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PERFORMANCE ANALYSIS OF SWEET POTATOES PRODUCTION IN OGBARU L.G.A OF ANAMBRA STATE, NIGERIA

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ABSTRACT

We examined the performance of sweet potatoes production in Anambra State, Nigeria. Data were analyzed with descriptive statistics, budgetary techniques, SWOT and multiple regression analysis. The finding confirmed sweet potato production as a source of livelihood engaged by mostly educated married farmers, with average age of 40 years, farming experience of 4 years and average farm size of 0.3ha. Personal saving was their main source of capital, while an average of 790kgs/ha of sweet potatoes were harvested. The selling price was ₦330.00/kg, average total cost was ₦99,968.30/ha, average total revenue was ₦260,730.60/ha, Net farm income was ₦160,762.30/ha while the return on investment was ₦1.61. The strengths of sweet potatoes farming included high yield, adaptability, availability of planting materials and market, while the weaknesses were lack of information, its sweet nature, and low price at harvest. The opportunities included sweet potatoes awareness creation, diversification into different varieties of sweet potatoes, and commercialization. The potential threats were its perishable nature, consumer perception, lack of financial support, and possibility of consumers changing their taste. Marital status, farming experience, quantity harvested, and selling price had positive effect on farmers' net income while total cost of production impacted it negatively. Lack of improved variety, and high cost of labour, were some constraints. The study concluded that Sweet potato farming is profitable and recommended that more awareness on its nutritional value, commercialization and varieties should be created by relevant bodies. Also, farmers should be supported financially and encouraged to expand their scale of production.

Key Words: Sweet potatoes, Performance, SWOT, Livelihood, Opportunities

INTRODUCTION

Food security cannot be accomplished in Nigeria without Agriculture and a lot of crops are produced through agriculture. Onubogu and Dipeolu (2021)^a noted that many crops including tuber crops are produced in Nigeria which serve as food security crops. Kwak (2019) reported that sweet potato is a food security crop which offers a flexible source of food and income to rural households that are mostly vulnerable to crop failure. It is also an early maturity crop that can be intercropped with some crops like yam and maize. Nigeria is known as one of the largest producers of sweet potato in Sub-Saharan Africa with annual production estimated at 3.46 million tons per year. Sweet Potato (*Ipomea batatas* (L.) Lam) is one of the globally important crops ranking seventh and fifth in production in the world and in Africa respectively (Low, Nyongesa, Quinn and Parker, 2015; Olayinka 2016). Fewer input and less labour are required in sweet potato production than in other crops such as cereals. Sweet Potato is of great importance. The roots can be eaten boiled, fried or made into sweet potato powder (Adeyonu, *et al.*, 2019). Apart from the roots, the young leaves of sweet potato are also edible as they serve as vegetable for man. The leaves and vines can also be fed as fodder to livestock (Olayinka, 2016).

Sweet Potato production has been identified as a great potential for increasing food production and income in Nigeria. However, Adeyonu *et al.*, 2019 noted that despite its potential uses and benefits, and

the ease of its production, the production of sweet potato in Nigeria is below the nation's potential. Adeyonu *et al.*, (2019) further attributed this low performance to poor quality of planting materials, high labour costs and other environmental constraints. Olayinka (2016) had opined that sweet potato productivity problems emanated from social and economic characteristics of the farmers because the farmers need to understand the new practices that will yield more profit. Increased yield will bring about an increase in net farm income (all things being equal).

Sanusi *et al.*, (2016) found that sweet potato production was dominated by the male farmers and attributed this to the fact that women had to care for the home front. In contrast Gbigbi (2019) asserted that female farmers dominated sweet potato production and marketing respectively in Nigeria. They attributed this to low capital needed for sweet potato production. The role of education in sweet potato farming cannot be overemphasized. According to (Gbigbi, 2019), the sweet potato farmers are educated and this implies that they could understand and adopt improved technology which will help their production. This level of education hence places the farmers at an advantage in the enterprise. However, despite the noted exposure and prospects in sweet potatoes production, Adeyonu *et al.*, (2019), reported that the performance of sweet potato farmers is negatively affected by poor yield, cost of labour, sex, farm size, and planting material but positively affected by age of farmers, educational attainment,

years of experience, training and credit access. This means that despite an increase in yield, net farm income does not show such increase if the quality of yield is poor. Tewe, Oyeniyi and Abu, (2013) and Gbigbi (2019) reported that the farm size of the sweet potatoes farmers however can be said to be on a small scale as average farm sizes of 0.4ha and 0.81ha respectively were recorded. Poor storability and seasonality were also noted as some of the problems faced by sweet potato farmers. It is therefore against this backdrop that this study examined the performance of sweet potatoes farmers in Ogbaru Local Government Area of Anambra State. Specifically, this study:

- i. described the socio-economic characteristics of sweet potato farmers in the study area,
- ii. estimated the net farm income of sweet potato farmers,
- iii. identified the strengths, weaknesses, opportunities and threats (SWOT) inherent in sweet potato production in the area,
- iv. determined the factors that affected the farmers' net farm income and
- v. identified the constraints to sweet potato production in the study area.

Since the period of Covid-19 pandemic and its challenges, it has become necessary for farmers to diversify into crops that can withstand difficult challenges and also serve as food security crop. This is because the Agricultural sector plays an indispensable role in ensuring food security and availability Onubogu and Dipeolu (2021)^b. Mica, Carmen, Roland, and Bailey, 2018 identified Sweet potatoes as such crop which can withstand difficult challenges and also serve as food security crop. Hence this study will expose the current situation of sweet potato production in the study area with an aim of encouraging farmers to venture into it.

Sweet potato production is a good source of income and livelihood in Nigeria. It is an enterprise practiced by married farmers who had a household size of between 5-6 persons who assist in the farm work as an alternative source of labour thereby reducing the total cost of production (Sanusi et al., 2016; Gbigbi, 2019). According to Sanusi et al., (2016) the average household size of sweet potato farmers was eight (8) persons while Gbigbi (2019) reported five (5) persons as the average household size. Sanusi et al., (2016) ascertained that sweet potato production is an enterprise practiced on full time basis though in combination with other enterprise on a small scale. This is an evidence that it is a source of livelihood.

METHODOLOGY

The Study Area

This study was conducted in Ogbaru Local Government Area of Anambra State, South East Nigeria. The study area is surrounded by River Niger on the west, and the Orashi River to the East along

Ogwu-Aniocha and Osomari forest reserve (east end), also borders Ozubulu, Oraifite and Oba to its North East. The shallow depth of the River makes the area subject to frequent flooding due to heavy rainfall in the rainy season which impacts local farms and crops. The study area is close to Onitsha, a major commercial city in Nigeria also located in Anambra State.

Population and Sampling Procedure

The study population comprised of all sweet potato farmers in Ogbaru Local Government Area. four towns (Umunankwo, Odekpe, Okpoko and Atani) out of the sixteen towns in Ogbaru Local Government Area were purposively chosen due to their popularity in Agricultural production. Random sampling method was used also to select 30 respondents from each of towns making it 120 respondents for the study. This selection was done based on proximity and baseline survey of sweet potato producers done by agricultural officers in the area.

Data were collected from the respondents through the administration of structured questionnaires, observation and interviews.

Method of Data Analysis

Data were analyzed using descriptive statistics such as mean, mode, percentage, etc., budgetary techniques, SWOT analysis, Likert scale and Regression analysis..

i. Gross margin analysis: The specific budgetary techniques employed were the Gross margin analysis and Net farm income. The model is stated thus:

$$GM = GI - TVC$$

$$GM = \text{Gross Margin}$$

$$GI = \text{Gross Income}$$

$$TVC = \text{Total variable cost}$$

$$NFI = GM - TFC, \text{ where}$$

$$NFI = \text{Net Farm Income}$$

$$GM = \text{Gross Margin}$$

$$TFC = \text{Total Fixed Cost}$$

The TVC included items such as total cost of labour, transportation, fertilizer, herbicides, planting material (vine) while the TFC included cost of renting land.

ii. SWOT analysis: A SWOT (Strength-Weakness-Opportunities-Threats) analysis was employed to identify the strengths, weaknesses, opportunities and threats in sweet potatoes production. Various variables were enumerated for the farmer to choose from. A 5 - point Likert Scale was used to identify the important variables. These variables were placed in a SWOT table. The 5 - point Likert scale included; Strongly disagree 1, disagree 2, neutral 3, agree 4, strongly agree 5

$$\frac{1+2+3+4+5}{5} = \frac{15}{5} = 3$$

$$\frac{15}{5} = 3$$

Hence, any variable that scored above 3 was regarded as important while those less than 3 were not important.

iii. Regression analysis: A multiple Linear Regression was used to determine factors that affect

the farmer's net income. This was implicitly given as: $NFI = f(AG, GEN, YIS, FE, MAS, FS, TC, SP, QH; M, e)$, and explicitly as:

$$Y = \beta_0 + \beta_1X_1 + \beta_2X_2 + \beta_3X_3 + \beta_4X_4 + \beta_5X_5 + \beta_6X_6 + \beta_7X_7 + \beta_8X_8 + \beta_9X_9 + \beta_{10}X_{10} + e_i$$

Where:

- $X_1 = AG =$ age,
- $X_2 = GEN =$ Gender (male =1; female = 0)
- $X_3 = YIS =$ years in school (number of years spent in formal education),
- $X_4 = FE =$ farming experience (in years),
- $X_5 = MAS =$ marital status, (married =1; otherwise = 0)
- $X_6 = FS =$ number of hectares (farm size),
- $X_7 = TC =$ Total cost (₦),
- $X_8 = SP =$ selling price of sweet potato (₦),
- $X_9 = QH =$ quantity harvested (output),
- $X_{10} = M =$ Mode
- $e =$ error term.

iv. Likert Scale: A 3-point Likert scale of Not a serious constraint (1), Serious (2) and very serious (3) was used to identify the constraints. Any option with a mean score greater than 2 ($(3+2+1)/3=2$) was considered as a serious constraint while any score less than 2 was taken as not serious.

RESULTS AND DISCUSSION

Table 1 shows that most (98%) of the farmers were within the economically active age brackets (21-50 years) with 40 years as the mean age. The respondents are said to be relatively young considering the mean age of 40 years, which means that they will be economically active in the sweet potato production enterprise. This is in line with the findings of Gbigi et al., (2019) who found out that the mean age of sweet potato farmers was 38 years.

58% of sweet potato farmers were male while 42% were female, Agricultural activities are practised by both male and female farmers. This result can be justified by the assertions of Sanusi et al., (2016) that sweet potato production was dominated by the male farmers which could be attributed to the fact that women had to take care of home front domestically. In this study, it was discovered that majority (64%)

of farmers were married while 36% were single, widowed and divorced. This buttresses the point that sweet potato farming is a source of livelihood as families are fed from its proceeds. Education has been identified as important in farming enterprise. The results on table 1 show that 32% of the respondents had secondary education and higher, 50% of the farmers had primary education while the farmers without formal education were 18% of the respondents. This implies that 82% of the respondents were exposed to formal education. The mean household size was found to be approximately 4 people, this is in line with the finding of Gbigi (2019).

The average number of years spent in potato farming is 4.5 years. The implication of this is that the sweet potato farmers in the area are young in the enterprise. A possibility is that the farmers are not consistent with sweet potato farming. With respect to farm size, the mean farm size cultivated by the respondents was 3.6 plots which is approximately 4 plots that is 0.3ha (less than 1 ha). This corroborates with Tewe et al., (2013) and Gbigi (2019) who reported average farm sizes of 0.4ha and 0.81ha respectively. The small average farm size can be justified by the fact that many farmers cultivate sweet potato as part time enterprise and this is as a result of low interest in concentrating only in sweet potato production. This is buttressed by the fact that the finding of this research reveals that 46% of the sweet potato farmers are part time farmers which inter-crop it with other crop production e.g. yam production, hence, this 46% of the farmers allocate small portion of farm land to sweet potato production since they practice mixed cropping. Another possible contributing factor to the small farm size is insufficient land.

The response of the farmers to their sources of funds for farming show that 68% of the farmers made use of their personal saving, 32% sourced funds from friends and relatives, while 52% of the respondents collected from cooperative groups which they belonged.

Table 1. Socio-economic characteristics of the respondents

Variable	Frequency	Percentage (%)	Mean/Mode
Age (years)			
21 – 30	7	14	40
31 – 40	20	4	
41 – 50	18	3	
51 – 60	4	8	
61 and above	1	2	
Sex			
Male	29	48	male
Female	21	42	
Marital status			
Married	32	64	married
Others	18	36	
Education Level			
No formal education	9	18	
Secondary	16	32	
Primary	25	50	
Household size			
0 – 3	22	44	4
4 – 7	24	50	
8 – 11	3	6	
Years of Farming			
0 – 4	68	34	3.9
5 – 9	26	13	
10 – 14	6	3	
Mode of operation			
Part time	23	46	Full time
Full time	27	54	
Farm size (plots)			
1 – 5	44	88	3.6(0.3ha)
6 – 10	6	12	
Source of Fund			
Personal saving	34	68	Personal
Friends and relatives	16	32	
Commercial bank/Isusu	0	0	
Co-operative Society			
None	24	48	
Member	26	52	

Source: Field Survey, 2021

Costs and Returns of Sweet potato production in the study area

The costs and returns associated with sweet potato production in the study area are displayed on table 2. The mean farm size cultivated by the respondents was 3.6 plots which is approximately 4 plots that is 0.3ha (less than 1 ha) while an equivalent of 790kgs of sweet potatoes were harvested/ha. The average selling price of each kg was ₦330.00.

The budgetary technique analysis revealed that an average total cost of ₦99,968.30 was incurred by the farmers per ha of land in a cropping season while an average total revenue of ₦260,730.60/ha was realized with a net farm income of ₦160,762.30 and the return on investment of ₦1.61. This shows that sweet potato farming is a profitable venture to invest in.

Table 2: Net farm income of the potato farmers

VARIABLE	VALUE
Average farm size (ha)	0.3ha
Average selling price /Kg (₦)	330
Average quantity harvested (kg)/ha	790kgs
Average Total Revenue (ATR) / ha (₦)	260,730.60
Average Total Variable Cost(₦)/ha	89,168.30
Average Total Fixed Cost/ ha (ATFC)(₦)	10,800
Average Total Cost/ ha (₦)	99,968.30
Average Gross Margin (AGM)(₦)=ATR-ATVC	171,562..30
Net Farm Income (NFI)/ha = AGM – ATFC (₦)	160,762.30
Return on investment (ROI)=NFI/ATC	1.61

Source: Field survey, 2021

Strengths, Weaknesses, Opportunities and Threats in Sweet Potato production

The strengths, weaknesses, opportunities and threats which are significant (using mean score) in sweet potato farming are displayed in the SWOT matrix (fig 1). Numerous strengths, weaknesses, opportunities and threats in sweet potato production were identified by the SWOT analysis. The SWOT analysis matrix shows that the key strengths of sweet potatoes farming are high yield, availability of planting materials, ready and available market, adaptability to different soil conditions, sufficient capital, minimal labour cost, early maturity and favourable weather, while the weaknesses include lack of information on improved variety, misinformation on sweet potato marketing, the sweet nature of sweet potatoes which makes it too sweet for adults, low price at harvest, highly perishable nature and lack of sustainability.

The opportunities to be explored in the enterprise include creating more awareness on the nutritional

value of sweet potatoes, taking advantage of the diversified uses of sweet potatoes, commercialization of sweet potatoes, creating an International market for fresh and processed forms of sweet potato, making storage processing facilities (value chain) available, and diversification into orange flesh sweet potatoes which has more nutritional value and health benefits than ordinary sweet potatoes. The potential threats in sweet potato production are the highly perishable nature of the sweet potato, poor consumer perception, lack of financial support, sweet nature of sweet potatoes, possibility of consumers changing from sweet potatoes to other staple foods and the threat of a possible climate change that may affect production of sweet potatoes. Ocholi, Zacharias, Nyiatagher and Monica (2017) had reported poor storability and seasonality as the problem faced by sweet potato farmers in their study and opined that if harvested sweet potato tubers are properly stored, the farmers will have more income.



Fig 1: SWOT matrix of sweet potato enterprise

Factors that determine the sweet potato farmers’ net profit

The factors that determine the net profit of the sweet potato farmers in the study area were identified using two functional forms of multiple regression results as displayed in Table 3. Marital status, farming experience, quantity harvested, and selling price of sweet potatoes had positive effect on the farmers’ net farm income while total cost of production had a negative effect on the farmers’ net profit.

As can be seen in table 3, the net farm income of married farmers is 91k more than that of the farmers that were not married. This affirmed the assertion of Alalade et al., (2019) that the farming households

have a perception that the addition of one working member in a family enhances farm operations thereby increasing farm production and ultimately increasing household income, and reducing cost of hired labour. Farming experience has a positive effect on the net farm income of the farmers. The result on table 4.. shows that for each 1 year increase in experience, the net farm income increases by 78k. This, according to Adeyonu et al., (2019) is because as farmers grow older and gain more experience in Sweet potato, they tend to be knowledgeable about utilization of inputs more efficiently and this leads to greater output and more revenue. Sanusi et al., (2016) also noted that

experience in an enterprise is an attribute which places a farmer ahead of others.

The quantity of sweet potatoes harvested was measured in bags of 10kg and the result displayed shows that there is ₦3,203.00 increase in net farm income for each 1bag increase in quantity of sweet potato harvested. This is an equivalent of ₦320.30 increase per increase 1kg increase in quantity harvested. This finding agrees with Alice, Lagat, and Langat (2016) and Gbigbi (2019) that more output leads to higher net income, but does not agree with them on farm size because the farm size in this study was not significant.

According to table 3 every 1% increase in the selling price of sweet potatoes will lead to an increase of ₦

8.43 in the net farm income. This is expected because if selling price increases the total revenue goes up thereby causing the net profit to increase too. The effect of total cost on the net farm income of sweet potatoes farmers is in line with a priori expectation and this is shown by its significant negative impact. For every 1% increase in total cost of production, the net farm income of sweet potato farmers reduces by ₦ 1.03. The implication of this is that the farmers have to employ all available means to reduce their cost of production. This finding supports Alice, Lagat, and Langat (2016) as well as Gbigbi (2019) who reported that costs of production affected the net income of sweet potato farmers.

Table 3: Factors that determine the sweet potato farmers’ net profit

Variables	Linear-Linear	Semi-log
Age	-23.557 (0.442) -0.776	-0.383 (0.310) -1.029
Sex	-3.268 (0.994) -0.007	-1.280 (0.204) -1.292
Marital status	0.908** (0.021) 2.402	0.906** (0.016) 2.525
Education	-60.371 (0.287) -1.080	-0.134 (0.604) -0.522
Farm experience	0.775** (0.019) 2.444	.524 (0.111) 1.632
Mode	650.283 (0.142) 1.501	0.344 (0.340) 0.966
Farm size	142.404 (0.185) 1.348	0.042 (0.912) 0.111
Quantity harvested	3203.002*** (0.000) 41.795	4.883*** (0.000) 8.408
Selling price	8.426*** (0.000) 19.249	5.149*** (0.000) 4.361
Total cost	-1.027*** (0.000) -15.197	-1.501** (0.028) -2.284
Constant	-36.49*** (0.003) -3.21	-25.543 (0.037) -2.162
R²	0.79	0.72
R̄²	0.70	0.67
F stat	10.949 (0.000)	5.85 (0.00)

Note:*, ** & ***= significant at 10%, 5% and 1% respectively. Figures before the parentheses are the coefficients of the variables, figures in parentheses represent the p-values, while the figures in bold letters are the t-values.

Source: author’s calculation from field survey data, 2021

CONSTRAINTS TO SWEET POTATO PRODUCTION

Table 4 displays the various constraints militating against sweet potato production. Among the very serious/ serious constraints, Lack of extension agents with a weighted mean score 2.40 was ranked first, lack of improved variety for planting with a weighted mean score 2.28 was ranked second, high cost of labour with a weighted mean score 2.22 was

third, Inadequate capital to finance farm production with a mean score of 2.20 was fourth while low price for sweet potatoes at harvest was fifth. This implies that majority of sweet potato farmers were not able to practice commercial sweet potato production, since source of knowledge from extension agent on new varieties and capital to expend production were not readily available to them.

Table 4 Constraints to sweet potato production

Constraints	Mean	Ranking	Decision
Lack of extension agents	2.40	1 st	Very serious
Lack of improved variety for planting	2.28	2 nd	Very serious
High cost of labour	2.22	3 rd	Very serious
Inadequate capital to finance farm production	2.20	4 th	Very serious
Low price for sweet potato at harvest	1.74	5 th	Serious
Lack of appropriate storage structure	1.48	6 th	Not serious
Pests and diseases	1.46	7 th	Not serious
Lack of market	1.24	8 th	Not serious
Lack of access roads to convey seeds and outputs	1.20	9 th	Not serious
High cost of sweet potato vine	1.18	10 th	Not serious

Source: Field Survey 2021

CONCLUSION

First, and perhaps, the most significant outcome of this study, is that Sweet potato farming in Ogbaru Anambra State, Nigeria is a profitable venture as justified by the gross margin analysis, irrespective of the constraints the farmers face. This study hence concludes that the performance of sweet potato production in the area is good and very encouraging. Secondly, several opportunities yet to be explored and developed exist. These opportunities, if properly worked upon and added to the strengths of the sweet potato production, will bring about a tremendous boost in sweet potato production. Thirdly, the weaknesses and threats which constitute bottlenecks to appropriate expansion of the enterprise are areas that need careful attention. Finally, the factors that determine the net farm income of the farmers should be leveraged upon for good planning. Suggestions include:

- i. With the growing food crisis and high prices of main stream food crops like rice, beans among others, there should also be a growing recognition of the importance of sweet potato in supporting livelihoods for the poor.
- ii. Several opportunities yet to be explored and developed in sweet potato production such as creation of more awareness on the nutritional value of sweet potatoes, diversified uses of sweet potatoes, commercialization of sweet potatoes, creation of an International market for fresh and processed forms of sweet potato, and diversification into orange flesh sweet potatoes which has more nutritional value and health benefits than ordinary sweet

potatoes, should be properly worked upon by the Government at all levels as well as both current and intending sweet potato farmers to bring about a tremendous boost in sweet potato production. This will lead to the development of the sector.

- iii. Extension agents should work on some of the weaknesses and threats, especially, misinformation on sweet potato marketing and poor consumer perception, which constitute bottlenecks to appropriate expansion of the enterprise.
- iv. Research institutes should take up a research on possibility of getting another specie of sweet potato with less sugary taste.

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