

ANALYSIS OF PROFITABILITY OF TOMATO (*Lycopersicum spp*) MARKETING AMONG RURAL WOMEN IN OLAMABORO LOCAL GOVERNMENT AREA OF KOGI STATE-NIGERIA

¹Edoka, M. H; ²Ebenehi, O; ³Adiel, K. B.

^{1, 2 &3}Department of Agricultural Extension and Rural Development,
Faculty of Agriculture,
Federal University Dutsin-Ma,
Katsina State, Nigeria

Corresponding author: edokamatthew475@gmail.com
Gsm: 08062961759; 08063745147 and 08036220655

DOI: <https://doi.org/10.57233/gujos.v4i4.05>

Abstract

This study assessed the constraints to tomato marketing among rural women in Olamaboro Local Government Area of Kogi State, Nigeria. Specifically, the study looked at the cost and returns of tomato marketing; ascertained the effects of tomato marketers' socioeconomic variables on their income; and identified major constraints to tomato marketing. These objectives were delineated to address the problems of tomato perishability due to absence of storage facilities and paucity of market information among the marketers. A purposive random sampling technique was used to select 120 respondents for the study. Primary data obtained through structured questionnaire were analyzed using descriptive statistics, gross margin model, Ordinary Least Square (OLS) multiple regression model, and mean score from Likert type of scale. Findings of this study revealed that 65.1% of rural women involved in tomato marketing were in their active age of 32 years with a mean household size of 7 members, and an average marketing experience of 11 years. Most (73.3%) had no extension contacts. The gross margin analysis indicated a gross margin from tomato marketing per month of ₦54,745 with a benefit cost ratio of ₦1.90k. Estimates of the OLS revealed that the semi-log was chosen as the lead equation due to its R^2 of 0.877 which implied that about 88% of the variation in the changes in income from tomato marketing is influenced by the independent variables considered. The results showed that years of schooling, household size, and marketing experience positively influenced the income from tomato marketing at 1% level of significance. Major constraints faced by women involved in tomato marketing in the area included high perishability of tomatoes ($M = 3.4$), poor storage facilities ($M = 3.4$), disease and pest infestation ($M = 3.3$), high transportation cost and low price of tomato ($M = 3.2$ respectively), high labour cost and lack of operational cost constituted ($M = 3.1$ respectively). The study therefore recommends that tomato marketers should expand their scale of operation as this will enable them enjoy economies of scale with positive effects on increased income, while both the Kogi State and Federal governments should improve rural infrastructure to address marketers' associated problems such as storage facilities, good road networks, markets and power supply.

Keywords: Rural women; Storage facilities; Tomato marketing. Tomato marketers; Tomato perishability.

Introduction

Agriculture is an important sector in most developing countries of the world, contributing over 40% to Nigerian Gross Domestic Product (GDP) (Food & Agriculture Organization, FAO, 2020), and increase in agricultural productivity depends to a large extent on marketability of farm produce so as to improve its vital roles in the national economy. Efficient market does not only link seller and buyer in reacting to current situations in supply and demand but rather has a dynamic role to play in stimulating consumption of output which are essential elements of economic development. Tomato is one of such agricultural produce that is greatly marketed in Nigeria, especially, in the Savannah belt. Tomato (*Lycopersicum spp*) belongs to the family *Solanaceae* is one of the most popular and widely grown fruits in the world (Agrio, 2005; Sushma, *et. al.*, 2021) including Africa (Osemwegie, *et al.*, 2010). According to Onuk, *et al.*, (2018), the trend in tomato production in Nigeria from 2000 to 2013 was 1,860, 600 metric tons. It is native to South America (Nonneoke, 1989). But was introduced into West Africa by Portuguese traders and freed slaves from West Indies (Jones, 1999; FOASTAT, 2022). Tomato is the second most important vegetable crop worldwide, contributing great amount of vitamins and minerals to human diet. Nigeria produced an estimated 4.1 million tons of tomatoes in 2021, which places her as a major player in tomato production (FAOSTAT, 2022) and 27.8% increase in production since 2018.

According to the Central Bank of Nigeria (2013), an annual total area of one million hectare is reportedly used for tomato cultivation in Nigeria while it makes up about 18 percent of average daily consumption of vegetable in homes. Nigeria is ranked second largest producer of tomato in Africa after Egypt (FAOSTAT, 2022), and fourteenth largest in the world, producing 1.51 metric tons annually valued at ₦87 billion at an average of 25-30 tons per hectare under rain fed production (CBN, 2013). Tomato is grown and eaten all over the world. It is used in diverse ways, including raw in salads and also processed into tomato soup. Unripe green tomatoes can also be breaded and fried. Tomato sauce is sold as drink. Tomato is a highly nutritious vegetable extensively used in culinary dishes world-wide (Mahbubar, *et al.*, 2018). The fruit is preserved by drying, often in the sun and sold either in bags, baskets or in jars with oil. Tomato is rich in vitamin, mineral and lycopene, an excellent antioxidant that helps reduce risk of cancer and prostate. Tomato production requires a high level of management, large labour and capital inputs and close attention to detail. Its production is subject to weather variations which may result in severe crop damage and losses.

Tomato marketing involves its movement from the point of production to the point of sales. That is, from the farmer to the final consumer, and this mainly involves physical handling, transportation and selling. The involvement of rural women in tomato marketing forms an essential link in the distribution sectors of rural and urban areas and even in regional economics (FAO, 2008). Tomato marketing is an important issue in Olamaboro Local Government Area of Kogi State Nigeria, as it constitutes a major source of income to the marketers. Rural women in the Local Government are involved in crop production and processing, especially, tomato processing and marketing. Tomato marketing among rural women is under-estimated. This is because; when surveys are carried out women are often not captured as they are considered as “house wives” and not farmers. It is important to note here also that tomato, other fruits and vegetables constitute important parts of men’s food or diet as they are rich sources of vitamins, mineral, carbohydrate, proteins, and dietary fibre. Studies have shown that, human requirement for tomato is 285g per one day for a balanced diet (Nwochukwu and Onyeenweaku, 2007). Tomato production has been on the increase in most areas both in acreage and yield.

The FAO (2008), noted that the mean annual tomato fruit yield the world over, has increased from 52. 597 million metric tons to 77.07 million metric tons, while Onuk, *et al.*, (2018), assert a total annual yield of 1, 860, 600 metric tons. The main area of production in the world’s production comes from temperate country where cultivation is done under intensive glass house management: unlike what is obtained in tropical countries like Africa where the crop is exposed to high temperature and humidity. For this reason, tomato production is restricted to savannah area of Nigeria, but the major markets for tomatoes are located in south and other neighboring countries. Observation has shown that, most tomato production in Nigeria is grown under irrigation during the dry season (September – March) (Alagha and Sangodoyin, 2013) that is, it is produced between the periods of March to June though on limited bases because of the intense temperature.

Inefficient resources use has constrained food production, resulting in low farmers’ incomes nationwide (Sofoluwe and Tijani, 2020). Understanding production efficiency is therefore, crucial for addressing low productivity in tomato farming and marketing. Increasing input use and improving technical efficiency can enhance agricultural output and productivity (Dolapo, *et. al.*, 2022). Measuring production efficiency allows for evaluating farmer performance and identifying inefficiencies (Kassa and Demissie, 2019).

Rural women are actively involved in tomato marketing activities in Nigeria as a means of livelihood. This, they do on a subsistence level due to financial constraints and other associated factors that limit them. However, studies have shown that rural women are confronted with heavy losses of tomatoes due to wastage, perishability, large quantity of tomato littered around the place during the season in market places among others (Okonji and Awolu, 2021). A reconnaissance study of Olamaboro Local Government reveals enormous loss of tomatoes produced is witnessed hence, leading to low income of tomato marketers and producers. This loss of tomatoes could also be traced to high perishability of tomatoes, lack of information on market outlets, lack of storage facilities, poor power supply and low prices among others (Kader, 2005; Dalapo, *et al.*, 2022).

A decade ago, there were hopes that various forms of private advisory service providers would fill the gap created by weakened public agencies, and create awareness, to help scale up businesses that will profit their client. Input suppliers are increasingly providing information regarding new varieties and planting methods, but these usually fail to reflect the need for impartial advice and issues related to sustainable natural resource management. Literature is replete with information on marketing outlets for tomato farmers, processors and marketers in Nigeria, but none has tomato marketers in Olamaboro Local Government Area of Kogi State in mind, hence, this study which hopes to fill this knowledge gap.

Methodology

The study area is Olamaboro Local Government Area, of Kogi State, Nigeria. Olamaboro Local Government Area has a land mass of 1,132km² and a population of 160,152 people as at the 2006 census (NPC, 2006). It is located on latitude 7° 11'N 7° 34'E and longitude 7° 18'N 7° 56'E. Olamaboro Local Government Area was carved out of Ankpa Local Government Area in 1989. The Local Government Area comprised of three districts: Imane, Okpo, and Ogugu, respectively, and has a total number of ten wards. Imane has two, Okpo has five wards and Ogugu, three wards, respectively. Olamaboro Local Government Area is bounded by Ankpa Local Government Area to the North, Ogbadibo Local Government Area of Benue State to the East, Enugu State to the South and Ofu Local Government Area to the West.

The local government is dominated by the Igala speaking people with other minority groups like the Idoma and Igbo, among others. The major occupation of the people is farming, though civil service and trading constitute secondary occupations, among others. It

has two marked seasons; the dry season, which spans from November to March, while the wet season comes between April and October. The cash crops commonly grown in large commercial quantities include oil palm, and cashew, while food crops include cassava, maize, beniseed, guinea corn, Bambara nut, yam, pigeon pea and tomatoes, among others.

The three (3) districts of the local government area were purposively selected for the study due to their large volume of tomato production and marketing. Four (4) communities from Okpo (due to the presence of large number of marketers than the other two districts), and two (2) communities each from Ogugu and Imane respectively, were randomly selected from the three districts making a total of 8 communities. From the 4 communities sampled from Okpo district, 60 tomato marketers were selected, while 30 marketers each, were selected from Imane and Ogugu districts, making a total of 120 respondents for the study.

Table1: Selection of Respondents from the Study Area

Local government Area	District	Number of Communities Selected	Number of Marketers
Olamaboro	Okpo	4	60
	Imane	2	30
	Ogugu	2	30
Total	3	8	120

Source: Field Survey, 2023

For the purpose of data collection, primary sources of data were adopted using a well-structured questionnaire and personal interview based on the stated objectives. Descriptive statistics, gross margin analysis, mean score and regression analysis were used to analyze the data collected.

Model Specifications

Gross Margin Analysis

Gross margin is the difference between the total revenue earned and total variable cost. Variable costs are the cost which varies with changes in output, i.e. it is a function of output level (Adegeye, 2009). Formula for this analysis is shown below:

$$GM = TR - TVC$$

Where GM = Gross margin (₦)

TR = Total Revenue (₦)

TVC= Total Variable Cost (₦)

Multiple Regression Analysis

A multi-factor benefit function analysis in this study is equated mathematically as; $Y =$

$f(x_s)$

$Y = (x_1, x_2, x_3, x_4, x_5, x_6, e)$

$Y = B_0 + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 + B_6X_6 + e_i$

Where

Y = Profit (₦)

B_0 = Intercept (₦)

B = Marginal effect of X_s and Y

X_1 = Age (years)

X_2 = Marital status (dummy Married = 1; Otherwise = 0)

X_3 = Gender (dummy, Male = 1; Female = 0)

X_4 = Level of education (Years)

X_5 = Household size (Number)

X_6 = Experience (Years)

X_7 = Quantity of tomato sold (Kg, or baskets)

X_9 = Marketing experience (years)

X_{10} = Error term

Results and Discussion

Costs and Benefit in Tomato Marketing

Table 2: Gross Margin analysis in Tomato Marketing per Month

Items	Value (₦)
A. Variable Costs	
Acquisition	41,550
Taxes and Levies	1,205
Transportation	12,870
Loading and offloading	2,430
Sanitation	1050
Total Variable Cost (TVC)	59,105
B. Fixed Cost	
Rent	990
Total Fixed Cost (TFC)	990
Total Cost (TC)	60,095
C. Return	
No of basket	23
Price per basket	4,950
Total Revenue (TR)	113,850
Gross Margin (TR – TVC)	53,755
Return per Naira Invested (TR/TC)	1.93

Source: Field Survey, 2023

The average costs and return among tomato marketers in the area is presented in table 2. The costs and return analysis of tomato marketing presented in the table showed variable cost (98.4%) and fixed cost (1.7%) of the total cost of tomato marketing in the study area. The results indicated that the cost of acquisition (₦41, 550) was the major variable costs incurred by tomato marketers. Based on the results, the total variable cost of tomato marketing per month in the study area was ₦59, 105 while a total revenue of ₦113, 850 was realized. The gross margin from tomato marketing per month was ₦53, 755.00. This implies that tomato marketing in the area was profitable as indicated with a positive gross margin. The return on Naira invested was 1.93. By implication, every one naira invested on tomato marketing, yields a return of ₦1.93k.

Effect of Socioeconomic Characteristics on Tomato Marketers' Income

Output of Ordinary Least Square (OLS) regression model on the effect of selected socioeconomic variables of women involved in tomato marketing on their income from the enterprise is as presented in table 3 below:

Table 3: OLS Estimates on the Effects of Socioeconomic Variables on Marketers' Income

Variables	Linear	Semi-Log	Exponential	Double-Log
Constant	5218.051 (0.918)	-240839.865 (-14.491) ^{***}	10.126 (53.212) ^{***}	14.463 (12.959)
Age (years)	-510.441 (-4.532) ^{***}	-3328.015 (-1.068)	-0.020 (-5.356) ^{***}	-1.330 (-5.222) ^{***}
Yrs Schooling	-1272.609 (-5.589) ^{***}	-6026.579 (-6.351) ^{***}	-0.019 (-2.546) ^{**}	-0.066 (-0.810)
Hhd size (number)	8186.030 (17.410) ^{***}	25280.012 (12.273) ^{**}	0.136 (8.635) ^{***}	0.682 (3.968) ^{***}
Marketing Exp	702.971 (4.307) ^{***}	2230.858 (3.280) ^{***}	0.007 (1.222)	0.075 (1.658) ^{**}
Qty of tomato	0.218 (4.187) ^{***}	815.849 (0.848)	-0.016 (2.510) ^{**}	0.054 (1.645) ^{**}
Expenses on food	-0.167 (-0.868)	412.243 (1.400)	-0.081 (-4.663) ^{***}	-0.095 (-3.872) ^{***}
R ²	0.759	0.877	0.491	0.567
F-value	146.059 ^{***}	268.900 ^{***}	44.653 ^{***}	16.049 ^{***}

Source: Computed from Field Survey Data, 2023

***, ** and * = coefficient significant @ 1%, 5% and 10% respectively; Values in parenthesis are t-values

After due econometric consideration, estimate of the Semi-log regression model was chosen as the lead equation. Hence, discussion was based on this output. The Semi-log regression model's estimates as presented in Table 3 indicated a coefficient of determination (R^2) value of 0.877 which implies that about 88% of changes in income from tomato marketing were accounted for by the independent variables considered in this study. The remaining 12% is attributed to error term. Also, a significant F-value showed that the model was a good fit. The findings revealed that except for age, quantity of tomato handled, and expenses on food, all other variables investigated in this study significantly influenced income from tomato marketing in the area.

The coefficient of household size was positive and significant at 1%. This result indicates that an increase in the number of persons per household will increase the income from tomato marketing. Members of the household are expected to serve as source of family labour. Number of years spent in tomato marketing was positively related to tomato marketers' income at 1% level of significance. This direct relationship implies that marketers with more experience in terms of years tend to have higher income from tomato marketing compared to their counterparts with lower years of experience. Years spent in marketing can increase marketers' skills and this could lead to higher return. This finding agrees with Ibitoye (2015; personal communication) who reported that the length of time in trading business can be linked to higher income from the enterprise. Marketing experience can lead to increase in income and competency in tomato marketing as a means of livelihood.

This finding could mean that tomato marketing serves as source of major income and livelihood for women in the area. Part of the income is usually used for the purchase of food items and other essential commodities.

Constraints to Tomato Marketing

The major constraints to tomato marketing identified by women tomato marketers in the area are presented in table 4 below.

Table 4: Mean Score of Constraints to Tomato Marketing

Constraints	Response				TSS	MS
	SA	A	D	SD		
High perishability	2	1	44	39	292	3.4*
High acquisition cost	4	18	41	23	255	2.9*
High labour cost	2	15	42	27	266	3.1*
Lack of operational funds	3	7	50	26	271	3.1*
Disease and pest infestation	0	5	50	31	284	3.3*
Low price	0	11	47	28	275	3.2*
Poor storage facilities	2	7	32	45	292	3.4*
Transportation	1	12	38	35	279	3.2*

Source: Field Survey, 2023 : SA=Strongly Agreed, A=Agreed, D=Disagreed, SD=Strongly Disagreed, TSS=Total Sum of Score, MS=Mean Score; *=Major Constraints.

The sampled respondents agreed to all the items investigated in this study as major constraints to tomato marketing in the area. However, high perishability of tomato and poor storage facilities (M= 3.4 respectively), disease and pest infestation (M=3.3) and transportation (M=3.2) were major constraints. Findings on poor storage facilities and perishability are interwoven. Perishability of tomato might be due to bulk handling of the produce which could lead to wastage. Consequently, adequate storage/processing facilities are needed to reduce loss and physical damage of the produce. This finding also agrees with Kader (2005) who confirmed poor storage facilities as the most serious problem encountered in the marketing of vegetable. The authors also reported lack of access to storage facilities, lack of market information, lack of credit for farming, poorly developed village markets, poor producer prices, and high perishability of produce, among others as major constraints to vegetable marketing, especially, tomatoes.

Conclusion

This study examined the constraints to tomato marketing among rural women in Olamaboro Local Government Area of Kogi State, Nigeria. The specific objectives were to ascertain the cost and returns of tomato marketing; determine the effects of tomato marketers' socioeconomic variables on their income; and identify the major constraints to tomato

marketing. From the findings of the study it is apparent that tomato marketing among women in the area is profitable while marketers' income was influenced by quantity of tomato sold, experience, household size, age and expenses on food. A key takeaway from the study is that the income of tomato marketers generally depends on how fast they are able to sell off the tomatoes due to its perishable nature.

Recommendations

Based on the findings of this study, the following recommendations are made:

- i. The Kogi State Government and other stakeholders should encourage tomato marketers in the area to expand their scale of operation as this will enable them enjoy economies of scale with its effect on increased income. This could be achieved by educating the marketers to adopt modern processing and storage technique to add value to their product.
- ii. Government agencies and non-governmental organizations should sensitize tomato farmers to form cooperative societies to attract loans from financial institutions to cushion their financial crisis.
- iii. Infrastructural facilities such as storage facilities, roads, power, good markets, etc. should be provided by government or other private bodies to enable marketers scale up their business.

References

- Adegeye, A. J. and Dittoh, J. S. (1985). *Essential of Agricultural Economic*. Impact Publishers, Ibadan, Nigeria. Pp. 56.
- Agrios, G.N. (2005). *Plant pathology*, Academic press, New York, USA.
- Food and Agricultural Organization FAO (2008).The world Vegetable Centre Newsletter www.avrdc.org.
- Adeoye, I.B. Odeleye, O.M.O. Babalola, S.O. & Afolayan, S.O. (2009): Economic Analysis of tomato losses in Ibadan metropolis, Oyo State, Nigeria. *African Journal of Basic & Applied Science*. 1, 87-95
- Aigbemi, B.A. and Lyonga, S.N. (1989). Tomato Production, Storage and Marketing in Cameroon. In: *Tropical Root Crops, Proceedings of the 9th Symposium of International Society for Tropical root crops*. Akoroda, M.O. and Arene, O.B. (Eds) Accra, Ghana. Pp. 377-382.
- Alagha, S. A. and Sangodoyin, A. Y. (2013). Irrigation water scheduling for tomato under soilless planting and greenhouse conditions. , *2*(5): 75-81.
- Dalapo, B. A; Luka, A.; Olugbenga, O. A; Victor, O. N.; Christiana, A. U.; and Oladayo, D. O (2022). Resource use efficiency and profitability analysis of tomato production (*Lycopersicum esculentum*) in Federal Capital Territory, Nigeria. *European Journal of Agriculture and food Sciences*, *4*(5): 75-81.
- Food and Agricultural Organization FAO (2010) FAOSTAT DATA, FAO, Rome Italy
- FAO (2020). Agricultural and Food security trends worldwide: Overview. Retrieved from <http://www.fao.org>.
- Giovannucci, E. (1999). Tomatoes, tomato-based products lycopene, and cancer: review of the epidemiologic literature. *J. Natl cancer Inst.* 17:91, 317-331.
- Idah, P.A. & Yisa, M.G. (2007). Fruits and Vegetables Handling and transportation in Nigeria. *AU J.T.* 10,175-183.
- Kader, A.A. & R.S. Rolle. (2005).The role of postharvest management in assuring the quality and safety of horticultural produce, FAO Food Agricultural Organizations of the United Nations, Rome. Pp. 23.
- Kassa, M. D. and Demissie, W. M. (2019). Smallholders' technical efficiency of teff production in Ethiopia. *African Journal of Agricultural Research*, *14*(33): 1641-1648.
- Mahbubar, M.; Harunur, R.; Motazzal, H.; and Mohammad, Z. (2018). Morphological characterization of tomato (*Solanum lycopersicum L.*)genotypes. *Journal of the Saudi Society of Agricultural Sciences*, *19*: 233-240.
- Nonneoke, I.L. (1989). *Vegetable production*. Van Nostrand Reinhold, New York, 657 pp.
- Onuk, E. G., Ibrahim, H.Y. and Umar, H.S. (2018). Competitiveness of tomato production in Konoka LGA of Nasarawa State, Nigeria. *FUDMA Journal of Agriculture and Agricultural Technology*, Vol. 4, No. 2, Dec. 2018. Pp. 220-226.

- Osemwegie, O. O., Oghenekaro, A.O. & Owolo, L.O. (2010). *Effect of pulverized Ganoderma spp., on Sclerotium rolfsii Sacc and post-harvest tomato fruit preservation. Journal of Applied Science and Research.* 6, 1794-1800.
- Sofoluwe, N. A. and Tijani, A. A. (2020). Resource use efficiency of smallholder producers' cooperative in Nigeria. *Organizacija Valdyba: Sisteminai Tyrimai*, 83: 111-124.
- Sushma, P.; Saidaiah, O.; Harikishan, S.; Geetha, A. and Ravinder, R. K. (2021). Evaluation of qualitative traits in tomato (*Solanum Lycopersicum L.*) germplasm. *Journal of Pharmacology and Photochemistry.*