop. Membership of organization of respondents was determined. Result indicated that one hundred (100) (83.33%) belong to different farmers organizations. This implied that the farmer can achieve economies of scale by pulling their resources together. Membership of farmer organization like cooperative aids in enhancing members' output through ensuring ease of access of members to credit and farm inputs at subsidized cost (Onunka, *et al*; 2021). The result of household size showed that majority thirty five (35) (29.2%) of the farmers had household size of six to ten (6 – 10) people, while the least seventeen (17) (14.2%) had household size range of sixteen to twenty (16 – 20) (14.20%). Ume *et al* (2020), reported that household members that are of labour age are source of family labour to household head with aim of increasing farm revenue at reduced total cost of production. Contact with extension workers was another variable that was considered, determined and discussed as indicated in Table 1. It was observed that majority, eighty (80) (67.00%) of the respondents had no contacts with extension agents, while forty (40) (33.33%) had contacts with extension workers. Onunka, *et al* (2017), reported that extension services aids in instilling the latent merits of improved agricultural technology to the farmers for high farm output to ensue.

Table I: Distribution of Respondent According to Socioeconomic Characteristics

Variables	Frequency	Percentage
Age		
Less than 20	3	2.50
21-40	35	29.17
41-60	60	50.00
62 and above	22	18.33
Level of Education		
No formal education	35	29.17
Primary school	60	50.00
Secondary school	20	16.67
Tertiary	5	4.17
Access to Credit		
Yes	92	77.00
No	28	23.33
Membership of Organization		
Yes	100	83.33
No	20	16.67
Household Size		
1-5	22	18.30
6-10	35	29.20
11-15	34	28.30
16 – 20	17	14.20
Extension Services		
Had Access	80	66.70
No access	40	33.30

Sources: Field survey, 2022.

Cost and Return of Pro vitamin A Cassava Production

The physical input used in pro vitamin A cassava production as contained in Table 2 included cassava cutting, fertilizer (NPK), transportation and miscellaneous. Among all the physical inputs, the cost of fertilizer (₦ 96,000) constituted the highest proportion, constituting about 18.74 % of total cost of production. The high cost of the resource could be attributed to removal of fertilizer subsidy programme by Federal government of Nigeria (Ume, *et al;* 2022). The cost of cassava cutting could be related to no presence of cassava multiplication centre in the study area, in effect, farmers have to travel distances places to procure the input (Ume and Mbah, 2022). High cost of cassava cuttings constituted about 11.83% of the total cost of production. The total cost of the physical inputs was ₦171,000, which constituted 33.7% of the total cost. Among the labour items considered in Table 2, cost of labour for land preparation (₦112,500) was highest and constituted about 22.19% of the total cost of production. The least cost was cost of planting, ₦21000, (4.14%). The total number of man days of labour employed in pro vitamin A cassava production in the study area was 376 with total variable costs of ₦863, 000 (170.22%). Furthermore, Table 2 revealed that the total revenue for cassava production per hectare was ₦1,362,000 with the total cost of ₦507, 000. The Benefit cost ratio was 1:1.59, implying that in every one naira, the farmer made ₦1.59 kobo.

Table 2. Cost and Return of Cassava Production (₦)

Items	Units	Quantity	Cost per unit	Total cost	Revenue	%
Revenue	Kg	4500	300		1,350,000	
Cassava	Bundle	20	600		12,000	
Total Revenue					1,362,000	
Cassava Cutting	Bundle	100	600	60,000		11.83
Fertilizer	Bags	8	12000	96,000		18.74
Transportation				5000		0.99
Miscellaneous				10000		1.97
Total physical cost		4598		171,000		33.7
Total Labour						
Clearing	Md 14	(116)manhrs	4000	56,000		11.05
Land preparation	Md 25	(200)manhrs	4,500	112,500		22.19
Planting	Md 7	(56) man hrs	3000	21,000		4.14
Weeding	Md 18	(144)manhrs	4000	82,000		16.17
Fertilizer app	Md 10	(80) man hrs	3000	30,000		5.92
Harvesting	Md 15	(120)manhrs	3000	45,000		8.88
Total labour	89	716	21, 500	346,000		68.24
TotalVariablecost =	863,000					170.22
GM = TR – TVC = 1,362,000 – 863,000 = 499,000						
Total fixed cost depreciation on (hoe, cutlass and basket) = ₦8000						
Total cost (TVC + Depreciation) = 507,000						
Total farm income = TR – TC = 855,000						
Return on investment (BCR) = 1.59						

S**ource: Field Survey, (2022)**
N/B kg kilogram, MD = man-day

Determinants to Profitability of Pro Vitamin A Cassava Farmers

Based on statistical criteria, Cobb - Douglas was chosen as lead equation. The coefficient of multiple determination, R^2 was 0.8267, implying that 86.67% of the variation in the dependent variable were accounted by the variables included in the model, while the remaining 13.33% were due to error term. The coefficient of the age of the farmer was negative and significant at 5% alpha level. The implication is the aged farmer dominated the farming population. This class of farmers is usually conservative to innovation adoption, resulting in low farm output (Ume; *et al;* 2020). The finding of Ekwe, (2013) disagreed with above assertion. He asserted that aged farmers are often efficient in resource use in order to maximize their farm outputs acquired through years of experimentation. As well, coefficient of extension services was positive and significant at 10 % probability level. Extension services aids in enhancing the farmers' production and profit through giving technical assistance and advice and prompt delivery of inputs (Okoye, *et al* 2021). Also, the estimated coefficient of access to credit was positive and significant at 1.0% risk level. Access to credit enhances farmers' outputs through ensuring purchasing farm input at appropriate time and in payment of labour (Ume and Mbah, 2022). Additionally, the coefficient of membership of organization had positive correlation with the dependent variable and significant at 5 % probability level. Organization such as cooperative society aids in boosting the productivity of her members' farm output through capacity building and provision of farm inputs at cheaper rate as well very timely (Nzeako and Ume, 2020). The finding of Okoye, *et al;* (2021) concurred with aforesaid statement. They asserted that membership of cooperatives through interaction could exchange information that is capable of enhancing their farm production.

Table 3:Estimated Multiple Regression Production Function for Cocoyam

Variable	Linear	Exponential	Double Log	Semi Log
Constant	9.064(4.344)***	6.0064(3.229)***	5.401(6.511)***	4.229(3.318)***
Age	0.470(0.467)	0.723(0.4541)	0.641(-2.081)**	1.521(-0.229)
Education	0.553(-0.666)	0.237(2.107)**	0.136(0.321)	-2.174(2.004)**
Household size	0.612(3.449)***	0.128(4.036)***	0.223(0.026)	-0.345(0.493)
Organization	-0.544(2.203)**	-0.209(-0.096)	0.177(2.008)**	0.554(0.329)
Credit access.	-0.011 (-0.403)	-0.599(-1.046)	0.133(3.055)***	0.094(0.089)
Extension service	0.043(0.407)	2.191(2.0113)**	0.115(2.254)**	3.130(3.118)***
R^2	0.6443	0.5714	0.8672	0.4700
F Value	4.486***	6.641***	12.04***	4.771***

Source: Field Survey, 2022
*****, **,*** significant at 1.0%, 5.0% and 10.0% levels of probability respectively
The figure in parenthesis is the t-ratio

Constraints to Pro Vitamin A Cassava Production

The problem of credit access was reported by 86.67% of the respondents (rank 1). The poor access to credit may be correlated to ignorance of credit facility as most banks are located in urban areas (Onunka; *et al;* 2017). This is followed by high cost of labour, 81.67%. The urban drift of able-bodied youths in quest for 'white collar' job, hence causing dearth of labour and with few available being very costly (Ume and Kaine, 2021). The least was bad road, 37.5%. This could be related to the fact that most rural roads lining to urban and rural markets are in very deplorable conditions, leading to less vehicles plying the roads during rainy season. This adversely affect to and fro of farm outputs and farm inputs, leading to low farm yield (Ume; *et al;* 2020)

Table 4. Constraints to Pro Vitamin A Cassava Production

Variable	Frequency	Percentage (%)
Access to credit	104	86.67
High cost of labour	98	81.67
Extension services	62	5167
Bad Road	45	37.50
Access to land	60	50.00
High cost of Agro chemicals	72	60.00

***Multiple Responses**
Source: Field Survey, 2022

CONCLUSION AND RECOMMENDATIONS

Based on the results, the following conclusions were deduced; The result showed that pro- vitamin A cassava production was profitable in the study area. The determinants to the profitability of pro vitamin A cassava varieties were access to extension services, membership of organization and access to credit. Also, the constraints to pro vitamin A cassava production in the study area were access to credit, high cost of agrochemicals, access to land and high cost of labour.

It was recommended based on the findings that there is need to develop and disseminate to farmers labour-saving devices such as hand driven plough by appropriate government agencies in partnership with Non-Governmental Organization (NGO) in order to curtail minimally their cost of production.

Second, the price of agrochemicals such as fertilizer, herbicides and among others should be subsidized at farm level by government agency concerned and Non-Government organization (NGO), so that genuine farmers could have access to the resources in order to enhance their farm outputs.

Third, Policies and programmes aimed at increasing farmers' access to credit from commercial banks at reduced interest rate and moderate collaterals.

Four, farmers should be encouraged to form or join cooperative society in order to have access to among others government goodies such as agrochemicals and seeds

Sixth, , extension agents should be motivated to be responsive to their duties through prompt payment of their salaries and other incentives.

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