DETERMINANTS OF FLUTED PUMPKIN (*Telfairia occidentalis*) PRODUCTION AND PROFITABILITY IN AKWA IBOM STATE, NIGERIA.

[1] Bassey, Nsikan Edet *, [2] Akpaeti, Aniekan Jim and [3]Okon, Uwemedimo E.

[1,2,3]Department of Agricultural Economics and Resources Management, Akwa Ibom State University, Ikot Akpaden, Mkpat Enin, P.M.B. 1167, Uyo, Akwa Ibom State, Nigeria

Tel: +234-803-5535-782, E-mail: nebass2005@gmail.com

Authors' contributions

All the authors collaborated to carry out the research. Author BNE was responsible for data collection and analysis. Author AJA designed the questionnaire, typed the manuscript and assisted in sourcing the literature and source the relevant literature while UTU proofread the final version of the manuscript.

Original Research Article

ABSTRACT

The study examined the determinants of fluted pumpkin production and profitability in Akwa Ibom State, Nigeria. Data collected through a multi-stage sampling technique from a sample of 60 respondents in the 2013 planting season were analyzed using the profit function, gross margin analysis as well as Ordinary Least Square (OLS) regression technique. Results of the descriptive statistics revealed aged farmers with average of five years experience with high literacy level (83.3%) dominated the study area. Majority were women (61.7%) whose sources of finance were personal savings. Pumpkin farmers had a Gross Margin and Net Income of N181, 953 and N158, 413 respectively. The price parameter for labor, land value, pesticide and output price impacted significantly on the profitability of farmers. Result further revealed that farming experience; household size, age of farmers, land size, capital and organic manure were the major determinants of pumpkin output in the study area. Hence, effort should be directed towards encouraging people to venture into pumpkin production, ensuring credit availability through the provision of soft, interest free loans as well as intensifying campaign on organic agriculture as a way out.

Key words: Fluted Pumpkin; profitability, production, Determinants.

1.0 INTRODUCTION

Approximately 925 million people in the world were estimated to be hungry in 2010. Of this, about 239 million (30%) were in Sub-Saharan Africa (FAO, 2010). In 2008, 47 percent of population of Sub-Saharan Africa lived on $1.25 a day or less (United Nation, 2012). This development calls for the evolution of a more proactive and pragmatic strategy towards enhancing agricultural output in the region. However, the potential of vegetable crops in meeting the dietary requirement and enhancing the economic status of people have been highlighted by several authors (Okon et. al 2012; Owombo, 2010; Taiga et. al 2008; Nwosu et.al 2012; Dam,2012; Mlozi,2013; Ibekwe and Adesope,2011), especially in Sub-Saharan Africa where the attainment of food security is intrinsically linked with reversing agricultural stagnation and safeguarding the natural resource base (Cleaver and Scriber, 1994). Vegetable cultivation and marketing provides job, support agribusiness industry and diversified income (Cruz,2006). It enhances household economic security and investment of farmers and retailers involved in its production (Yahaya, 2002). Vegetable is an integral component of our daily food. It forms important condiment in the National diet (Ibekwe and Adesope,2010). Nutritionally, vegetable contains the essential nutrients needed for proper body development. For instance, it is a source of both micro and macro nutrients (Schipper, 2000; Bakhru, 2003; Kocher, 1986), providing between 20 and 50 percent of iron vitamin in resource poor diets (Sabo and Dia, 2009). According to Aliyu (2006), vegetable supplies part of protein, vitamin and minerals needed in diets as well as roughage which promote digestion and prevent constipation. Medicinally, diets rich in fibres from vegetable are sources of omega 3 fatty acids which help in the prevention of heart related diseases (Oguntola, 2006). The macro nutrients in vegetable also contribute to reducing incidence of colon and stomach cancer (Grubben and Denton,2004).Vegetables are succulent crops consisting of more than 90% water (AVRDC,1990),hence, its yield and quality are water dependent. It belongs to the family cucurbitacea and is said to have originated from West Africa.

Fluted pumpkin (*Telferia occidentalis*) is one of the most important vegetable crops grown extensively in almost every State but mostly in the Southern part of the country by most households and consumed by majority of Nigerians because of its dietary importance. It is one of the major income generating crops in many parts of Africa (Adebisi-Adelani *et.al,* 2011). The crop is often planted in flat land or in mounds. Planting the crop in raised beds has been documented to reduce the effect of flooding during raining seasons (AVRDC, 1981). Its yield is believed to be 300% higher in dry than wet season (Aladetoyinbo, 2005). Harvested pumpkin can be eaten raw or processed by variety of methods and use in diverse ways depending on culture.

Several studies have been done on fluted pumpkin production and profitability in Nigeria. Nwosu et.al (2012) analyzed the socioeconomic determinants of fluted pumpkin leaf production in Ezinihitte Mbaise Local Government Area of Imo State. From his findings, production status, source of land, labour source, household size, educational level, farming experience, farm size and production objective were the major determinants of output. Among the constraints to vegetable production were lacks of credit facilities, unavailability of inputs, pest and diseases infestation, inadequate information about inputs and output prices as well as poor road network. Nwachukwu and Onyenweakwu(2007) estimated the allocative efficiency among FADAMA fluted pumpkin farmers in Imo State, Nigeria using the maximum likelihood estimation of the translog model. Emeyonu et.al (2010) focused on the effect of waste water use on fluted pumpkin crop production in Imo State, Nigeria using the ordinary least square regression technique. Studies such as Enete and Okon, (2010), Udoh and Sunday (2007) documented significant influence of labour, capital, land size, planting material, fertilizer and manure on vegetable cultivation. Also, other studies such as Edet and Etim (2010) and Udoh (2005) have documented the importance of manure on vegetable production in Nigeria.

The demand for fluted pumpkin in the study area has increased tremendously due to the diverse ways in which the crop is put to use. Udoh and Akpan (2007) linked its popularity to the low cost per unit of

resource use in the production, short gestation period and quick returns on invested capital compared to other crop enterprises. The introduction of the FADAMA farming system in the State was aimed at ensuring the availability of vegetables during the dry season. In spite of the aforementioned effort and the potential of fluted pumpkin, production of the crop is still carried out in small scale. The bulk of pumpkin produced cannot meet the need of Akwa Ibom people, incidence of post harvest losses continue to characterized the pumpkin subsector. There is need to examine those factors that determine fluted pumpkin production and profitability in the study area with view to improving upon its supply and profitability. This therefore forms the basis for the study.

2.0 Study area: The study was carried out in Akwa Ibom State, Nigeria. The State is located between Latitude 4 0 321 and 50 331 North and Longitude 70 251 and 80 251 East. It has a total population of 3,920,208 people out of which 2,044,510 are male and 1,875,698 female (NPC, 2006). It occupies a total land area of approximately 7,246 square kilometers. The state is an agrarian with six agricultural zones viz: Abak, Oron, Ikot Ekpene, Etinan, Uyo and Eket. Her favorable climate favors the production of both permanent and arable crops.

2.1 Sampling procedure and data collection method

Data used for the study were primary data collected through a multi- stage sampling in the 2013 planting season. The first stage involved the selection of three agricultural zones from the existing six. These were Oron, Uyo and Eket. The second stage involved the selection of one Local Governt Area from each of agricultural zones. The selected Local Government Areas were Eket, Uyo and Oron respectively. Three villages where pumpkin is grown extensively were randomly selected from the three selected Local Government Areas in the ratio of one per Local Government Area (1:1). Uya Oro village was chosen from Oron, Mbiabong Etoi from Uyo, Esit Urua in Eket . Next, 20 pumpkin farmers were selected in each of the villages with the help of key informants from a compiled list of pumpkin growers in the area, making a total of 60 respondents through which structured questionnaire were administered

2.2 Method of data analysis

The data collected were analyzed using both descriptive and inferential statistics. Apart from mean and simple percentages, other analytical techniques used were;

2.2.1 Gross Margin analysis

This was used to examine the returns on fluted pumpkin production in the study area. The formula for computing the gross margin was given as:

$$GM = TR - TVC \quad . \quad . \quad . \quad (1)$$

Where: GM = Gross margin per hectare (₦)

TVC = Total Variable Cost per hectare (₦)

TR = Total Revenue per hectare (₦)

2.2.2 Profit function Analysis

To estimate the profitability level of individual resource input used in pumpkin production, the profit function analysis was carried out. The profit function model is specified as :

$$\Pi^* = \pi^*(P_y, P_a, P_b, P_c, P_d, P_e, P_f, \ldots\ldots Z_a, Z_b), \quad . \quad . \quad . \quad (2)$$

Where,

Π^* = Amount of variable profit per hectare (₦),

P_y = price of output per hectare (₦),

P_a = Price per unit of labor (₦),

P_b = Price per unit of manure (₦)

P_c = Price per unit of pesticide (₦)

P_d = Price per unit of planting material

Z_a = Capital (measured as depreciated value of fixed assets used in pumpkin production) and

Z_b= land value (₦), (whether purchased, inherited or rented).

2.2.3 Production function analysis

The implicit form of the production function analysis for pumpkin production in the study area is implicitly stated as follows:

$$Y = (X_1, X_2, X_3, X_4, \ldots, X_{11}, + U) \quad \ldots \quad (3)$$

Where Y = output of vegetable (₦),

X_1 = Educational level of farmers (years)

X_2 = Farming experience (years)

X_3 = Household size (number),

X_4 = Age of farmers (in years),

X_5 = land size (hectares)

X_6 = labour (mandays)

X_7 = Capital (value of depreciated farm tools)

X_8 = Organic manure (in kilogramme)

X_9 = Quantity of planting material (in kilogramme)

X_{10} = harvesting frequency (number of times)

U = error term

The model can be stated explicitly as:

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 \ldots b_{10}X_{10} + U \ldots \quad (5)$$

Where $b_1 \ldots b_{10}$ are coefficients to be examined and

$X_1 \ldots X_{11}$ are the explanatory variables defined in equation (1) above.

3.0 RESULT AND DISCUSSION

3.1 Socioeconomic characteristics of respondents

Table 1 presents the socioeconomic characteristics of pumpkin farmers in the study area. Results revealed that female farmers (61.7%) dominated the study area. The dominance of female farmers is because pumpkin production is not that tedious and can be undertaken by women. Majority (66.7%) were married, 20% single while 11.3% were divorcees. Experience wise, farmers were quite experience with an average experience of 12 years. 25 percent had less than 5 years experience, 50 percent had between 6-10 years, 16.7 percent had 17-21 years while 8.3 percent had more than 21 years of experience. This is capable of impacting positively on pumpkin production in the study area. With regards to household size, 33.3 percent had a household size of less than 5 people, 58.3 percent had between 5 and 10 while 8.3 percent had a household size greater than 10. The implication of this large household size showed available labor for pumpkin production in the study area. Enete and Okon,(2010) reported a large household size in the study area. In terms of source of financing pumpkin production, 50 percent financed their farming operations through personal savings, 38.3 percent borrowed from friends and relatives while 11.7 percent financed theirs through other sources. None of the farmers were able to access finance from formal sources. The age range of farmers in the study area was from 19 to 63 years with majority being within the age bracket of 41-50 years (43.3%), followed by above 50 years (28.3) while 21.7% and 6.7% were within 31-40 and 0-30 years age brackets. The dominance of 41-50 years showed that farmers were still young. This is capable of impacting positively on pumpkin production. Enete and Okon (2010) reported a dominant age group of 31-40 years in the study area. This is contrary to other regions in Nigeria especially South West where majority of farmers are above 60 years. Educationally, about 83.3 percent of respondents were literate. 50 percent attended primary school, 28.3 percent attended secondary school, 5 percent had tertiary education while 16.76% did not have any formal education at all. The implication of this high rate of literacy implies that farming information from extension agents and other sources can be better assimilated, processed and put to practice. Beside educated farmers are early adopters of farming both farming and agricultural marketing innovations. In the study area, Okon et al (2010) reported that about 90 percent of respondents were literate. With respect to labor source for pumpkin production, 66.7 percent of farmers in the study area made use of family labor while 25 percent and 8.3 percent made use of hired and borrowed labor respectively. The high use of family labor justifies the huge household size in the study area.

3.2 Average costs and returns in pumpkin production in the study area

Table 2 present the average costs and returns of pumpkin production in the study area. Total revenue of ₦ 297,150.6 was realized per hectare of pumpkin. The total cost of ₦ 138, 737.60 was incurred. Of this, variable cost constituted about 83.03 percent (₦115, 197,6) of total cost of pumpkin production. Further analysis of the variable cost component showed that labor accounted for 88 percent, manure 3.4%, pesticide 8.6 percent and planting material 1.3 percent of total variable cost of production. A gross margin and net income of ₦ 181,953 and N158, 413 were realized per hectare. This indicated that pumpkin production is profitable in the study area. Comparing the net return with the national minimum wage of 18,000 revealed that pumpkin production is a profitable venture in the study area, hence can constitute a good source of employment for our young school leavers and the teeming population. Enete et. al (2010) reported a gross margin and net income of ₦327,252.56 and ₦322.412.88 on their study in waterleaf in the study area

3.3 Profit function analysis

Table 3 presents the result of the profit function which was employed to determine the factor that influenced the profitability of pumpkin production in the study area. From the table, 89.63 percent of the variability in profit is explained by the combined effect of the variable price items in the function. Result revealed that the price parameter for labour, land value and pesticide had negative significant effects on the profit level while the price variable for output price had a positive significant effect on the profit level of farmers

Table 1 : Demographic characteristics of pumpkin farmers

Variable	Number	Frequency
Gender		
Male	23	38.3
Female	37	61.7
Farming Experience		
Less than 5 years	15	25
5-10 years	30	50
11-16 years	10	16.7
17 and above	5	8
Household size		
Less than 5	20	33.3
5-10	35	58.3
Greater than 10	5	8.3
Sources of Finance		
Personal savings	30	50
Friends and Relatives	23	38.3
Other sources	7	11.7
Age		
0-30	4	6.7
31-40	13	21.7
41 -50	26	43.8
Above 50	17	28.3
Educational background		
No formal Education	10	16.7
Primary school	30	50
Secondary school	17	28.3
Post secondary	3	5
Labor source		
Family Labor	40	66.7
Hired Labor	15	25
Borrowed Labor	5	8.3

Source: computed from field survey data, 2013.

Table 2: Income and Expenditure by Pumkim Farmers per Hectare

Items	Units	Value (₦)
Revenue items		
Value of output	(kg)	297,150.60
Total Revenue		**297,15.60**
Cost items		
(i) Variable cost		
(a) Labour		101,376
(b) Cost of manure	(kg)	3,926.00
(c) Pesticide	(liters)	9,895.60
(d) Planting material	(kg)	1,500.00
Total variable cost		**115,197.60**
(ii) **Fixed Cost**		
(a) Land	**(hectare)**	10,120.00
(b) Depreciation		13,420.00
Total Fixed Cost		**23,540.00**
Total Cost(TVC+ TFC)		**138.737.60**
Gross Margin (TR-TVC)		**181,953.00**
Net Income (GM-TFC)		**158,413.00**

Source: Computed from field survey data,2013. **Note:** ₦160 is equivalent to 1 US $

Table 3 : Profit function analysis for fluted pumpkin

Parameter	Coefficient	Standard error	t-value	P-value
Intercept	3146.61	2245.01	1.4016	0.2122
Labor cost	-3.8511	0.4461	-8.6328	<0.00001
Manure cost	-2.3150	1.8631	-1.2426	0.2190
Output price	8.2816	0.9172	9.0292	<0.00001
Capital	-0.5218	0.5046	-1.0340	0.2730
Land value	-0.9336	0.0719	-12.9847	<0.00001
Pest control	-3.2152	0.1151	-27.9339	<0.00001
Planting material	-0.3834	0.3152	-1.2164	0.2199

Source: Field survey,2013

3.3 Determinants of fluted pumpkin production

Table 4 presents the regression result for the factors affecting flutted pumpkin output in the study area. Of the four functional forms that were estimated, (linear, semilog, double log and exponential), the linear model was chosen as the lead equation because of the high R^2 value and the significant number of explanatory variables.

The coefficient for farming experience was positive and significant at 5 percent level. Experienced farmers are perceived to better understand and processed new farming information from extension agents and other sources and hence, improves upon their efficiency and output. They are also known to be early adopters of new farming techniques. Enete and Okon (2010), Nwosu et. al (2012) and Bassey and Okon (2008) reported a significant differences between farming experience and water leaf, amaranth spp and cassava output in the study area respectively.

Household size impacted positively on pumpkin production in the study area at 5 percent level. Since pumpkin production is labor intensive, large household sizes would imply available labor for pumpkin production. This is the case in the study area where the vegetative pattern and land tenure system does not favour mechanization. Other studies such as Okorji et.al (2010), Nwosu et. al (2012) and Enete and Okon (2010) reported similar findings

The age coefficient had a positive significant impact on output at 5 percent level of probability. This implied that output of pumpkin reduces with increase in farmer's age. This finding is surprising given that aged farmers were supposed to be more experienced than start- up farmers. Okorji et. al (2010) reported similar findings on their study on dry season vegetable at Imo State.

The coefficient for land size was significant at the one percent, implying that increasing land size would increase output of pumpkin. Increasing land size means that the available labour in the study area could be efficiently utilized by farmers. The positive relationship between land size and output can be attributed to economy of scale. This finding is consistent with Akpan et.al (2011). Other studies such as Enete and Okon (2010) reported an inverse relationship in the study area.

The capital coefficient was positive and significant at the one percent level. This suggests the importance of capital in pumpkin production in the study area. This result compares favorably with Enete and Okon (2010).

Also, the coefficient of organic manure had a positive significant impact on output at 10 percent level. The use of organic manure to improve the soil fertility would invariably enhanced output of fluted pumpkin in the study area. Enete and Okon (2010), Udoh and Sunday (2007) reported similar findings in the study area.

Table 4: Result of the multiple regression analysis/ production function analysis

Coefficient/variable	Linear (L)	Semi-log	Double-log	Exponential
Intercept	3864.210 (21240.99)	9.8125*** (0.3019)	7.3901 (4.7529)	-50009.19 (28762.78)
Educational level	718.765 (457.621)	0.0305*** (0.0082)	0.0561 (0.0439)	13873.88 (26549.69)
Farming Experience	3141.232** (1152.372)	0.0046 (0.0134)	0.0716 (0.0722)	294.575 (165.028)
Household size	804.625** (271.836)	0.0324 (0.0259)	0.1932*** (0.0181)	3258.30** (1346.451)
Farmers Age	-1676.70** (684.546)	-0.0034 (0.00732)	0.0754 (0.2176)	1965.17 (2718.73)
Land size	0.8843*** (0.2285)	2.1561*** (0.5714)	2341.55 (2151.41)	1478.75 (857.13)
Labor	14.0021 (8.0652)	0.0015 (0.008)	0.2328 (0.6982)	1389.75 (868.13)
Capital	2.9672*** (0.8970)	1.9521* (1.1410)	0.0975 (0.1312)	2134.87 (1791.28)
Organic manure	9.8741* (5.1082)	0.0026* (0.0014)	0.6580 (0.3781)	5643.40*** (1810.81)
Planting material	0.0321 (0.6520)	0.0211 (0.0782)	-0.0974* (0.0562)	-3162.73 (3026.14)
Harvest. Frequency	-2871.40 (5011.10)	-0.0035 (0.0063)	0.1153 (0.0862)	-373.401 (989.212)
R^2	0.8345	0.7174	0.8091	0.6924
Adj. R^2	0.8074	0.6887	0.7774	0.6607
Observations	60	60	60	60

Source: field Survey, 2013. N/B, figures in brackets are standard errors. *** Significant at 1%,**significant at 5%, and *significant at 10%. (L) is the lead equation.

4.0 Conclusion

The study examined the determinants of pumpkin production and profitability in Akwa Ibom State, Nigeria. The summary statistics revealed that pumpkin production was dominated by literate farmers (83.3%), majority which were female (61.7%) with average household size of 7 persons. The major sources of finance, dominant age group and labour sources were personal savings, 41-50 years and family labor (66.7%) respectively. The price parameter for labor, land value, pesticide and output impacted significantly on pumpkin profitability. Farmers had a gross margin and net income of ₦181, 953 and ₦158, 413 respectively, implying that pumpkin production is profitable. Farming experience, household

size, age, land size, capital and organic manure were the major determinants of pumpkin output in the study area.

5.0 Recommendations.

Based on the findings of this study, it is recommended as follows:

(i) People should be encouraged to go into pumpkin production. This can be achieved through series of awareness campaigns, provision of basic production inputs like planting material, pesticides, manure etc. If possible, government should acquire large expanse of lands and lease them out to vegetable farmers at reduced rates and less stringent conditions. This would go a long way to reduce the land rental value and ensure access to land.

(ii) To ensure capital availability, soft, interest free loan should be given to pumpkin farmers. This would enable them acquire land, procure production inputs and increase their scope of production.

(iii) Awareness campaigns on the use of organic manure should be intensified. All hands should be on desk to support the on-going campaign on organic farming, as it is a right step in the right direction towards boosting agricultural outputs.

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