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ECONOMIC ANALYSIS OF YAM PRODUCTION IN SOTHERN TARABA, TARABA STATE, NIGERIA

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ABSTRACT

This study analyzed the economic analysis of yam production in southern Taraba, Taraba State, Nigeria. Specific objectives were to determine the cost and return of yam production, analyze factors influencing profitability of yam production and identify constraints faced by yam farmers in the study area. A multi-stage sampling technique was employed to select 170 yam farmers across the study area and the data was collected using structured questionnaires. Data collected were analyzed using descriptive statistics, gross margin analysis, and a multiple regression model. Results showed that yam production is highly profitable, with an average gross margin of ₦2,161,138.57 per farmer, driven by both market sales (₦241,5456.79) and home consumption (₦120,001.24). Factors influencing profitability of yam production shows that land, yam sett, fertilizer, agrochemicals, labor, and staking materials were significant at 1% level and had a positive influence on the output. However, major production constraints identified were inadequate capital ranked 1st with a mean of 4.49, high labor costs (4.12), poor access to roads (4.02), lack of storage facilities (3.90), and high cost of yam setts (3.78). The study concluded that while yam production presents a viable income source, its profitability could be enhanced through improved access to land, subsidized inputs, mechanization, and infrastructure development. It was recommended that Secure and equitable access to arable land should be promoted through improved land tenure systems and land development initiatives.

Keywords: *Profitability, Yam, Production and Southern Taraba*

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INTRODUCTION

Background of the study

Yam (*Dioscorea spp*) is one of the most important staple food crops in Nigeria, both in terms of production volume and sociocultural relevance. Nigeria is the largest producer of yam globally, accounting for about 67% of global output (Olawuyi, 2021). Yam plays a significant role in the food security, income generation, and cultural practices of rural households across the country (Nanbol and Namo, 2019). Yam production is most prevalent in the middle belt and southern regions of Nigeria, where favorable agro ecological conditions exist (Twumasi *et al.*, 2024). Taraba State, particularly its southern zone comprising LGAs such as Wukari, Donga, Takum, Ussa, and Ibi is well known for its substantial yam production, owing to its rich alluvial soils, adequate rainfall, and long farming tradition (Jiya, 2022). Despite the favorable environmental conditions, yam production in Southern Taraba is still largely dominated by smallholder farmers who often face significant socioeconomic and technical challenges (Musa *et al.*, 2023). These challenges impact the level of profitability and productivity, thereby threatening the sustainability of yam farming as a livelihood source (Komolafe *et al.*, 2022).

Profitability in yam production is not only a function of prices and yield, but also a reflection of efficient resource use and effective cost management (Adams and Nkoro, 2021). Profitability refers to the financial gain realized from an enterprise after all costs have been deducted. In the context of yam production, profitability is typically measured using gross margin, net return, and return on investment (ROI) (Simpa and Nmadu, 2014). These dimensions help in evaluating the financial performance of the farm and determining whether resources are being used efficiently. Profitability analysis is a critical tool for policy makers, development practitioners, and researchers in understanding the economic sustainability of farming systems. Profitability, in economic terms, refers to the ability of an enterprise to generate earnings relative to its costs. Yam production is both labor intensive and capital demanding, and its profitability is directly influenced by factors such as input prices, output prices, labor costs, land use efficiency, and access to productive resources (Adenuga *et al.*, 2013).

Despite the dominance of yam production in the region, there is increasing concern about the economic viability of yam farming among smallholder farmers. This is primarily because farmers are confronted with high production costs, unstable market prices, pest and disease outbreaks, and limited access to capital and technology. Therefore, assessing the profitability of yam production becomes essential for understanding whether farmers are achieving adequate returns on their investment and for identifying areas where productivity and efficiency can be improved (Adams and Nkoro, 2021). Yam production remains a major agricultural activity in Southern Taraba, yet the majority of yam farmers operate within a small-scale, resource constrain. While the region is blessed with favorable climatic conditions and fertile soils, farmers still struggle with rising input costs, poor market access, and post harvest losses all of which threaten the profitability of yam production. The lack of comprehensive studies that quantify and analyze the profitability of yam production in this specific context leaves a significant knowledge gap. Most existing studies focus on broader regions or different crops, making it difficult to design interventions tailored to yam farmers in Southern Taraba. Consequently, there is an urgent need to evaluate the cost components, revenue structure, and net returns from yam farming in order to support evidence based planning and agricultural policy formulation. This study seeks to fill that gap by providing a focused analysis of profitability and its determinants in yam production in Southern Taraba. The specific objectives were to; determined the cost and return of yam production; analyze factors influencing profitability of Yam production and identified the constraints faced by yam farmers in the study area

Materials and methods

Study area

The Study was conducted in Southern Taraba, Taraba State, Nigeria. The study area is made up of five local government areas (Wukari, Takum, Donga, Ussa and Ibbi) and one special Development Area (Yangtu). It lies between latitudes $8^0 30^0$N and $9^0 3^0$E of the Equator and between longitudes $8^0 30^0$N and $10^0 30^0$E of the Greenwich Meridian (Danladi *et al.*, 2024). It covers an area 14,099Km^2 land mass with a population of about 687,077 people as at 2006 (NPC 2006). The National Population Commission had projected an annual growth rate of 3.5% which brought the population figure to 1,233,080.294 people as at 2023 (Danladi *et al.*, 2024). The area shares boundaries with Gassol, Bali, Kurmi, Gashaka and Karim-lamido Local Government areas in the North, Nasarawa State and Plateau State to the North -West, Benue State in the South-West and Republic of Cameroun in the Southeast. It has tropical wet and dry seasons, well drained alluvial soil and characterized by both savannah and rain forest vegetation. Its dry season lasts for a minimum of four months (December to March) while the wet season spans early March and late November in the South. The area has mean annual rainfall of 1800mm (Rukwe *et al.*, 2020).

Majority of the population consists of peasants farmers cultivating food and cash crop such as sorghum, yam, maize, cassava, sesame, rice etc. at a small-scale level, fresh water fishing and forestry.

Sampling Procedures
A multi-stage sampling technique was used to select 170 yam farmers in the study area using well structured questionnaires. In stage one, Southern Taraba was purposively selected based on the availability of yam farmers. In stage two, three (3) local government areas out of the five local government area that made up southern Taraba were selected. The last stage, 170 yam farmers were sampled using simple random sampling to select yam farmers from the selected wards.

Data Collection
Primary data was used for this research work. The primary data was collected using a well structured questionnaire which was administered to the respondents in the study area.

Data Analytical Techniques
Data for the research were analyzed using Descriptive statistics such as frequency, Percentage, Mean and Standard deviation to achieve Objective iii. Gross margin was used to determine objective i, and multiple regression model was used to analyze Objective ii.

Multiple regression model
This study applied four different functional forms such as linear, double log, exponential and semi-log functions to determine the inputs (independent variables) and output (dependent variable) relationship. The specifications of the functions are given as:

Linear function
$Y=\beta_0 + \beta_1X_1+ \beta_2X_2+ \beta_3X_3+ \beta_4X_4+ \beta_5X_5+ \beta_6X_6+Ui$…… (1)

Double log function
$\text{Log } Y=\text{Log}\beta_0 + \beta_1\text{Log}X_1+ \beta_2\text{Log}X_2+ \beta_3\text{Log}X_3+ \beta_4\text{Log}X_4+ \beta_5\text{Log}X_5+ \beta_6\text{Log}X_6+Ui$…… (2)

Semi Log function
$Y=\text{Log}\beta_0 + \beta_1\text{Log}X_1+ \beta_2\text{Log}X_2+ \beta_3\text{Log}X_3+ \beta_4\text{Log}X_4+ \beta_5\text{Log}X_5+ \beta_6\text{Log}X_6+Ui$…….. (3)
Exponential function
$\text{Log } Y= \beta_0 + \beta_1X_1+ \beta_2X_2+ \beta_3X_3+ \beta_4X_4+ \beta_5X_5+ \beta_6X_6+Ui$…… (4)
Where
Y =Total production output (₦)
X_1 = Quantity of yam sett (kg)
X_2 = Quantity of fertilizer (kg)
X_3 = Labour used (Mandays)
X_4 = Number of heaps (numbers)
X_5 = Agro chemicals used (litre)
X_6 = Number of stakes (Numbers)

Gross margin
The method was mathematically given as:
Gross Margin = Total Revenue – Total Variable Cost ……..… (5)

Results and discussion
Cost and Return of Yam Production
The cost and return analysis presented in Table 1 reveals that yam production in Southern Taraba, Taraba State is a profitable agricultural enterprise. The average output of yam tubers per farmer was 7,333.42, sold at an average price of ₦400.33 per tuber, resulting in a total revenue (TR) of ₦2,535,457.99. This revenue includes both income from market sales (₦2,415,456.79) and the estimated value of home consumption (₦120,001.24), underscoring yam's dual role as a cash crop and a subsistence crop for farm households. The total variable cost (TVC) incurred during yam production was ₦374,319.42. Major components of this cost include fertilizer (₦99,432.17), herbicide (₦54,728.44), transportation (₦45,981.48), and hired labour (₦44,369.14). These input items collectively account for a significant proportion of the production costs, indicating the capital intensive nature of yam farming in the region. This aligns with the findings of Adenuga *et al.* (2013), who reported that yam farming in Nigeria involves high input use, especially for land preparation, labor, and agrochemicals.

The gross margin, calculated as the difference between total revenue and total variable cost, stood at ₦2,161,138.57. This large positive margin signifies that yam production is economically viable and profitable for the farmers in the study area. According to Abiodun and Titus (2006), the high gross margin in yam production indicates strong enterprise performance and justifies continued investment in the enterprise. Furthermore, this level of profitability suggests that, if effectively managed, yam farming can serve as a reliable source of income and livelihood for rural households in Southern Taraba. The findings confirm that yam farming in Southern Taraba holds substantial profit potential. However, the high input costs especially for fertilizer and agrochemicals imply that profitability could be further improved through better access to subsidized inputs, group marketing, or efficient production technologies. Strengthening rural infrastructure and reducing transportation bottlenecks could also help farmers capture more value from their produce.

Table 1: Cost and Return of Yam production in the study area

Variables	Average
Tubers of Yam produced	7333.42
Price per Tubers in Naira	400.33
Variable Cost	**₦**
Land rent	35121.15
Hoe	3209.88
Cutlass	2503.23
Bags/Baskets	1894.53
Other equipment	12449.38
Planting materials	3285.19
Hired labour	44369.14
Family Labour	34207.06
Fertilizer	99432.17
Herbicide	54728.44
Pesticide	30406.17
Cost of transportation	45981.48
Other	6731.61
Total Variable Cost (TVC)	**374,319.42**
Revenue	**₦**
Sales	2,415,456.79
Home Consumption	120,001.24
Total Revenue (TR)	**₦2,535,457.99**
Gross Margin (GM = TR – TVC)	**₦2,161,138.57**

Author's compilation

Factors influencing profitability of yam production in the study area

The Factors influencing profitability of yam production was analyzed using multiple regression model. Double-log functional form was chosen using various criteria for the selection of the best functional forms. The R^2 of 0.8970 implies that 89.70% of the variation in production variation in output of the farmers in Naira (Y) was explained by the independent variables used in the model. The F-ratio test was significant at 1% meaning that the model double-log was adequate in explaining the probability of the factors influencing profitability of yam production on the output of the farmer. Land (X_1) was significant at 1% and had a positive relationship with the output, which implies a unit increase in land will lead to 1.10% increase in yam output. Land is a critical factor in yam production (Adams and Nkoro, 2021). Yam sett (X_2) was significant at 1% and has a positive relationship with the output. Which implies that a unit increase in yam sett used increases output by 1.11% showing that availability of quality planting material is vital. Fertilizer (X_3) is significant at 1% and had a positive relationship with output, which implies that every unit increase in fertilizer application will lead to 1.7 % increase in production. The large coefficient shows that fertilizer is one of the most productive inputs, indicating its crucial role in soil fertility management (Ayala and Rao, 2002). Agrochemicals (X_4) is significant at 1% level and has a positive relationship with output, which shows that a unit increase in agrochemical leads to a 1.0% increase in yam production. Labour (X_5) is positive and significant at 1% level, which implies a unit increase in labour will lead to 0.9% increase in output. Labour input also play a significant role, with high elasticity, consistent with the labour intensive nature of yam farming (Adams and Nkoro, 2021). Stakes (X_6) is significant at 1% and had a positive relationship with the output, which implies that a unit increase in staking will lead to 1.6% increase in output. The high coefficient implies staking is essential, likely due to its roles in supporting yam vines and preventing tuber rot.

Table 2: Factors influencing profitability of yam production in the study area

function	Constant Term	X_1 Land	X_2 Yam set	X_3 Inorganic fertilizer	X_4 Agro chemicals	X_5 Labour	X_6 Stakes	R^2	F-value
Linear	11.478 (4.42) ***	0.244 (382) ***	-1.112 (-2.36) **	0.646 (13.93)	1.056 (2.08) ***	0.003 (0.13) **	-0.010 (-0.94)	0.8875	114.90 (0.0000) ***
Semi log	3.236 (58.18) ***	0.105 (3.89) **	-0.002 (-2.23) ***	0.013 (13.71) **	0.001 (1.78) ***	0.000 (0.20)	-0.002 (-1.24)	0.8832	110.18 (0.0000) ***
Exponential	0.715 (4.10) ***	0.203 (3.66) **	-0.048 (-2.37) ***	0.5546 (14.10) **	0.034 (2.17)	0.234 (0.21)	-0.01 (-1.44)	0,8962	125.19 (0.0000) ***
Double log	-111.145 (-12.34) ***	1.1001 (0 .159) ***	1.109 (0.069) ***	1.69 (0 .16) ***	0 .95 (0 .04) ***	0 .89 (0 .15) ***	1.63 (0 .40) ***	0.8970	127.18 (0.0000) ***

Author's compilation *** sig at 1%, ** sig at 5%, * sig at 10%

Constraints Affecting Yam Production in the Study Area

The results presented in Table 3 revealed that yam farmers in Southern Taraba, Nigeria, face a range of production constraints, which directly or indirectly affect productivity and profitability. The most critical constraint identified was inadequate capital to finance yam production, with a mean score of 4.49. This aligns with previous findings by Balana and Oyeyemi (2022), who reported that limited access to credit is a major barrier to expanding farm operations and acquiring inputs. The high cost of labor ranked second with a mean of 4.12, reflecting the labor intensive nature of yam farming. Yam production involves operations such as land clearing, staking, and harvesting, which require significant human labor (Wumbei *et al.,* 2022). Labor scarcity or high labor costs can limit the scale of yam cultivation, especially in rural areas where mechanization is minimal. The lack of access roads was ranked third with a mean of 4.02. Poor rural infrastructure impedes timely transportation of inputs like yam setts and fertilizers and the evacuation of produce to markets. This not only increases postharvest losses but also reduces farmers' income due to spoilage and price fluctuations (Musa *et al.,* 2023).

Furthermore, lack of appropriate storage structures was ranked fourth with a mean of 3.90 and the high cost of yam setts was ranked fifth with a mean of 3.78. Yam is highly perishable and bulky, necessitating proper storage and timely market access (Musa *et al.,* 2023). Inadequate storage facilities contribute to significant postharvest losses, especially during the rainy season, and can further drive down farmers' profit margins (Binge *et al.,* 2023). Other constraints includes Bulkiness of yam making transportation difficult and was ranked sixth with a mean of 3.77, Lack of labour to carry out operation at the right time ranked seventh with a mean of 3.68. Difficulty in Mechanization of operation ranked eight with a mean of 3.67. Inadequate Staking materials ranked ninth with a mean of 3.55, Lack of standard in grading for grading yam was ranked tenth with a mean of 3.36, Lack of yam sett to improve variety of planting was ranked eleventh with a mean of 3.23. Low price of yam at harvest period ranked twelve with a mean of 3.15 and Lack of Market ranked thirteenth with a mean of 3.08.

Table 3: Constraints affecting Yam production in the study area n=170

Technologies	Mean	Standard Deviation	Rank
Inadequate Capital to finance yam production	4.487654	0.90710	1st
High cost of labour	4.1173	0.97411	2nd
Lack of access road to convey yam sett and output	4.0247	1.17400	3rd
Lack of appropriate storage structure	3.8951	1.03124	4th
High cost of Yam sett	3.7840	1.31744	5th
Decreasing soil fertility	2.9259	1.38562	15th
Bulkiness of Yam making transportation difficult	3.7654	1.31188	6th
Difficulty in Mechanization of operation	3.6667	1.44892	8th
Lack of labour to carry out operation at the right time	3.6790	1.40387	7th
High storage pests infestation and disease infestation	1.7593	1.28926	17th
Inadequate Staking materials	3.5494	1.30956	910th
Pest attack on the field	1.5679	0.91825	9th
Lack of standard in grading for grading yam	3.3580	1.33569	11th
Lack of yam sett to improve variety of planting	3.2284	1.31534	12th
Unavailability of yam sett	2.0432	1.02968	16th
Low price of yam at harvest period	3.1481	1.38861	13th
Lack of Market	3.0802	1.48273	14th

Author's compilation

5.0 Conclusion and Recommendations

Conclusion

This study examined the profitability, influencing factors, and constraints associated with yam production in Southern Taraba, Nigeria. The results affirm that yam production in the region is a profitable venture, with a high gross margin of ₦2,161,138.57 per farmer per planting season indicating strong enterprise viability. Yam plays a dual role as both a cash and food crop, contributing significantly to household income and food security. The regression analysis identified key production factors such as land size, yam sett quantity, fertilizer use, agrochemicals, labor, and staking materials as significantly and positively influencing profitability at 1% level. These findings underscore the input intensive nature of yam production, highlight the importance of resource availability, and input management in enhancing farm productivity. However, the study also revealed multiple constraints that impede optimal yam production. Inadequate capital, high labor costs, poor rural infrastructure, lack of storage facilities, and high cost of yam setts were among the most critical constraints. These bottlenecks limit both productivity and profitability, pointing to the need for policy and institutional interventions.

Policy recommendation

Based on the findings of the study, it is recommended that;

i. Secure and equitable access to arable land should be promoted through improved land tenure systems and land development initiatives.
ii. Distribution of improved, disease-free yam setts through multiplication centers to ensure timely and affordable planting material.
iii. Stakeholders and the government should encourage yam farmers to join cooperatives or get loans through bank of agriculture (BOA) to further enhance increased production and profitability

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