

Analysis of Financial Profitability of Tomato Growers in Taraba State, Nigeria

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Abstract

The study analyzed the financial profitability of tomato growers in Taraba State, Nigeria. The specific objectives of the study were to: describe the socio-economic characteristics of the respondents; examine the factors influencing tomato production; estimate tomato growers' profitability; and discover limitations impeding tomato production in the research area. Purposive, snowball, and simple random procedures were employed in the selection of the tomato growers. Data were collected via structured questionnaire. The questionnaire was used to generate data from 150 respondents. Data were analyzed using descriptive statistics, budgeting techniques and multiple regression analysis. The result of the study revealed that most of the farmers were educated with mean schooling years of 5 and had reasonable mean farming experience of 10 years. The results also showed that majority of the farmers have attended training with a mean of 6 times training in a year. The finding indicated that land, fertilizer and cost of irrigation were the factors that influence tomato production. The result further pointed that tomato production is a profitable venture with a cost benefit ratio of 2.26. The result also established that high cost of input was the major constraints militating against tomato production. Based on this finding it was recommended that input such as fertilizer should be made available to the farmers at a subsidized rate by both private sector and government. Tomato farmers should be educated on how to tackle pest and disease associated with tomato production.

Key words: Analysis, Financial, Profitability, Tomato, Growers

1.0 Introduction

The Nigerian state continues to rely on agriculture to meet its diverse needs, owing to its role in providing food and employment for the nation's ever-increasing population. Tomato (*Lycopersicum esculentum*) is one of the most important vegetables grown in Nigeria, and it is consumed in a variety of ways (Aremu *et al.*, 2016). Nigeria is ranked 16th in the world and is also Sub-Saharan Africa's main tomato growers (Ugonna *et al.*, 2015). Nigerian tomato production in 2019 was approximately 1.8 million metric tons, accounting for approximately

68.4% of West African production (FAO, 2010; Michael & Kolawole, 2020). According to Okojie (2017), despite her place in the global and regional tomato production rankings, Nigeria still imports tomatoes to meet its demands. The annual value of Nigeria's tomato imports is \$170 million (Sunday *et al.*, 2018). Tomatoes are high in vitamins A and C, as well as minerals like iron and phosphorus, and are the richest source of nutrients, dietary fibres, and antioxidants like lycopene and beta-carotene, which protect cells from cancer.

According to Ugonna *et al.* (2015) the life span of tomato plant ranges between three to four months. Tomatoes are widely grown in the Northern hemisphere of Nigeria due to the effect of seasonality. Small-scale farmers in Nigeria cultivate land area of less than 5 hectares that account for the vast majority (90%) of producers (FAOSTAT, 2018). Michael & Kolawole, (2020) observed that large-scale tomato production in Nigeria is primarily done through irrigation during the dry season, when temperatures are mild and humidity is low. However, during the rainy season, tomato production is frequently hampered by pests and diseases that thrive in such damp and warm circumstances.

Tomato farmers face a variety of constraints, according to Ugonna *et al.* (2015) and Ofor *et al.* (2007) they include poor production practices due to low soil fertility, a lack of improved seeds, a lack of improved technology, insufficient pest and weed control, high postharvest losses and a lack of processing and marketing infrastructure. Tomato production in Nigeria per hectare today is reported to have 20-40 tons average annual yield which is low. In addition, about 40 %-50 % of the output is lost as a result of poor handling, processing and preservation practices (FAOSTAT, 2018).

In order to boost tomato production in Nigeria the Federal Government came up with a new tomato sector policy (AETS Consortium, 2018). The goals of this sector policy change were to improve tomato import substitution, promote investment in the national tomato processing industry, generate jobs, and help to the elimination of massive post-harvest losses (Edeh, 2017). This initiative is targeted at the country's major tomato growing areas and Kano State, which generates around 7.5% (44,020 Ha) of the nation's total area under tomato production (Plaisier *et al.*, 2019), was one of the places where this approach was predicted to stimulate favorable benefits.

Tomato farming entails various costs, and it is necessary to understand its viability before beginning production. Profit maximization is a critical goal of any farm business. It is always the desire of a firm to minimize cost in order to maximize profit *ceteris paribus*. This can be achieved in Taraba State through the knowledge of cost analysis and benefits cost ratio in monetary terms. It is therefore on this premise that this research work was conducted in Taraba State to analyze financial profitability of tomato farmers in the study area.

The specific objectives of the study were to:

- i. Describe the socio- economic characteristics of tomato farmers
- ii. Examine factors influencing tomato output
- iii. Estimate profitability of tomato production
- iv. Identify constraint militating against tomato production in the study area.

2.0 Materials and Methods

2.1 The Study Area

The research was carried out in Taraba State. The research region has a land mass of 54,426 km² and is located between latitudes 6° 30' N and 8° 30' N of the Equator and longitudes 9° and 12° E of the Greenwich Meridian (Oruonye & Bashir 2011). The research region had a population of about 2,300,736 people as of 2006 (NPC 2006). With a population growth rate of +2.94% a year, the current population of Taraba State is 3,066,800. Six Local Government Areas comprise the research region. It has tropical wet and dry seasons, well-drained alluvial soils, and savannah and rainforest vegetation. The dry season lasts at least five months (November to March), whereas the wet season lasts from early March to late November in the south and from early April to late November in the north. The average annual rainfall ranges from 1000mm in the north to more than 1800mm in the extreme south and Mambilla area (Oruonye & Bashir 2011).

2.2 Sampling Procedure and Sample Size

Purposive, snow ball and simple random procedure were employed in the selection of the study areas and tomato farmers respectively. Three local government areas in the state known in tomato production were purposively selected (Ardo/ Kola, Lau and Zing). Mayo Renowu, Lau and Zing were the main farming community known in tomato production and purposively selected. A snow ball sampling procedure was then employed to generate the sample frame since there were no established or official records of tomato farmers in the study area. A simple random sampling was employed to select tomato farmers in proportion to their number in each of the selected farming community. A total of 150 tomato farmers were covered which form the sample size and was used for analysis.

2.3 Data Collection

Data for this study were collected from primary sources. Data were collected on cost of input used, output produced, socio-economic characteristics of farmers. Data for this study were collected using structured questionnaire.

2.4 Data Analysis

The study employed both descriptive and inferential statistics to analyze various objectives of the study. Frequency, mean and percentage were used to address objective (i) and (iv) while budgeting techniques was used to address objective (ii) Multiple regression analysis was used to address objective (iii)

2.4.1 Cobb Douglas Production Model

The explicit form of the production function analysis for tomato production in the study area as presented as follows:

$$Y = X_1 + X_2 + X_3 + X_4 + X_5 + X_6 + U \dots\dots\dots \text{Equation 2.1}$$

Where:

Y = output of tomato (kg/ha)

X_1 = land size (ha)

X_2 = Quantity of labour (man-days /ha)

X_3 = quantity of fertilizer (in Kg/ha)

X_4 = Cost of seeds (₦/kg/ha)

X_5 = Cost pesticides (₦/litre/ha)

X_6 = Cost of irrigation (₦/ha)

U = error term

$B_1 - B_6$ = Coefficients that was examined

Four functional forms were used (Linear function, Semi log, Exponential and Cob Douglas functions) of the production function were tried and explicitly represented.

Linear function

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + ei \dots \text{Equation 2.2}$$

Semi log function

$$Y = \ln b_0 + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + ei \dots \text{Equation 2.3}$$

Exponential Function

$$\ln Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + ei \dots \text{Equation 2.4}$$

Cobb Douglas

$$\ln Y = \ln b_0 + b_1 \ln X_1 + b_2 \ln X_2 + b_3 \ln X_3 + b_4 \ln X_4 + b_5 \ln X_5 + b_6 \ln X_6 + ei \dots \text{Equation 2.5}$$

2.4.2 Budgeting Technique

Returns were computed by finding the product of the output with the unit price of the output. The gross return was evaluated as follows:

Gross return $GR = \sum QP$

GR = Gross return from tomato (N/ Kg / ha)

P = Average price of the tomato

Q = Quantity of tomato

This research adopted the formula of gross margin as used by Sharmin *et al.* (2018)

$$GM = \sum GR - TVC \dots \text{Equation 2.6}$$

Where:

GR = Gross return

TVC = Total variable cost

$$NR = \sum GR - TC \dots \text{Equation 2.7}$$

Where:

NR = Net return

TC = Total cost

$$TC = TVC + TFC \dots \text{Equation 2.8}$$

BCR = benefit cost ratio =

$$\text{BCR} = \text{Gross Return} / \text{Total Cost} \dots\dots\dots \text{Equation 2.9}$$

3.0 Results and Discussion

3.1 Socio-economic Characteristics of Tomato Farmers

The distribution of respondents according to their age is presented in Table 3.1. The result reveals that most (38%) of the respondents are within the age range of 30-39 years. The result of the study further shows that greater (74.67%) number of the respondent is within the age range of 20 – 39 years with a mean age of 42 years meaning that bulk of the respondents are in their active age and hence have the physical agility to exert their efforts effectively to boost tomato production. The result of this research corroborate with the work of Mitra & Sharmin (2019) who found that tomato farmers in Bangladesh were idle age farmers and have the capacity to feature well in tomato production. Therefore, age is a significant factor as far as tomato production is concerned. Young members of the family can work as a family labor that will reduce the hired labor cost.

3.1.1 Education level of the respondents

Education level of the respondents is presented in 3.1. The result indicates that majority (88%) of tomato farmers in the study area are learned because they had one form of formal education or the other with mean schooling years of 5. With this level of education the farmers can easily be acquainted to new ideas and new technology coming up in vegetable production and can make adoption of new technology easily (Djidonou *et al.*, 2013; Peter & Susan, 2014). The result further reveals that the respondents are likely to be receptive to new and improved innovations that could lead to increase in tomato output compare to those without formal education. The implication of this result is that education assists the tomato farmers to adopt new production techniques and increase productivity.

3.1.2 Farming experience of the respondents

The farming experience of the respondents is presented in Table 3.1. The result shows that majority (66.67%) of the respondents had between 1-9 years of farming experience in tomato production with a mean farming experience of 10 years. This implies that farmers in the study area have sufficient experience in tomato production. With this wealth and verse experience the farmer would be able to averse any form of risk that might want to hamper their production. The result of this work is in consonance with Peter and Susan, (2014) who found that tomato farmers with farming experience produce better output compare to those without farming experience. The implication of this finding is that tomato farmers with experience can easily overcome the risk attached to tomato production thereby leading to increase in tomato production all things being equal.

3.1.3 Gender of the respondents

The distribution of the respondents by gender is also presented in Table 3.1. The result of the finding clearly indicated that majority (68%) of the tomato farmers were male. This is an indication that male dominated tomato production in the study area than their female counterpart. The implication of this finding could be that while the male dominated the production aspect the female dominated the marketing aspect. This implies that as male produce female in the other hands engage in the selling of tomato.

Table 3.1: Socio-economic Characteristics Tomato Farmers

Variables	Freq.	Percentage	Mean	Minimum	Maximum
Age (Years)			41.6	21	65
20 – 29	55	36.67			
30 – 39	57	38.00			
40 – 49	28	18.67			
≥ 50	10	6.66			
Education			4.65	1	7
No Education	27	18			
Primary Education	70	46.67			
Secondary Education	38	25.33			
Tertiary Education	15	10			
Farming Experience			10.26	5	18
1-9	100	66.67			
10-18	27	18			
≥19	23	15.33			
Gender					
Male	102	68			
Female	48	32			
Training			5.66	4	15
1 – 5	70	46.67			
6 – 10	60	40			
11 -15	20	13.33			

Source: Field survey 2023

3.1.4 Training Attended by Tomato Farmers

Training attended by tomato farmers in the study area is presented in Table 3.1. The result indicates that majority (46.67%) of the tomato farmers attended a number of training that ranges between 1 to 5 times in a year with a mean training of 6 times in a year. This implies that tomato farmers in the study area have sufficient training in a year that would help them boost their production. The implication of this finding is that farmers that attend train will do better in tomato production than those that did not attend training.

3.1.5 Extension Contact

The result of the study revealed that majority (58%) of the tomato farmers have 1 – 2 extension visit throughout the year with a mean extension visit of 2. The result of this study indicated that the extension visit to farmers in the study area is very low because 2 visits in the entire production year will not acquaint them to the help they need.

3.2 Factors that influence tomato output

Findings in Table 3.2 presents the estimation results from the Cobb-Douglas production function because it is the equation that has the best fit out of the four functional forms that was use . In addition, a goodness of- fit measure was reported. One measure is the coefficient of multiple of

determination (R^2). The value of R^2 is 0.75 implying that 75 percent of the variations in tomato productivity is explained by the explanatory variables in the model while the remaining 25 percent which is accounted for due to other factors which is not in the model. A second measure is the overall fit of the estimated regression. F-value (38.6) is significant at 1% level of significance which implies that all explanatory variables in the model are important for explaining the variations in productivity of tomato in the study area. The result of this work is in tandem with the finding of Mitra & Sharmin (2019) who found F- value to be 42.9 and statistically significant at 10% in the research conducted in Bangladesh. So also the coefficient of fertilizer 0.72 is significant at 5% level implying that quantity of fertilizer is an important input that contribute significant increase to the yield of tomato output in the study area all things being equal. The result of this work is in consonance with FAOSTAT (2018) who also reported that fertilizer is important inputs that contributes significantly to the yield of vegetables. In addition, cost of irrigation water per hectare is significant but its coefficient is a little bit lower than fertilizer, meaning that irrigation water play a significant role in boosting the yield of tomato in the study area .The result of this research is similar to that of Mitra & Sharmin (2019) who found that irrigation water is significantly related to tomato production in the research conducted in Bangladesh.

The area of land cultivated by the tomato farmers is significant at 1% level, meaning that increase in the hectare of land cultivation equally lead to increase in the output of tomato. Elasticity of scale of production is computed from the estimated coefficients. The sum of estimated coefficients is 0.62 which implies farms are operating under decreasing returns to scale. Inputs used in production process are divided into modern and traditional inputs. Modern inputs used are fertilizer, irrigation and pesticide while the traditional inputs used are seed and labour. From the result of the study the modern inputs used have larger share in total output elasticity than the traditional inputs. Factor share for modern and traditional inputs are 0.48 and 0.04 that shows the importance of modern inputs in production process. Alene & Manyong (2007) also found that modern inputs capture large share of output elasticity. The elasticity of quantity of fertilizer (x_2), coefficient of variation (θ), output price per kg and factor price per kg were utilized in determining the risk attitude coefficient.

3.3 Tomato Production's Financial Profitability

Table 3.3 shows the results of a financial profitability analysis of tomato farmers in the research region. All costs incurred in the cost of production and returns realized from the enterprise were calculated for the duration of the period of farm operation. The price of using variable inputs and fixed inputs were calculated. Variable inputs considered were human labour, seed, fertilizer, manure, land preparation, pesticide, irrigation, loading and transportation cost while fixed inputs are depreciation of fixed assets, rent on land. Table 3 further shows that the total variable cost of tomato production in the study area was N 130,347.15 per hectare which was 76.47 percent of total cost of tomato production. It was found that the total variable cost of production was higher than the total fixed cost which was 23.53 percent of total cost of tomato production.

Table 3.2: Cobb – Douglas production function Estimate

Variable	Coefficient	Std.err	T	p-value
Quantity of land (in ha) (X_1)	1.02***	0.33	3.10	0.00
Quantity of labour(Man – days /ha) (X_2)	-0.02	0.05	- 0.40	0.74
Quantity of fertilizer (Kg) (X_3)	0.72**	0.30	2.40	0.01
Cost of seed (N / kg/ha) (X_4)	0.06	0.07	0.86	0.42
Cost of pesticides (N / lit/ha) (X_5)	-0.02	0.09	-0.22	0.86
Cost of irrigation (N / ha) (X_6)	0.58**	0.22	2.64	0.02
Constant	7.1***	1.02	6.96	0.00
R^2	0.75			
Adjusted R^2	0.77			
F-value	38.6***			0.00
Returns to scale	0.62			
Factor shares (Traditional inputs)	0.04			
Factor shares (Modern inputs)	0.48			

**, **, * represent significant at 1%, 5% and 10% level

Among the different cost items, labor, cost of pesticides and loading and transportation are the major variable cost items which accounted for about 13.12, 11.93 and 11.60 percent of the total variable cost. Average gross return of tomato production is N 385,670.76 per hectare while gross margin is N 255,323.61 The benefit cost ratio (BCR) of tomato farming is 2.26 indicating that tomato farming in the study area is a profitable venture. The result of this work corroborate with the work of Karim *et al.*, (2009) which found that tomato production among small, medium and large farmers is profitable with a cost benefit ratio of 4.22, in a research titled ‘Profitability of Summer BARI Hybrid Tomato Cultivation in Jessore District of Bangladesh’

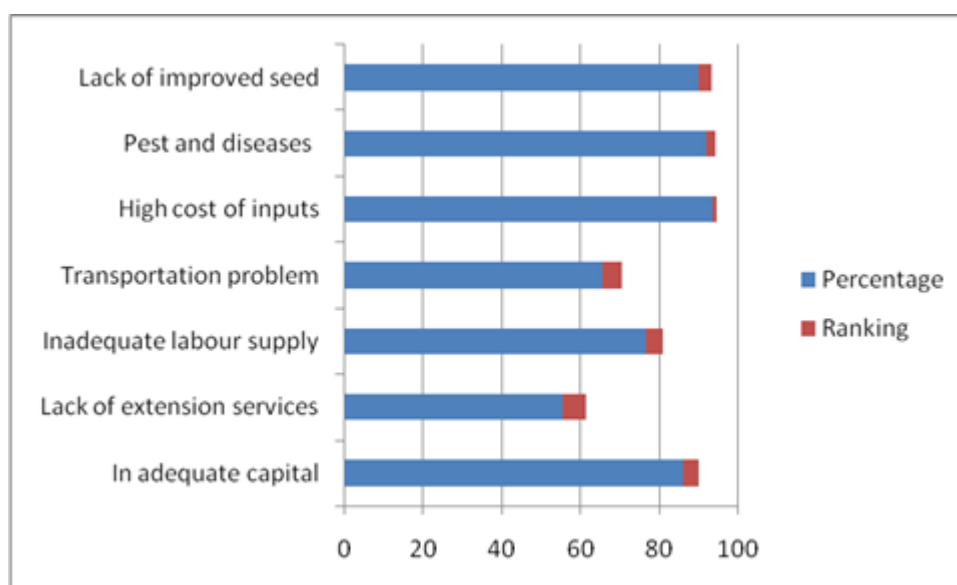
3.4 Constraints associated with Tomato Production

Data on constraints are presented in Figure 3.1 and discussed accordingly. The results of the finding shows that high cost of inputs is ranked first with about 93.33% of the respondents are of the opinion that high cost of inputs was their major challenge during the production period. Similarly, pest and diseases was ranked second constraint with 92% of the respondent states that pest and diseases affect their production. Furthermore, lack of improved seed is ranked third constraint militating against tomato production in the study area with about 90% of the respondents indicating that lack of improved seed is their problem in tomato production. Inadequate credit is ranked forth constraints hampering tomato production in the study area. The result of this finding is in consonance with the work of Sandip &Yunus, (2009) which identified capital as a constraint that militate against active participation in agricultural production activities.

Table 3.3: Financial profitability of tomato farmers (per hectare)

Items	Value of cost and return (₦)	Percentage Based on total cost	Percentage Based on variable cost
Variable cost			
Cost of Seed	7,552.90	4.43	5.79
Cost of Human Labour	22,363.30	13.12	17.16
Cost of Land Preparation	17,450.61	10.24	13.39
Cost of Fertilizer	15,190.74	8.91	11.65
Cost of Irrigation	15,365.39	9.01	11.79
Cost of Manure	14,506.32	8.51	11.13
Cost of Pesticide	19,582.45	11.49	15.02
Loading & Transportation	18,335.44	10.76	14.07
Total Variable Cost	130,347.15	76.47	100
Rent on Land	20,340.68	11.93	
Depreciation Fixed Assets	19,764.72	11.60	
Total Fixed cost	40,105.40	23.53	
Total cost of production	170,452.55	100	
Returns			
Gross Return (GR)	385,670.76		
Gross margin(GM)	255,323.61		
Net return(NR)	215,218.21		
Benefit cost ratio(BCR)	2.26		

Source: Field data, 2023

**Figure 3.1 Constraints Associated with Tomato Farmers**

4.0 Conclusion and Recommendations

This study has established that land, fertilizer and cost of irrigation are the major factors that influence tomato production in the study area. The result of the study also reveals that tomato production is a profitable venture in the study area, however, if farmers can take necessary actions it will enable them maximize gains and improve their wellbeing if other things being equal.

Based on the finding the following recommendations were made:

- i. Input such as fertilizer should be made available to the farmers at a subsidized rate by both private sector and government.
- ii. Irrigation facilities should be made available to the farmers at affordable price in order to cut down the cost of irrigation,
- iii. Timely training should be given to tomato farmers to acquaint them of modern production techniques in order to boost their production.
- iv. Tomato farmers should be educated on how to tackle pest and disease associated with tomato production.

Acknowledgements

The authors are grateful to the Management of Tertiary Education Trust Fund (TET Fund) for the financial support given to the research team to successfully carry out the research work. The authors in addition wish to appreciate the effort of Taraba State University for her due diligent in ensuring that the fund was released and used for what it was meant for. The authors express boundless thanks to Research Assistants who in one way or the other assisted in conducting the survey to generate the raw data that were used in this study.

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