ID: 482

Improved Tomato Varieties and Farm Size: Major Determinants of Level of Output of Tomato Crop in Ondo State, Nigeria

Olanrewaju Peter Oladoyin

Department of Agricultural Economics, Adekunle Ajasin University, P. M. B.001, Akungba-Akoko, Ondo State, Nigeria.

Abstract

The study aimed to evaluate the economic viability and profitability of cultivating improved tomato varieties in Akure North and Ifedore Local Government Areas of Ondo State, Nigeria. Primary data were collected through a well-structured questionnaire, with a sample size of 150 farmers selected using snowball sampling through a multi-stage procedure. Data analysis involved descriptive statistics, farm budgeting techniques, and multiple regression. Findings revealed that 36.7% of farmers were within their active working age. Most of the farmers (71.3%) were female, and 73.3% were married, with an average household size of seven. Around 40.7% of the farmers had higher education (HND/B.Sc.), and 68.7% were members of farming associations. Economic analysis indicated a total cost of N208,374.04 and a net income of N601,625.96, yielding a return on investment (ROI) of 3.89, meaning N2.89 profit for every N1 invested. The study also highlighted that farm size, farming experience, educational level, and agrochemical applications significantly influenced tomato production. Challenges identified included unfavourable climate, theft, price instability, poor seed supply, and inadequate capital. The study recommended government support in providing subsidies and resources for farm expansion and better extension services to ensure a steady supply of improved tomato varieties.

Keywords: *Economic performance, profitability, tomato farming, farm size, constraints, Nigeria*

Introduction

Tomatoes are a vital component of human nutrition due to their rich content of vitamins, minerals, and antioxidants. Their significance in addressing vitamin deficiencies, particularly in regions prone to malnutrition, is widely recognized (USDA Nutrient Database). In Nigeria, tomatoes are a staple food, especially in the preparation of soups and stews, making them essential for daily consumption in households across the country. However, despite their nutritional value, tomato production in many developing countries, including Nigeria, remains challenged by several factors that limit both output and quality (Abdulai et al., 2018; Bidzakin et al., 2018).

Globally, malnutrition remains a significant issue. Between 2010 and 2012, approximately 868 million people suffered from undernourishment, while nearly two billion experienced health issues due to micronutrient deficiencies (FAO, 2012b). In Nigeria, rural communities bear the brunt of these nutritional deficits, with tomatoes playing a pivotal role in combating these problems while simultaneously supporting the rural economy. The introduction of improved tomato varieties offers a promising solution to increase yields, minimize post-harvest losses, and stimulate the development of processing and export industries, thereby contributing to economic growth (Perez et al., 2017).

Adopting improved agricultural technologies, particularly modern seed varieties, has the potential to transform low-productivity, subsistence farming into more commercially viable enterprises, helping to alleviate malnutrition (Awideide et al., 2016). Anang (2019) emphasizes that such technological innovations are particularly vital in developing countries, where smallholder farmers face significant inefficiencies. However, over-reliance on rain-fed agricultural systems and the limited adoption of advanced inputs, such as fertilizers and modern seeds, continue to hamper tomato productivity (McMichael, 2013). Approximately 90% of African farmers still rely on local seed varieties, which are often of poor quality, limiting both yield and market value (Mohiuddin et al., 2007).

Improving tomato productivity in Nigeria will require institutional changes, such as reforms in land tenure systems and enhanced access to agricultural inputs and credit. It also depends on increasing farmers' adoption of improved technologies (Donkoh et al., 2013). Despite the potential economic benefits of improved tomato production, many farmers remain hesitant to invest in this area, particularly in southwestern Nigeria, where Hausa migrants, known locally as "Kanawa," dominate the off-season production (Ahmed & Anang, 2019).

This study, therefore, seeks to conduct an economic analysis of the production of improved tomato varieties in Akure North and Ifedore Local Government Areas of Ondo State. The specific objectives include examining the socio-economic characteristics of tomato farmers, determining the profitability of improved tomato production, analyzing the factors affecting production, and identifying the key constraints faced by farmers.

Methodology

This study was conducted in Akure North and Ifedore Local Government Areas (LGAs) of Ondo State, Nigeria, known as the "Sunshine State." Akure North LGA includes five key communities: Iju, Ita-Ogbolu, Oba-Ile, Igoba, and Ogbese. These communities are situated between latitudes 5°45' and 7°52'N, and longitudes 4°20' and 6°05'E, with a population of approximately 198,000. The area's vegetation is predominantly rainforest, characterized by dense trees and grasses. Major economic activities in Akure North include fishing and the cultivation of food and tree crops, such as cocoa, rubber, oil palm, and cashew. Farming and trading are the principal occupations of residents.

Ifedore LGA, one of the 18 LGAs in Ondo State, has its headquarters in Igbara-Oke and is bounded to the north and east by Akure South LGA, to the south by Osun State, and to the west by Ekiti State. The area lies within longitude 4.89°E and latitude 6.89°N, covering approximately 295 km². According to the 2006 census, Ifedore had a population of 176,327. The LGA includes major towns such as Igbara-Oke, Ijare, Ilara, Ipogun, Ibule, Isarun, Erigi, and Obo. The presence of Elizade University is also notable in the area.

Primary data were collected for this study using structured questionnaires. A multi-stage sampling technique was employed. In the first stage, Akure North and Ifedore LGAs were purposively selected due to the concentration of farmers growing improved tomato varieties. In the second stage, five communities were randomly selected from each of the two LGAs. In the third stage, 15 tomato farmers were randomly selected from each community using a snowball sampling method, resulting in a total sample size of 150 respondents.

Data were analyzed using descriptive statistics, farm budgeting, and multiple regression analysis. Descriptive statistics, including frequency and percentage, were used to summarize the socio-economic characteristics of respondents, such as age, gender, marital status, and household size, as well as to identify challenges faced by farmers. The budgeting technique was employed to assess the profitability of improved tomato varieties production.

Model Specification

Budgeting techniques involved the method of calculating gross margin, profit and Return on Investment (ROI) of improved varieties of tomato production in the study area. It is expressed as follows:

Net Revenue (NR)= TR - TC

Where:

NR = Net Revenue or Profit of Improved varieties of Tomatoes Enterprise
TR= Total Revenue of Improved varieties of Tomatoes production
TC= Total Cost income on Improved varieties of Tomatoes production
Return on Investment (ROI) = TR/TC
Total cost (TC) = Total Variable Cost (TVC) + Total Fixed Cost (TFC)
Total revenue (TR) = Output (Q) x Per Unit Price (P)
Profit = Total revenue - Total cost
Gross margin = Total revenue - Total variable cost
Return on Investment = Total revenue\ Total cost

The multiple regression analysis was used to identify the factors affecting improved tomatoes varieties production in the study area. The regression model in implicit form is given as:

Y= F(X1, X2, X3, X4,X5 .....U)
Where Y = Output of Improved varieties of Tomatoes (naira)
X1= Farm Size (ha)
X2= Agro-Chemical (litre)
X3= Farming experience(years)
X4= Labour Cost (naira)
X5= Age of farmers (years)
X6= Level of education (years)
UI= Error term.

The following functional forms were estimated for the production function and the one that best satisfies the theoretical, statistical and econometric criteria for a production function was selected as lead equation. The functional forms that were estimated were: Linear, semi-log, double log and exponential.

Explicitly, the models were expressed as follows:

Linear function:

$Yi = b0 + b1X1 + b2X2 + b3X3 + b4X4 + b5X5 + b6X6 + Ui$

Semi-Log:

$Yi = b0 + b1\log X1 + b2\log X2 + b3\log X3 + b4\log X4 + b5\log X5 + b6\log X6 + Ui$

Exponentials:

$\text{Log } Yi = b0 + b1X1 + b2X2 + b3X3 + b4X4 + b5X5 + b6X6 + Ui$

Double log

$\text{Log } Yi = b0 + b1\log X1 + b2\log X2 + b3\log X3 + b4\log X4 + b5\log X5 + b6\log X6 + Ui$

Results and Discussion

Socio-economic Characteristics of the Respondents

Gender plays a significant role in agricultural activities, with both men and women having specific responsibilities in farm labor. These roles vary by country and ecological zone. The findings show that 28.7% of the respondents were male, while 71.3% were female. This suggests that tomato production in the study area is largely female-dominated, likely because men are more involved in cash crop farming, which is generally more lucrative. This aligns with the findings of Karim (2012), who noted that some agricultural activities are more suited to one gender than the other, with tomato production being more commonly handled by women. The age distribution of the respondents indicated that the majority (36.7%) of farmers were between 31 and 40 years old, while 27.3% were aged 51 and above. This suggests that most farmers are within their productive years, which is expected to result in higher output. This finding is consistent with Ogunjimi et al. (2012), who reported that most Nigerian farmers fall within the productive age range. Table 1 reveals that 17.3% of the respondents were single, 73.3% were married, and 9.3% were widowed. The high proportion of married women actively engaged in tomato farming supports Ajayi's (2013) findings, which suggest that married women tend to focus more on their businesses to provide for their families. The study also showed that 34.7% of respondents had a household size of 1-5 members, while 55.3% had a household size of 6-10 members. A large household size may provide a labour advantage, as suggested by Afolami (2013), who found that larger households tend to achieve higher profits in tomato production, helping them meet basic family needs. The education level of the respondents showed that 40.7% had an HND or B.Sc. degree, while only 4% had no formal education. This indicates a relatively high level of literacy among farmers, which could facilitate the adoption of improved farming techniques and a better understanding of agricultural inputs such as fertilizers and chemicals. The majority (80.7%) of respondents cultivated tomatoes on small plots of land, ranging from 1-5 plots (648 square meters per plot). Only 18.7% had farms of 6-10 plots. This suggests that most farmers operate on small holdings due to limited financial resources, aligning with Samson's (2011) observation that farm size significantly affects the amount of farm produce. The farming experience of respondents indicated that 44.7% had been engaged in tomato farming for 1-5 years, 32.7% for 6-10 years, and 22.7% for over 11 years. Farmers with less experience are generally more open to adopting new technologies, which can enhance productivity and efficiency in tomato farming.

Improved Tomatoes Varieties in the Study Area

Table 2 showed that 12.7% of the respondents were into the production of cherry tomatoes, 3.3% are into beefsteak tomatoes production, 14.0% are into grape tomatoes production,11.3% are into plum tomatoes production, 4.7% are into patio tomatoes production,.7% are into campari tomatoes production, 1.3% are into branfywine tomatoes production while 52.0% of the respondents are into UTC tomatoes production. This result shows that majority (52.0%) of the respondents are into UTC tomatoes production in the study area. This may be due to the high yield in production. Also, UTC tomatoes do not decay or get sour easily after harvest for long periods of time, and UTC tomatoes variety is good for tomatoes paste because it is a reddish fleshy tomato with stripes of yellow and low water content.

Costs and Returns

The incurred cost items for the improved tomato varieties production were fixed and variable costs. The fixed cost included expenditure on hoe, cutlass, knapsack, wheelbarrow and rent on land. The variable cost involved expenses on labour, transportation, herbicides, fertilizer and seed. The average income from improved tomato varieties production in Akure North and Ifedore Local Government Area of Ondo State was estimated as N625,446.43.while the total average variable cost was N184,533.57, given a total fixed cost of N23,820.47, in which straight line

method of depreciation schedule was used. The average total cost was N208,374.04, with net income of N601,625.96. The return on investment (ROI) of 3.89 suggests that every N1 invested in tomato production will yield an additional income of N3.80k. This clearly, indicated that tomato production enterprise is profitable in the study area.

Table1. Socio-economic Characteristics of the Respondents

Gender	Frequency	Percentage	Mean
Male	43	28.7	
Female	107	71.3	
Marital Status			
Single	26	17.3	
Married	110	73.3	
Widowed	14	9.3	
Age			
20-30	21	14.0	
31-40	55	36.7	
41-50	33	22.0	
51-60	41	27.3	
Educational Status			
No formal	6	4.0	
Primary	51	34.0	
Secondary	20	13.3	
HND/B.SC	61	40.7	
Postgraduate	12	8.0	
Household Size			
1-5	52	34.7	
6-10	83	55.3	
11-15	15	10.0	
Experience (years)			
1-5	67	44.7	
6-10	49	32.7	
11 years and above	34	22.7	
Farm Size (plots)			
1-5	121	80.7	
6-10	28	18.7	1.5
11-15	1	7	
Total	150	100.0	

Source: Field Survey,2023

Table 2. Popular Types of Improved Tomatoes Varieties in the Study Area

Tomatoes	Frequency	Percentage
Cherry Tomatoes	19	12.7
Beefsteak tomatoes	5	3.3
Grape tomatoes	21	14.0
Plum tomatoes	17	11.3
Patio tomatoes	7	4.7
Campari tomatoes	1	.7
Branfywine tomatoes	2	1.3
UTC	78	52.0
Total	150	100.0

Source: field survey 2023

Factors that Affect the Production of Improved Tomato Varieties in the Study Area

The table presents the results of a regression analysis on factors affecting the production of improved tomato varieties. The model's constant is statistically significant with a coefficient of 18.259 and a p-value of 0.009, indicating the baseline level of production when all other variables are held constant. Farm size is positively correlated with tomato production, with a coefficient of 0.391 and a p-value of 0.014, suggesting that larger farm sizes significantly contribute to higher production. Similarly, the use of agrochemicals has a strong positive effect on production, as indicated by a coefficient of 0.341 and a highly significant p-value of 0.005.

Farming experience also shows a positive impact on production, with a coefficient of 0.500 and a p-value of 0.040, implying that farmers with more years of experience tend to achieve better yields in tomato production. However, labour costs and the age of farmers do not significantly affect production, as reflected by their respective p-values of 0.239 and 0.647, showing no meaningful statistical relationship with production. Education level, however, plays a crucial role, with a coefficient of 0.287 and a p-value of 0.000, indicating that higher educational attainment significantly boosts tomato production, likely due to better understanding and adoption of improved farming techniques. The model's R-value of 0.949 suggests a very strong correlation between the independent variables and tomato production. The R-squared value of 0.949 means that 94.9% of the variation in tomato production is explained by the model, and the adjusted R-squared value of 0.867 confirms the model's high predictive power even when adjusted for the number of predictors.

Table 3. Cost Structure and Returns of Improve Tomatoes Varieties Production

Items	Average	Percentage
Fixed Cost	Value in (N)	
Land	13,333.33	11.5
Hoe	2,500	0.3
Cutlass	3,857.14	0.3
Knapsack	1,133.33	1.9
Wheelbarrow	2,146.67	2.0
Basket	850	0.3
Total Fixed Cost (TFC)	23,820.47	15.4
Labour		
Planting, Harvesting, Weeding	30,125	17.5
Variable Cost		
Transportation	75,000	24.5
Herbicides	16,071.43	10.5
Fertilizer	42,857.14	20.1
Seed	20,500	12.0
Total Variable Cost	184,553.57	84.6
Total cost TFC+TVC	208,374.04	100.0
Total Revenue= Qty*price	810,000	
Gross Margin=TR-TVC	625,446.43	
Net Farm Income NFI=(TR-TC)	601,625.96	
Return on investment=TR/TC	3.89	

Table 4: Results Showing the Factors Affecting the Production of Improved Tomato Varieties Production.

Variable	Coefficient	Standard error	p-value
Constant	18.259	3.015	.009
farm size	0.391**	0.015	.000
Agrochemicals	0.341***	0.092	.005
farming experience	0.500**	0.242	.040
labour cost	-0.500	0.432	.239
Age of farmers	-0.206	0.406	.647
level of education	0.287***	0.036	.000
R	.949a		
R square	0.9		
Adjusted R square	0.867		

Source: Data analysis, 2023

Constraint militating improved tomato varieties production in the study area

Table 5 shows that farmers in the study area were faced with a lot of challenges. These major challenges were highlighted and ranked. The result revealed that unfavourable climatic condition was the major constraint in the study area followed by the incidence of pilfering and theft. This implies that favourable climatic conditions will enhance the level of output of the crop in the study area. Instability of price ranked third while the poor supply of tomato seeds was ranked the fourth major constraint. The findings have revealed that the availability of improved tomato varieties is one of the major factors that determine the level of output of the crop. Therefore, improved tomato varieties seed should be supplied to tomato farmers at a subsidized rate to increase the level of output Inadequate capital was ranked the fifth major challenge militating the tomato farmers in the study area, this is as a result of challenges faced in accessing credit. Inadequate market information and storage facilities with the incidence of pests and diseases were ranked sixth, seventh, eighth constraint respectively.

Table 5. Constraints militating improved varieties of tomatoes production

S/N	Constraint	Very serious		erious		ild		ot at all		Mean	Rank
		F	%	F	%	F	%	F	%		
1	Unfavorable climatic condition	57	38.0	53	35.3	27	18.0	13	8.7	1.97	1st
2	Incidence of pilfering and theft	61	40.7	49	32.0	26	17.3	14	9.3	1.95	2nd
3	Instability of price	62	41.3	53	35.3	25	16.7	10	6.7	1.89	3rd
4	Poor supply of tomatoes seeds	60	40.0	54	36.0	28	18.7	8	5.3	1.89	3rd
5	Inadequate capital	66	44	52	34.7	24	16.0	8	5.3	1.83	5th
6	Inadequate market information	71	47.3	48	32.0	21	14.0	10	6.7	1.80	6th
7	Storage facility	77	51.3	44	29.3	19	12.7	10	6.7	1.75	7th
8	Incidence of pest and disease	77	51.3	50	33.3	11	7.3	12	8.0	1.72	8th

Source: Computed from Field survey, 2023

Conclusion

Tomato production was found to be a profitable enterprise in the study area because it recorded a Net Farm Income of N601,625.96 and a return on investment of 3.89 which implies that for every one naira spent in tomato production a profit of N2.89 kobo is realized. This study has also revealed that farm size was significantly related to the level of tomato output. Farmers and younger people are encouraged to invest in tomato production as it is a profitable enterprise in the study area. Therefore, it is recommended among others, that government should assist farmers with loans and resources to expand farm size to boost the production of tomatoes. Extension services should be rendered to boost the supply of improved tomato varieties to the farmers.

References

Awideide, B. A., Karimov, A. A., & Diagne, A. (2016). Agricultural technology adoption, commercialization and smallholder rice farmers‘ welfare in rural Nigeria. Agricultural and Food Economics, 4(1), 1-24.

Anang, B. T., & Yeboah, R. W. (2019). Determinants of off-farm income among smallholder rice farmers in Northern Ghana: Application of a double-hurdle model. Advances in Agriculture, 2019.

Abdulai, S., Zakariah, A., & Donkoh, S. A. (2018). Adoption of rice cultivation technologies and its effect on technical efficiency in Sagnarigu District of Ghana. Cogent Food & Agriculture, 4(1), 1424296.

Afolami C.A, and Ayinde I.A, (2001) Economics Of Tomato Production IN Yewa North Local Government Area of Ogun State, Nigeria. African Journals online, Agro-Science Vol.2(1) 2001: pp. 17-23.

Donkoh, S.A., Tachega, M. and Amowine, N. (2013b). Estimating technical efficiency of Tomato Production in Northern Ghana. American Journal of Experimental Agriculture, 3(1), pp. 56-75.

Food and Agriculture Organization of the United Nations, FAOSTAT: Production- Crops, 2012a data.

FAOSTAT: Production- Crops, 2012b data. Gentilcore, D. (2010) A History of Tomato in Italy Pompdoro! New York, NY:Columbia University Press. Gittinger, J.P. (1984). Economic Analysis of Agricultural project, 2nd edition,John Hopkins University press Baltimore London. Hackett A.

FAO (2010) FOASTAT Database. Accessed 5 July 2012. Available http://faostat.fao.org/site/567/DesktopDefault.aspx?PageID=567#ancor.

Karim, Sabrina and Kyle Beardsley. 2012. “Female Peacekeepers and Gender Balancing: Token Gestures or Informed Policymaking?” International Interactions 39(4):461–488.

Karim, Sabrina and Kyle Beardsley. 2016. “Explaining sexual exploitation and abuse in peace- keeping missions the role of female peacekeepers and gender equality in contributing countries.” Journal of Peace Research 53(1):100–115.

Karim, Sabrina and Kyle Beardsley. 2017. Equal Opportunity Peacekeeping. Oxford, UK: Oxford University Press.