



Research Article

Socio-Economic Analysis of Cost and Returns of Yam Production Among Small Holder Farmers in Delta State, Nigeria

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Abstract

The study investigated socio-economic analysis of costs and returns of yam production among small holder farmers in Delta State, Nigeria. Multistage, purposive and simple random sampling techniques were used to select 120 respondents for the study. Well structured questionnaires were used to obtain data. Out of the 120 questionnaires administered, one questionnaire was rejected due to unacceptable errors. Descriptive statistics and net farm income were used in analyzing the data. Results revealed that majority (75.6%) were males, 45.4% were within the age range of 26 years and 35 years, 68.9% were married, 37.8% had 6 - 10 years of farming experience and the majority (42.9%) of the respondents had secondary school education. Out of the 15 variables investigated as regards to the determinants of yam production in Delta State, only seven (7) variables were found to be statistically related to the factors influencing the determinants of yam production in the study area. Those variables were family size ($p < 0.009$), farming experience ($p < 0.000$), income ($p < 0.000$), educational level ($p < 0.000$), access to credit (0.003), farm size ($p < 0.001$) and age ($p < 0.000$). The enterprise was profitable based on the positive values of gross margin (₦3,502,575), net farm income (₦2,904,575) and net return on investment (₦1.53k). This implies that yam production is a profitable enterprise in the study area since RNI was greater than one. The constraints were; high cost of labour, pests/disease attack, low knowledge of improved yam, poor extension services, inadequate finance, poor road network and high cost of local seed respectively. The paper therefore, recommends that farmers should be encouraged to join cooperative society in order to pool their resources together to take advantage of economies of scale purchase, thereby reducing cost of production.

Keywords: Costs and returns, constraints, yam production, small-holder, farmers.**Introduction**

Yams (*Dioscorea* spp) are annual or perennial tuber-bearing and climbing plants with over 600 species, out of which six are economically important in terms of food and medicine (Apu, Ani, Agbarevo, Ugboaja, Ekwe and Obinna, 2020). It belongs to the genus "*Dioscorea*" and family of "*Dioscoreaceae*", it is a tropical crop with many species, which originated from South East Asia and later came into West Africa in the 16th century. Yam is one of the principal tuber crops in the Nigeria economy, in terms of land under cultivation and in the volume and value of production (FAO, 2019; Ndubueze, Adeyoola and Nwigwe, 2020).

In Nigeria, yam production increased from 45,409.800 tons in 2016 to 46,912.650 tons in 2017 at end of the year with an average of 30,343.870 tons between 1995 and 2017. The highest production was 46,912.650 tons in 2017 and lowest was 22,522.500 tons in 2001 (National Bureau of Statistics, 2017). Nevertheless, yam production in Nigeria has doubled more over the past 10 years, from 22.5 million tons in 2001 to 46.9 million tons in 2011 (Ndubueze, Adeyoola and Nwigwe, 2020). The increase in output is attributed to the large area planted than increased productivity (Zaknayiba and Tanko, 2013 in Ndubueze, Adeyoola and Nwigwe, 2020).

Presently, yam has become expensive as production has not kept pace with population growth, and the demand exceeds supply. Yam production faces several constraints that significantly affect its potentialities to support rural

development and meet consumers' needs as an affordable nutritional product (Daniel and Akintunde,2022). These challenges in yam production include production cost which includes high cost of labour and planting materials. This rising cost of yam production consequently affects its realizable revenue from its production. Others include weed pressure, decline in soil fertility, soil borne pests and diseases, leaf disease, storage pests and diseases, barn making and lack of staking materials, use of traditional technology for production of seed yam, scarcity of planting materials (Simpa and Nmadu, 2014). Kleih *et al.* (2012) in Daniel and Akintunde, (2022) stressed that low soil fertility, lack of improved yam varieties, poor road networks, high cost of labour and lack of finance to carry out necessary farming activities were the constraints to productivity and profitability.

Yams are one of the most expensive crops to produce; the planting and harvesting processes require significant labor input, yam seeds are expensive, and the supply of seed is limited. Research indicates that households may save up to 30 percent of harvested yam tubers for the next planting season. According to available literature, approximately 45 percent of harvested yam seed is saved for the next planting season. This starkly contrasts with other staple crops, for which approximately 20 percent of harvested yields are saved. It was against this backdrop that this study was born to empirically ascertain the cost and returns of yam production in Delta State, Nigeria. Other specific objectives of this study were to examine the socio-economic characteristics of yam farmers in the study area, determine the cost and returns associated with yam production, ascertain the determinants of yam production in the study area, and estimate the constraints to yam production in the study area.

Methodology

The study area is Delta State of Nigeria. The state covers a landmass of about 18,050 km² (6,970 sq mi), of which more than 60% is land. The state lies approximately between 5°00' and 6°45' E and 5°00' and 6°30' N. It is geographically located in Nigeria's Midwest, bounded in the north and west by Edo State, the east by Anambra, Imo, and Rivers States, southeast by Bayelsa State, and on the southern extreme is the Bight of Benin which covers about 160 kilometres of the state's coastline. There are 25 local government in the State with head quarter at Asaba (Isorhovoja,2015).

Multistage sampling techniques were used for the study. Three (3) local governments out of the 25 local governments in the State were used for the research based on their activities on yam production. Here, Aniocha North, Ndokwa East and Ndokwa West were selected. These gave a total of three local government used for the study. Two communities per L.G. were purposefully selected due to their active participation in farming activities. Isele Asagba and Isele Ukwu, from Aniocha North; Obi-Igbo and, Ashaka from Ndokwa East; Amoji and Ogbe-Ogume from Ndokwa West were used. This gave a total of 6 communities that used for the study. Twenty (20) farmers each were randomly sampled from each community and this gave a total sample size of 120 farmers that were used for the work. Data used for this research were collected through a structured questionnaire. Descriptive statistics, net farm income and regression model were used in analyzing the data.

Measurement of Variables

To determine cost and returns, Net Farm Income (NFI) will be used. The inputs used include seed yam, herbicides, labour as variable inputs and machete, hoe, bicycle/motor cycle, head pan/basket among others as fixed inputs. The fixed inputs were depreciated. Gross margin is the excess of sales revenue over purchases or profit above variable cost, while net farm income is the difference between gross margin and total fixed cost. The average prevailing market prices of inputs and output was used to derive the relevant monetary values of inputs and output. These are mathematically represented as:

$$GM = TR - TVC$$

$$NFI = GM - TFC \text{ or } TR - TC$$

$$NROI = NFI/TC$$

Where:

GM = Gross Margin

TR = Total Revenue

TVC = Total Variable Cost

NFI = Net Farm Income

TFC = Total Fixed Cost

TC = Total Cost

RNI = $NFI \div TC$, where; RNI = returns per Naira invested

Decision Rule: RNI >1, implies that the enterprise is profitable; RNI =1, implies that the farmer is operating at breakeven point and RNI <1, that the farmer is operating at loss (Olukosi and Erhabor 1988 in Daniel and Akintunde, 2022).

To ascertain the determinants of yam production among farmers. Multiple regression analysis was used to determine the independent variables that contributed significantly in explaining variation in the dependent variable which stands as the total production output.

$$T = a + b_1x_1 + b_2x_2 + b_3x_3 + b_4x_4 + b_5x_5 + \dots + b_{13}x_{15} + \mu$$

Where

T = Total output

(kg/ha)

a = constant term

b₁-b₁₅ = regression coefficients

μ = error term

X₁ = age

X₂ = educational level

X₃ = Household size

X₄ = Membership of social organization

X₅ = Farm size

X₆ = Farming experience

X₇ = Training received

X₈ = type of ecosystem

X₉ = Tillage type

X₁₀ = Soil fertility

X₁₁ = income of the farmers

X₁₂ = Constraints to use of the crop

X₁₃ = Types of farming practice

X₁₄ = access to credit

X₁₅ = sex

Results and discussion

Data in Table 1 revealed that the majority (45.4%) of the yam farmers fall within the age range of 26 and 35 years and have a mean age of 41 years. This implies that they were in their economic active age and productive that can make positive contribution to agricultural production. The result also revealed that 75.6% of the farmers were males, while 24.4% were females. This indicates that more males than females were involved in yam production in the study area. This may be attributed to the laborious nature of yam production which most females cannot comply with. The finding is in agreement with the finding of Daniel and Akintunde (2022) who observed that men dominated the activities of yam production in Southern Taraba State, Nigeria. On educational level, it was observed that few (13 %) of the respondents had no formal education while majority (42.9%) of the farmers had secondary school education. According to the finding, the result on household size indicated that the mean household size was 3 persons. This implies that there was a moderate supply of family labour for farm operations in the study area as most respondents have relatively small families. This result is not in line with the finding of Toluwase and Sekumde (2017) that indicated the relatively large family size in their study. In terms of access to credit loan, 37.8% of the yam farmers had access to credit while 62.2% had no access to credit. This implies that majority of the farmers studied had no access to credit facilities and were using their personal saving for farm operations. This could stem from the fact that government hardly grants financial credit to farmers and even when it does, it is mostly inadequate and inaccessible to rural farmers due to lack of collaterals (Rukwe and Zubairu, 2019). However, the result showed that about 69.7 % of the yam farmers did not belong in any cooperative association while 30.3% of the farmers were members of cooperative association. This implies that majority of the yam farmers in the study area were not members of any cooperative society and may not benefit from assumed benefits accrued to cooperative society. On farming experience, 37.82% of the respondents had between 6-10 years of farming experience while 11.0% of the farmers in the study area had between 1-5 years of farming experience with a mean of 11 years. This implies that yam farmers in the study area have a significant level of experience in yam production and that the managerial ability of the farmers can be beneficial in yam production. On the other hand, 37.1% of the respondents cultivated 0.5-0.9 hectares of land while 30.2% of the respondents cultivated 3-4 hectares of land. The average hectare of land cultivated was 1.3 hectares. This implies that majority of farmers are small scale yam farmers. The finding is in agreement with Daniel and Akintunde (2022) who reported that farmers in their study area were small scale farmers.

Table 1: socio-economic characteristics of yam farmers in Delta State, Nigeria (n=119)

Variables	Frequency	Percentage	Mean
Sex			
Male	90	75.6	
Female	29	24.4	

Age			
18-25	9	7.6	
26-35	54	45.4	41 years
36-45	9	7.6	
46-55	32	26.8	
56-65	15	12.6	
Marital status			
Married	82	68.9	
Single	37	31.1	
House hold size			
1-2	63	53.0	
3-4	41	34.4	3 persons
5-6	15	12.6	
Farming experience			
1-5	13	11.0	
6-10	45	37.8	11 years
11-14	21	17.6	
15-19	26	21.8	
20-24	14	11.8	
Level of education			
Non formal education	13	10.9	
Primary school	36	30.3	
Secondary school	51	42.9	
OND/NCE	9	7.6	
First degree/HND	10	8.4	
Farm size			
0.5-0.9 ha	44	37.1	
1.1-2 ha	39	32.7	1.3 ha
2.2-3 ha	36	30.2	
Access to credit			
Yes	45	37.8	
No	74	62.2	
Membership of cooperative			
Yes	36	30.3	
No	83	69.7	

Source: field survey,2024.

Cost and Returns of Yam Production in the Study Area

The cost and returns on investment with yam production in Delta State were carried out to determine the viability of the various cost components, such as, the variable and fixed cost items used in yam production. The total cost incurred on yam production was ₦1,892,925. This shows that the farmers spent more money on yam inputs. The total revenue obtained from yam business was ₦4,797,500. The total fixed cost of yam production was ₦598, 000, while the total variable cost was ₦1,294,925. It was revealed that the total fixed cost accounted for only 31.6% of the total cost in yam production in the study area. This implies that variable costs (86.4%) were the highest cost items in yam production in the study area compares to the fixed cost items. This result considerably agrees with the finding of Zaknayiba and Tanko (2015) who reported that yam farmers spent over 78.9% of the total cost of production on variable inputs. The table further showed that the net farm income was ₦2,904,575. The return per naira invested (RNI) was ₦1.53k which implies that yam production is a profitable enterprise in the study area since RNI was greater than one.

Table 3: Estimated costs and returns for yam production in Delta State, Nigeria

Variables	Amount(N)	Percentage
Total Revenue	4,797,500	
Variable Cost		
Yam seedlings	520,325	40.2
Pesticides	340,520	26.3
Labour	381,124	29.4
Transportation	31,445	2.4
Storage	21,511	1.7

Total variable cost	1,294,925	100
Fixed cost		
Machetes	67,000	11.2
Hoe	56,000	9.4
Rake	36,000	6.0
Baskets	39,000	6.5
Interest on loan	400,000	66.9
Total fixed cost	598,000	100
Total cost (TC)=TVC +TFC	1,892,925	
Gross margin (GM)=TR-TVC	3,502,575	
Net Farm Income (NFI)=TR-TC	2,904,575	
Return perN1 Invested=NFI/TC	1.53k	

Source: Field work, 2024.

Multiple regressions Analysis Showing Determinants of Yam production in Delta State

The results of regression analysis of the independent variables (age, educational level, household size, farmers' group, farm size, farming experience, type of ecosystem used, types of tillage system used, access to credit, level of soil fertility, income of the farmers, perceived constraints, farming practice, training received and sex) on determinants of the factors influencing yam production among farmers show that a strong correlation ($R=0.987$) exists between dependent variable and independent variables. These variables were able to explain 99% of the variation in determinants of yam production among farmers ($R^2=0.974$). The adjusted R^2 also supported the claim with a value of 0.971 or 97.1%. This implies that the independent variables explain the behaviour of the dependent variable at 97 level of confidence.

Out of the 15 variables investigated as regards to the determinants of yam production in Delta State, only seven (7) variables were found to be statistically related to the factors influencing the determinants of yam production in the study area. Those variables were family size ($p<0.009$), farming experience ($p<0.000$), income ($p<0.000$), educational level ($p<0.000$), access to credit (0.003), farm size ($p<0.001$) and age ($p<0.000$).

Table 2: Multiple regression Analysis Showing Determinants of Yam production in Delta State

Model	Unstandardized Coefficients		Standardized Coefficients		
	B	Std. Error	Beta	T	Sig.
Constant	5.7619	3.3890		5.225	.000
House hold size	-9003.617	3400.451	-.084	-2.648	.009
Farming experience	7335.673	817.258	.226	8.976	.000
Income generated	.524	.013	1.056	40.094	.000
Level of education	27837.365	4239.041	.179	6.567	.000
Access to credit	30701.049	10060.673	.092	3.052	.003
Farm size	50256.340	14438.166	.184	3.481	.001
Age	-4211.352	535.816	-.307	-7.860	.000

Source: Field work, 2024. $R^2=0.974$ Adjusted $R^2=0.971$

Constraints faced by Yam Farmers in the Study Area

The constraints to yam production in the study area were ranked according to their degree of importance. The constraints were as follows: high cost of labour, pest/disease attack, low knowledge of improved yam, poor extension services, inadequate finance, poor road network and high cost of local seed respectively. High cost of labour was top in the rank. This could be attributed to the migration of youthful ages to the urban areas for in search of white collar jobs. This may also constrain smallholder yam farmers from enhancing productivity. This is in agreement with the finding of Daniel and Akintunde (2022) who reported high cost of labour as a major constraint to yam production. Poor extension service was considered the fourth major constraints. This was attributed to inadequate extension service in the study area which may be due to government's negligence on extension service in Nigeria. Yam farmers' inadequate knowledge of new farming techniques has reduced their productivity. This agrees with the finding of Akerele *et al.* (2019) who reported lack of extension service as a major challenge to yam productivity.

Table4: Constraints to yam production in the study area

Constraints	Mean	Ranking
High cost of labour	4.20	1 st
Pests/disease attack	3.90	2 nd
Low knowledge of improved yam sett	3.70	3 rd
Poor extension services	3.00	4 th
Inadequate capital	2.50	5 th
Poor road network	2.30	6 th
High cost of inputs	2.10	7 th

Source: Field Survey, 2024.

Conclusion and Recommendations

Results revealed that majority (75.6%) were males, 45.4% were within the age range of 26 years and 35 years, 68.9% were married, 37.8% had 6 - 10 years of farming experience and the majority (42.9%) of the respondents had secondary school education. Out of the variables investigated as regards to the determinants of yam production in Delta State, only seven (7) variables were found to be statistically related to the factors influencing the determinants of yam production in the study area. Those variables were family size, farming experience, income, educational level, access to credit, farm size and age. The enterprise was profitable based on the positive values of gross margin (₦3,502,575), net farm income (₦2,904,575) and net return on investment (₦1.53k). The constraints were; high cost of labour, pests/disease attack, low knowledge of improved yam, poor extension services, inadequate finance, poor road network and high cost of inputs respectively. Based on the findings of this study, the following recommendations were made:

- Farmers should be encouraged to join cooperative society in order to pool their resources together to take advantage of economies of scale purchase, thereby reducing cost of production.
- There should be revitalization of extension services in the state through which farmers will be updated on current knowledge of production techniques that will help to improve their yam output level.
- Rehabilitation of rural roads is also necessary to enable the farmers have access to their produce.
- Government should properly address problem of high cost of inputs in the country by placing subsidy on agricultural inputs.

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