

ASSESSMENT OF PROFITABILITY AND LOGISTICS OF TOMATO PRODUCTION FROM MARKETS IN NORTHERN SENATORIAL DISTRICT, KADUNA STATE TO DIFFERENT PARTS OF NIGERIA

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Abstract

This study analyzed the profitability and logistics of tomato distribution from markets in Northern Senatorial District, Kaduna State to different parts of Nigeria. Gross margin formula was used to analyze the data with sample size of 400. Questionnaires were designed and the purposive sampling method was used to select and interview marketers, intermediaries, vehicle drivers, channel loaders and consumers. Ullman's Theory of Spatial Interaction and the Theory of Demand and Supply were used in the study. The study revealed that the highest cost of tomato per basket was found in Lamban Zango which was ₦4,900 and also has the highest net marketing margin of ₦700. This could be as a result of its proximity to urban centres. It is closer to Zaria metropolis and Kaduna city centre with high population. The rate of return on investment was 0.14 for Lamban Zango tomato marketers which means that one Naira invested in marketing of tomato in Lamban Zango yielded 14 kobo returns. Meanwhile, the cheapest price for tomato was found in Makarfi which was ₦2,900. The rate of return on investment was 0.03 for Makarfi tomato marketers which means that one Naira invested in marketing of tomato in Makarfi yielded 3 kobo returns. It could be said that tomato marketing was highly profitable in the study area. The gross margin results are considered as efficient in the study area. It was therefore, recommended, among others, that government should try to ensure stability in the pricing and supply of gasoline to all nooks and crannies of the country. State governments should come up with an agreed pattern of taxation on our high ways to check extortions and multiple taxation; while our law enforcement agents should be well-trained, adequately remunerated and re-oriented to carry out their duties effectively and also address the issues of insecurity. Only by so doing could we enhance efficiency in the logistics distribution of tomato not only from Northern Senatorial District, but also to and from all other parts of Nigeria.

Keyword: Logistics, Tomato, Distribution, Markets and Zaria

Introduction

Agriculture is an important sector in most developing countries, and thus, increasing the agricultural productivity largely depends on its produces and marketability. Efficient market does not only link sellers and buyers in reacting to current situations in supply and demand but rather has a dynamic role to play in stimulating consumption of outputs which are essential elements of economic development (Haruna *et. al.*, 2012). According to Katharina and Stefan (2011), the concept of marketing subsumes a set of different innovative advertising instruments which aim at gaining a large effect with a small budget. Agricultural marketing is defined as the performance of all the activities involved in the flow of agricultural products and services from

the initial points of agricultural production until they reach the hands of the ultimate consumers. It is interested in everything that happens to crops after they leave the farm gate; making decision, taking actions and bearing the responsibility of the action. Agricultural marketing also articulates all processes that take place from when the farmer plans to meet specified demands and market prospects to when the produce finally gets to the consumers (Haruna *et al.*, 2012).

Olukosi and Isitor (2004) explained that the marketing task involves transferring goods from producers to consumers. It is the marketing function that ensures that consumers acquire the product in the form, places and time desired. Marketing stimulates production, enterprise and specialization, hence resulting in an improved productivity of all sectors of the economy. As the economy of a nation grows, the gap between farmers and consumers widened and the task of marketing becomes more complex (Abbott, 1987). In research conducted by Oladejo and Sanusi (2008), the net returns to marketing were affected by estimated marketing costs and selected personal characteristics of marketers. The authors further disclosed that the marketers in the study area were carrying out their distributing function using diverse channels revealing that 10.9% claimed to supply their wares in wholesales while the remaining 26.4%, 42.7% and 20% sell directly to the retailers, final consumers and processors/food vendors, respectively.

According to Aminu and Musa (2007), the bulk of tomato production lies in the Northern part of Nigeria especially areas around Jigawa, Kaduna and Kano States. Some places in the southern part of Nigeria such as Oyo State also produce some quantity of tomato but the urban centres mostly in the southern region of Nigeria constitute the major consumption areas and market in those areas are the common outlets for all the production zones (Sanusi and Dada, 2016).

In recent times, Federal and State Governments of Nigeria have made it a matter of policy attention to diversify the present over dependence of the country's economy on oil by focusing on Agriculture and entrepreneurial development of its citizens. To this end, more people are going into the production of fruits and vegetables such as citrus, water lemon, tomato, vegetables among others, which in the long run necessitated the springing up of more tomato markets and participation of more people in fresh tomato marketing in Nigeria (Aremu, 2011). Though marketing is considered very important, it has been a neglected aspect of agricultural development plans (Akura *et al.*, 2018) and this has led to a situation where marketing tomato by farmers and other stakeholders involve lot of cost which invariably influence its market performance. The study hence examined the profitability performance of the participants. Though much work exists on fresh tomato production, little is known on its marketing profitability and operational efficiency of the participants which this study aims at filling such gaps and this study will also add to the existing literatures on marketing of fresh tomato. In order to assess how efficient fresh tomato market is being operated among the actors, critical economic evaluation of institutions involved is essential in the framework of efficiency. (Folayan *et al.* 2007).

Marketing of tomato is a very good source of employment both at the urban and rural levels for the rapidly increasing population size of Nigerians who earn their living as producers, transporters, marketers, middlemen and the professional packing men. Excess production through finished products such as tomato "puree", "paste", and "ketch up" could be exported to the foreign countries and thus gives Nigeria a good foreign exchange (Amao, 2010; Salau and Salman, 2017).

Nigeria ranks as the 16th largest tomato producing nation in the world and has the comparative advantage and potential to lead the world in tomato production and exports (NBS, 2010). The production of tomato in Nigeria in 2010 was about 1.8 million metric tonnes, which accounts for

about 68.4% of West Africa, 10.8% of Africa's total output and 1.28% of world output. Unfortunately, the country still experiences deficiency in critical inputs, lack of improved technology, low yield and productivity, high post-harvest losses and lack of processing and marketing infrastructure. The demand for tomato and its by-products far outweighs the supply. With a population of over 200 million people, an estimated national population growth rate of 5.7% per annum, and an average economic growth rate of 3.5% per annum in the past five years, Nigeria has a large market for processed tomato products. Apart from the Nigerian market, the advantage of the trade liberalization in the West African market could be used to enhance the sale of processed tomato products in this region. At present, a significant percentage of processed tomato products used in Nigeria are imported, resulting in unnecessary pressure on foreign exchange reserve. It is therefore necessary to study the entire value chain for Nigerian tomato to improve its production and processing (Ugonna *et al.*, 2015).

The distribution component of the value chain is separated in three parts. First, part of the tomato is sold to end users either in the vicinity of the farm or through wholesale marketers to local market or processors. Processors get their supplies directly from the farmers or the dealers. This component of the value chain is not organized in Nigeria, resulting in little or no value addition to the product.

Literature Review

Benefit/Cost Analysis

Forkenbrock (1990) discusses two types of benefits of corridor highway investments, reductions in transportation costs and increases in economic activity. Although road user benefits should form the basis for decisions of whether or not to invest public funds to upgrade highways, policy makers often wish to see estimates of economic development. The question of which benefits should be taken into account depends on the geographic perspective, whether regional (where transfers can occur), or national (where road user net benefits can be demonstrated).

Parameter estimation

A number of studies focus on empirical estimation of elasticities. Bjorner makes an explicit distinction between traffic (km) and transport demand (ton-km), where the former is an input in the shipper's production of transport services, while the latter is derived from firm's production of output. Estimated price elasticity with respect to traffic is shown to be considerably higher than elasticity with respect to transport.

The most extensive review of alternative demand models and their elasticity estimates is given by Oum (1989) and Oum *et. al.* (1992). Transport demand models of four types are described and elasticities for all commodities are provided for rail and truck transport with respect to freight rates, speed, and reliability. Oum distinguishes between elasticity of aggregate market demand, mode specific elasticities, and mode choice elasticities.

The Theory of Supply and Demand

The law of supply and demand combines two fundamental economic principles describing how changes in the price of a resource, commodity, or product affect its supply and demand. As the price increases, supply rises while demand declines. Conversely, as the price drops supply constricts while demand grows. Levels of supply and demand for varying prices can be plotted on a graph as curves. The intersection of these curves marks the equilibrium, or market-clearing price at which demand equals supply, and represents the process of price discovery in the marketplace.

- i. The law of demand holds that the demand level for a product or a resource will decline as its price rises, and rise as the price drops.
- ii. Conversely, the law of supply says higher prices boost supply of an economic good while lower ones tend to diminish it.
- iii. A market-clearing price balances supply and demand, and can be graphically represented as the intersection of the supply and demand curves.
- iv. The degree to which changes in price translate into changes in demand and supply is known as the product's price elasticity. Demand for basic necessities is relatively inelastic, meaning it is less responsive to changes in their price.

The law of demand

The law of demand holds that demand for a product change inversely to its price, all else being equal. In other words, the higher the price, the lower the level of demand. Because buyers have finite resources, their spending on a given product or commodity is limited as well, so higher prices reduce the quantity demanded. Conversely, demand rises as the product becomes more affordable. As a result, demand curves slope downward from left to right, as in the chart below. Changes in demand levels as a function of a product's price relative to buyers' income or resources are known as the income effect.

Naturally, there are exceptions. One is Giffen goods, typically low-priced staples also known as inferior goods. Inferior goods are those that see a drop in demand when incomes rise because consumers trade up to higher-quality products. But when the price of an inferior good rises and demand goes up because consumers use more of it in place of costlier alternatives, the substitution effect turns the product into a Giffen good. At the opposite end of the income and wealth spectrum, Veblen goods are luxury goods that gain in value and consequently generate higher demand levels as they rise in price because the price of these luxury goods signals (and may even increase) the owner's status. Veblen goods are named for economist and sociologist Thorstein Veblen, who developed the concept and coined the term "conspicuous consumption" to describe it. Consumer income, preferences, and willingness to substitute one product for another are among the most important determinants of demand.

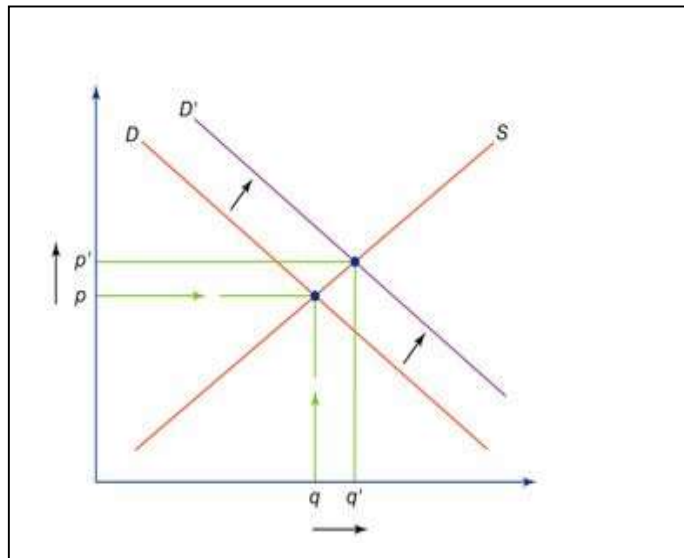


Fig. 1 Demand Curve

The law of supply

The law of supply relates price changes for a product with the quantity supplied. In contrast with the law of demand the law of supply relationship is direct, not inverse. The higher the price, the higher the quantity supplied. Lower prices mean reduced supply, all else held equal. Higher prices give suppliers an incentive to supply more of the product or commodity, assuming their costs aren't increasing as much. Lower prices result in a cost squeeze that curbs supply. As a result, supply slopes are upwardly sloping from left to right. As with demand, supply constraints may limit the price elasticity of supply for a product, while supply shocks may cause a disproportionate price change for an essential commodity.

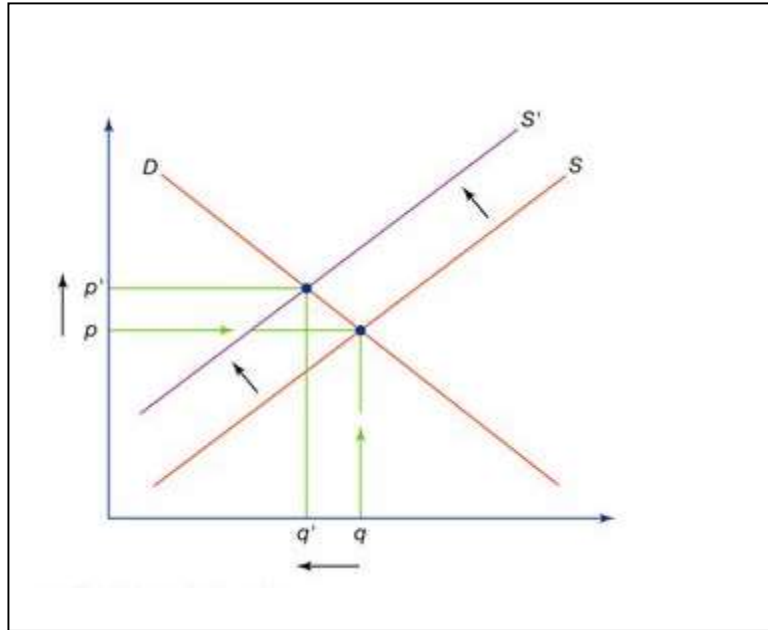


Fig. 2: Supply Curve

Equilibrium Price

Also called a market-clearing price, the equilibrium price is the price at which demand matches supply, producing a market equilibrium acceptable to buyers and sellers. At the point where an upward-sloping supply curve and a downward-sloping demand curve intersect, supply and demand in terms of the quantity of the goods are balanced, leaving no surplus supply or unmet demand. The level of the market-clearing price depends on the shape and position of the respective supply and demand curves, which are influenced by numerous factors. In industries where suppliers are not willing to lose money, supply will tend to decline toward zero at product prices below production costs. Price elasticity will also depend on the number of sellers, their aggregate productive capacity, how easily it can be lowered or increased, and the industry's competitive dynamics. Taxes and regulations may matter as well.

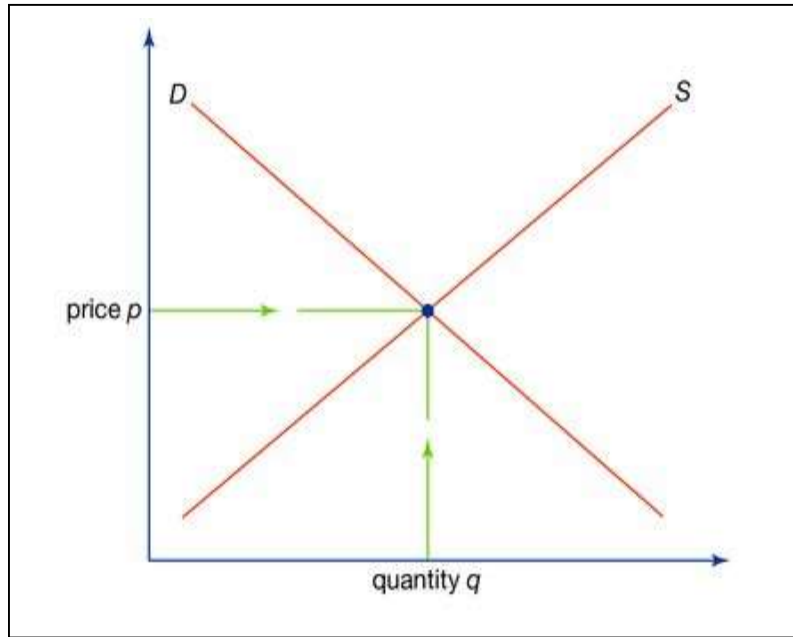


Fig. 3: Equilibrium Curve of Demand and Supply

Supply and demand are both very important to economic activity. Supply is the total amount of a particular good or service available at a given time to consumers at a given price. Demand is a representation of a consumer's desire to purchase goods and services; it acts as a measurement of a consumer's willingness to purchase a specific good or service at a given price. These two economic forces influence each other; they are both important for the economy because they impact the prices of consumer goods and services within an economy and the quantities produced and consumed.

Basic Laws of Supply and Demand

The law of supply and demand predicts four ways that changes in either demand or supply will drive changes in pricing:

- i. Prices fall when supply increases and demand remains constant. If supply increases without a change in demand, a surplus usually occurs. This can happen for many reasons, including surges in productivity. To move excess stock, especially if there's a pending expiration date, suppliers tend to lower prices to try to boost demand.
- ii. Prices fall when demand decreases and supply remains constant. A surplus can also occur when customers want less of a good or service, even without a change in supply. The effect is the same: lower prices.
- iii. Prices rise when supply decreases and demand remains constant. If supply drops, shortages occur. In that situation, customers are often willing to pay higher prices to get the goods and services they want. Supply constraints can occur for many reasons, including supply chain problems. If the problem is temporary, prices tend to return to their baseline once supply is restored.
- iv. Prices rise when demand increases and supply remains constant. A shortage can occur if the demand for a product increase but the supply doesn't - or if demand increases faster

than production can ramp up. When supply eventually catches up with demand, prices tend to stabilize.

Consumers may exhaust the available supply of a good by purchasing a given good or service at a high volume. This leads to an increase in demand. As demand increases, the available supply also decreases. While an increased supply may satiate available demand at a set price, prices may fall if supply continues to grow. But if supply decreases, prices may increase. Supply and demand have an important relationship because together they determine the prices and quantities of most goods and services available in a given market. Both economists and companies analyze the relationship between supply and demand when making strategic product decisions. The assumption behind a market economy is that supply and demand are the best determinants for an economy's growth and health.

Table 1: How changes in supply and demand affect prices and supplier inventory

Supply	Demand	Inventory Level	Price Change
Increases	Remains constant	Surplus	Lower
Remains constant	Decreases	Surplus	Lower
Decreases	Remains constant	Shortage	Higher
Remains constant	Increases	Shortage	Higher

According to market economy theory, the relationship between supply and demand balances out at a point in the future; this point is called the equilibrium price. According to the principles of a market economy, the relationship between supply and demand balances out at a point in the future. This point - at which supply is equal to demand - is called the equilibrium price. At the equilibrium point, the market price for a given good ensures that the quantity of goods supplied is equal to the number of goods demanded. At this point, prices are perfectly set to interest consumers to purchase goods; at the same time, ensuring that companies produce neither too much nor too little product. The law of supply and demand can provide a useful model for understanding and determining pricing. It can help determine an equilibrium price, where suppliers can meet demand without overstocking, and customers get everything they need at a price they can accept. However, supply, demand and pricing can also be influenced by factors that the law of supply and demand doesn't consider, such as production costs, supply chain problems and regulations.

The view that companies have both a value creation system (or demand chain) and a value delivery system (or supply chain) that need to be managed and coordinated, in order to maximize effectiveness and efficiency, is well recognized in the literature (e.g., Esper *et al.*, 2010; Jacobs, 2006, Jüttner *et al.*, 2006; Walters and Rainbird, 2004). A demand chain can be described as a network of autonomous organizations involved in the demand processes aimed at responding to customer demand through value creation (Esper *et al.*, 2010; Jüttner *et al.*, 2007; Rainbird, 2004). Within each organization, the demand chain includes all the demand processes and activities involved in generating customer demand. The processes

may differ between various types of organizations, but typically include market intelligence, new product development (NPD), branding, as well as marketing and sales (Jüttner *et al.*, 2007; Walters, 2006A). Demand chain management (DCM) aims to manage and coordinate these demand processes, within a particular company and across the demand chain, in order to understand, create, and stimulate customer demand as cost-efficiently as possible (Jüttner *et al.*, 2007; Walters, 2008). While DCM, to a degree, is cost--focused (efficiency), the emphasis is on increasing revenues (effectiveness) by identifying, designing, marketing, and selling desirable (e.g., innovative, customized, and affordable) products. The ultimate test of DCM excellence is a revenue level that allows the particular company and the demand chain, as a whole, to prosper in the long run (Gumesson, 2007).

A supply chain can be described as a network of autonomous organizations involved in the supply processes aimed at fulfilling customer demand through value delivery (Gibson *et al.*, 2005; Mentzer *et al.*, 2001). Within each organization, the supply chain includes all the supply processes and activities involved in fulfilling customer demand. The processes may differ between various types of organizations but typically include sourcing, manufacturing, and distribution (Christopher, 1998; Fisher and Raman, 1996; Houlihan, 1985; Stevens, 1989). Supply chain management (SCM) aims to manage and coordinate these supply processes, within a particular company and across the supply chain, in order to fulfill customer demand as cost-efficiently as possible (Gibson *et al.*, 2005; Mentzer *et al.*, 2001). While SCM, to a degree, is revenue-- focused (effectiveness), the emphasis is on lowering costs (efficiency) by reducing the total amount of resources required to provide the necessary level of customer service (Charlebois, 2008; Jones and Riley, 1985; Kempainen and Vepsalainen, 2007). The ultimate test of SCM excellence is a cost and service level that allows the particular company and the supply chain, as a whole, to prosper in the long run (Mentzer *et al.*, 2001).

There is no major difference between the demand and supply chain with respect to the network of organizations involved (besides the focal company, these chains may include suppliers, transporters, distributors/retailers, and the customers themselves), but with regard to the processes considered (Jacobs, 2008). In this sense, the demand and supply chain can often be seen as different perspectives of the same network of organizations. When the demand and supply processes are considered simultaneously, the term demand--supply chain (or value chain) can be used (e.g., Rainbird, 2004; Walters, 2006B). Regardless of chain view, the scope begins with the source of supply (or point of origin) and ends at the point of consumption (Stevens, 1989). However, this so--called ultimate chain is seldom considered in reality; instead, companies normally utilize more narrow views. For example, Mentzer *et al.* (2001), in addition to this ultimate chain, also discuss a direct chain including the focal company and first tier of suppliers and customers, as well as an extended chain which, in addition to the direct chain, also includes suppliers of the immediate suppliers and customers of the immediate customers (second tier). Still, from the perspective of an original equipment manufacturer (OEM), the most common scope in practice (Lumsden, 2006), and also the one used in this thesis, is probably from first tier suppliers to front tier customers.

Empirical Review

Sanusi and Dada (2016) carried out a similar study on profitability analysis of marketing Tomato in Odeda Local Government Area of Ogun State, Nigeria. Using a two-stage sampling technique. Their results showed that Olodo and Kila marketers had an average net profit of ₦16,300 and ₦11,550/basket/month with rate of return on investment of 0.35 and 0.21, respectively. The major constraints associated with tomato marketing were high cost of purchasing tomato (32.5%

in Olodo and 25.0% in Kila), inadequate preservation (17.5% in Olodo and 15.0% in Kila), and high transportation cost (15.0% in Olodo and 20.0% in Kila).

According to Olugbire *et al* (2020) worked on profitability and operational efficiencies of fresh tomato marketing in Oyo State Nigeria” employed primary data using structured questionnaire to collect information from 100 randomly selected fresh tomato marketers in the study area. Data collected were analyzed using descriptive statistics; gross margin and marketing efficiency analytical techniques. The result of the analysis revealed that for every ₦100 invested in fresh tomato trading in the study area, wholesalers, retailers and wholesalers/retailer realized profit of ₦28.00, ₦18.00 and ₦ 258.00 respectively while the average operational efficiencies of wholesalers, retailers and wholesalers/retailer are 60.85%, 74.00% and 80.50% respectively. These positive and size of profits obtained for each fresh tomato marketing institutions is an indication that these institutions were able to recover their operating expenses; hence, marketing fresh tomato in the study area is profitable and efficient.

Adams *et. al.* (2021) studied the profitability of tomato farmers and determinants of farmers' choice of marketing outlets (wholesaler or retailer) in Ghana. A two-stage sampling technique was used to collect data from 100 tomato farmers in Ghana. Analytical tools which include descriptive statistics, gross margin analysis (GM), profitability ratios and binary logit model were employed. Finding indicates that farmers who supply to wholesalers have gross margin of Gh¢7.86 (US\$1.67) per 25 kg crate, while farmers who supply to retailers recorded a major loss of Gh¢5.36 (US\$1.14) per 25 kg crate. The result suggests that farmers selling to wholesalers are better off than farmers supplying to retailers. The binary logit regression analysis reveals a positive relationship between farmers' choice of marketing outlet (wholesaling) and age of respondents, quantity of tomato sold and cost of labor for production. A negative relationship also existed between farmers' choice of marketing outlet and weighted average selling price and household size.

Amurtiya and Adewuyi (2020) studied on tomato production in some selected Local Government Areas of Kano State, Nigeria. The study determined the profitability of tomato production; and identify the constraints associated with tomato production in the study area. The study adopted multistage sampling technique to collect primary data from 101 respondents using a semi-structured questionnaire. Data collected were analyzed using descriptive statistics and gross margin analysis. The findings of the study reveal that tomato production is a male-dominated activity. The gross margin of the venture was ₦302832, while the Net farm income and return on investment were ₦245916 and 114.5% respectively. This implies that tomato production is a profitable venture in the study area. Based on the result, pest and diseases, lack of modern production and processing facilities, inadequate capital, inadequate information on production and marketing, price fluctuation, and lack of government support were ranked topmost among the respondents' challenges.

Oke *et. al.* (2020) studied the supply side of the market for tomato in Bauchi State, Nigeria. The data employed were purposively obtained from farmers, wholesalers and retailers from agricultural areas in 7 Local Government Areas of Bauchi State. These include Bauchi, Alkaleri, Toro, Kari, Shira, Darazo, and Ganjuwa. Analysis is mainly predicated on the weighted least squares regression in order to address the problems that may arise from having heteroskedastic errors in the models. The findings show that farm characteristics majorly affect supply of tomato while handling costs and cooperative membership are mainly responsible for loss of tomato across the marketing chain. Also, cooperative membership does not play a significant role in improving the situations of neither the farmers nor the middlemen in terms of increased profitability and supply. In addition, socioeconomic and farm characteristics are found to be key

factors affecting tomato' profitability. Therefore, farmers should be encouraged to embrace a competitive market setting in order to achieve a free flow market interaction in the determination of price. A favourable farm-land ownership and acquisition policy should be made by government in order to increase output of tomato and consequently, higher profitability. This is most likely to have a positive influence on employment generation as more rural populace would be engaged in the production of farm products. Besides, infrastructural development, specifically in the area of transportations needs to be enhanced by the government in order to ease movement of agricultural produce from the point of harvest to their final destinations. Attention should also be given to government investment in storage facilities to minimize the spoilage level of farm produce in Nigeria. Farm cooperatives should be reformed so as to promote profitability of the agricultural firms.

Salau (2017) worked on economic analysis of tomato marketing in Ilorin metropolis, Kwara state, Nigeria. Simple random sampling technique was used in the selection of one hundred and twenty tomato marketers in the study area. A well-structured questionnaire was used for data collection. Data collected were analyzed using descriptive, Herfindahl Index, costs and returns and multiple regression analysis. and inferential statistics. The study revealed that 70% of the marketers were female with mean age of 39.5 years. The Herfindahl Index of 0.008 revealed that tomato market tends toward pure competition. Furthermore, the costs and returns analysis indicated that tomato marketing is a profitable venture in the study area with a monthly gross margin of N328,095. Furthermore, the regression analysis indicated that about 96% of the total variation in net returns was explained by the independent variables. Moreover, the study revealed that purchase cost, labour cost, transport cost and marketing experience are important in determining the net returns of tomato marketers. It was also observed that 30% of the respondent identified finance to be their major constraint.

Aliyi, *et. al.* (2022) worked on profitability and market performance of smallholder vegetable production. A multi-stage sampling procedure was employed to select 420 sample households randomly from nine *kebeles*, and 139 traders were selected purposively. Both qualitative and quantitative data were collected from primary and secondary sources by using structured questionnaires. Descriptive statistics, gross profit formula and structure-conduct-performance model was applied to analyze the data. The result of profitability analysis showed that potato, tomato and cabbage production in the study area was profitable. The result of structure analysis indicated that the market structure for potato, tomato and cabbage was characterized by weak oligopolistic market. The analysis of market conduct showed that the price of vegetables was determined by traders. Performance analysis demonstrated that the total gross marketing margin and profit margin was highest when producers sold vegetables to consumers and the lowest when they sold vegetables to collectors across the channel. Shortage of inputs, pests and diseases, lack of improved storage, post-harvest loss, brokers' interventions, low price of the product, poor transportation facility and information flow were the major constraints. Therefore, policy initiatives aiming at increasing farmers' access to quality vegetables inputs, strengthen vegetable extension services, improving infrastructure, disseminating reliable market information, reducing unfair profit distribution and increasing bargaining power of farmers to accelerate rural economic growth and poverty reduction.

Oladejo and Oladiran (2014) studied marketing analysis and consumption pattern of tomato in Oyo State, Nigeria. A two-stage sampling method was employed to select one hundred and thirty-six (136) respondents. A total of thirty-three (66) tomato marketers and a total of seventy (70) tomato consumers were selected from four major produce markets within Ogbomosho metropolis,

using a two-stage sampling technique. Descriptive, budgetary and inferential statistics were used to analyze the marketing and consumption data collected from respondents. Findings revealed that the mean age of tomato marketers was 43.3years while that of consumers was 29years, 84.9% compared with 82.9% of sampled marketers and consumers respectively belong to the female gender. The average number of years spent in school was 6years and 15years for the marketers and consumers respectively. Budgetary analysis revealed that tomato marketing is a profitable enterprise with BCR of greater than one. Tomato consumers claimed to consume tomato on daily basis using freshness as the major criteria for purchase and preferred to consume tomato in form of stew. Data analysis further revealed that there is significant relationship between tomato transaction costs and quantity supplied by marketers. The major challenges to tomato marketing and consumption respectively were rapid deterioration in quality and unstable market price.

Materials and Methods

Zaria is located between Latitudes $10^{\circ} 12' 0''$ N to $11^{\circ} 24' 0''$ N of the Equator and Longitudes $6^{\circ} 54' 0''$ E to $8^{\circ} 42' 0''$ E of the Greenwich Meridian. The study is which at the present time lies within eight (8) Local Government Areas in Kaduna State and a major city in the state. These Local Government Areas includes: Giwa, Kubau, Zaria, Lere, Sabon Gari, Soba, Makarfi and Kudan in Kaduna state, Nigeria. It is the capital city to the Zazzau Emirate Council as well as being one of the original seven Hausa city-states. It covers a total land area of 563km^2 with an altitude of about 762 meters above sea level. It lies in the Northern part of Kaduna State (Ogunleye, 2006).

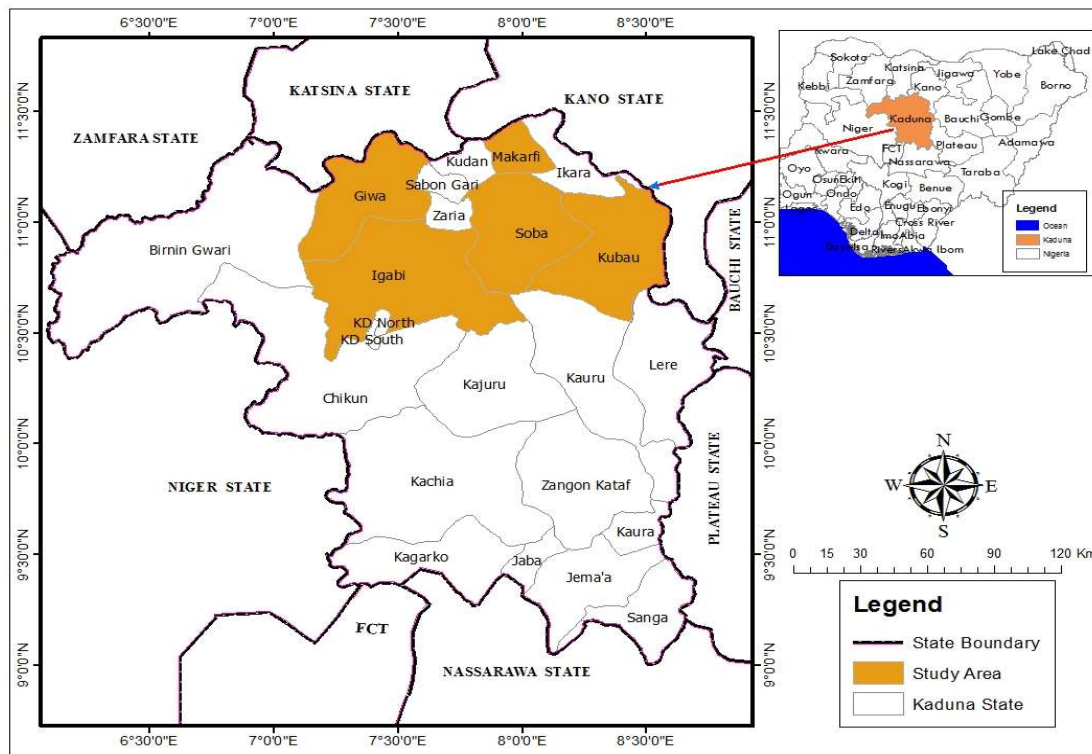


Fig. 4: Map of Kaduna State Showing Study Area.

Source: GIS Lab Department of Geography Using Arc GIS 10.3 Software.

Types of data used

The data used in the study are shown in Table 2

S/N	Types of Data	Sources	Purpose
1	Location/Sites of major tomato markets in region	GIS/Questionnaire	To identify and map out the major tomato markets in the region
2	Major tomato destinations in the study	Questionnaire	To identify where tomato is transported to
3	Profitability of tomato	Questionnaire	To determine whether tomato marketing is profitable in the study area
4	Marketing Structure	Questionnaire	To identify the market structure in place in the study area
5	Mode of Transportation	Questionnaire	To identify the modes and means of transportation used for transporting tomato
6	Challenges faced	Questionnaire	To identify and examine the challenges faced in transporting tomato
7	Literature Review	NPC, FOS, Journals	Literature review and other online materials

Sources: Author's compilation, 2022

Sample Size and Sampling Technique

The study sampling frame comprised of eight districts predominant in tomato trading. The population of the eight districts was 1,896,640 (NPC, 2006). The sample size was gotten using Taro Yamane (1967) sample size formula. The formula is stated as:

$$n = \frac{N}{1 + N(e)^2}$$

Where n = sample size

N = Total number of population under (1,896,640)

e = sampling error of 0.05 significance level

$$n = \frac{1,896,640}{1 + 1,896,640(0.05)^2}$$

$$n = \frac{1,896,640}{1 + 1,896,640(0.0025)}$$

$$n = \frac{1,896,640}{1,896,641 \times 0.0025}$$

$$n = \frac{1,896,640}{4,742.6}$$

$$n = 399.9$$

Approximately 400

The “gross margin” for an item is the sales revenue obtained from the item minus the direct costs of producing (or in the case of a reseller, the cost of acquiring and selling the item). The direct costs are the variable cost that go up or down based upon the number of units sold. If there are commissions on sales, then those commissions are considered a cost of sales, deducted from the sales proceeds to derive the Gross Margin for the sale of the item. The “overhead” is the group of expenses that remain fixed regardless of the numbers of unit sold. This method was utilized to achieve the fourth objective in assessing the efficiency of tomato marketing system. Gross margin is determined using the formula:

$$GM = TR - TVC \dots\dots\dots (i)$$

where: GM = Gross Margin (₦)

TR = Total Revenue (₦)

TVC = Total Variable Cost (₦)

$$TVC = X_1 + X_2 + X_3 + X_4 + X_5 + X_6 + X_7 + X_8 \dots\dots\dots (ii)$$

X_1 = Cost of storage (₦)

X_2 = Market levy (₦)

X_3 = Local government levy (₦)

X_4 = Cost of transportation (₦)

X_5 = Cost of loading and offloading (₦)

X_6 = Cost of purchasing tomato (₦)

X_7 = Cost of baskets (₦)

X_8 = other variable costs (₦)

$$\pi = TR - TC \dots\dots\dots (iii)$$

OR

$$\pi = GM - TFC \dots\dots\dots (iv)$$

where: π = Net Margin = Profit (₦) GM = as defined previously TR = Total Revenue as previously defined

TC = Total Cost (₦)

$$TC = TFC + TVC \dots\dots\dots (v)$$

TFC = Total Fixed Cost (₦)

$$RRI = \frac{\pi}{TC} \dots\dots\dots (vi)$$

where:

RRI = Rate of Return-on-Investment π = as defined previously TC = as previously defined.

Results and Discussion

Gross Margin Calculation

It is importance to analyze the marketing cost of retail Tomato marketing because is a key determinant in the profit margin that accrues to the marketer. Adejobi (2005) defined marketing cost as the difference between the amount paid by the consumers of final products and the total amount received by the producer. This is the cost incurred during the marketing process.

In this section we show the results of the calculation of the Gross Margin per basket of tomato for each market surveyed. Table 4.3 shows the breakdown of variable cost per basket of tomato for each market.

Using the formula $G = TR - TVC$, we derived the Gross Margin per basket of tomato in the markets surveyed which is shown Table 4.3.

Table 4.3: Net Marketing Margin and Marketing Efficiency at Wholesale Level in the Study Area, Dry Season

Variable	Estimate at Collection Centres								Average
	Kidandan	Anchau	Lamban	Tundun Saibu	Soba	Makarfi	Maigana	Giwa	
Farm Gate	3000	3200	4000	2850	3100	2600	3000	3400	3143.8
Wholesale price	3500	3900	4900	3100	3450	2900	3500	3900	3643.8
Consumer retail price	4000	4500	5000	3100	4000	3500	4000	4300	4050
Marketing cost	200	250	200	150	300	200	200	300	225
Marketing margin	500	700	900	250	350	300	500	500	500
Net marketing margin	300	450	700	100	50	100	300	200	250

Cost and return are valued in ₦ per basket (40 to 45 kg). Source: Field Work, 2022

$$GM = TR - TVC \dots\dots\dots (i)$$

where: GM = Gross Margin (₦)

TR = Total Revenue (₦)

TVC = Total Variable Cost (₦)

$$TVC = X_1 + X_2 + X_3 + X_4 + X_5 + X_6 + X_7 + X_8 \dots\dots\dots (ii)$$

X_1 = Cost of storage (₦)

X_2 = Market levy (₦)

X_3 = Local government levy (₦)

X_4 = Cost of transportation (₦)

X_5 = Cost of loading and offloading (₦)

X_6 = Cost of purchasing tomato (₦)

X_7 = Cost of baskets (₦)

X_B = other variable costs (₦)

$$RRI = \frac{\pi}{TC} \dots\dots\dots (vi)$$

where:

RRI = Rate of Return on Investment π = as defined previously

TC = as previously defined

RRI = Rate of Return on Investment for Kidandan

$$\begin{aligned} RRI &= \frac{\pi}{TC} \\ &= \frac{300}{3500+200} \\ &= \frac{300}{3700} \end{aligned}$$

0.081

RRI = Rate of Return on Investment for Anchau

$$\begin{aligned} RRI &= \frac{\pi}{TC} \\ &= \frac{450}{3900+250} \\ &= \frac{450}{4150} \end{aligned}$$

0.11

RRI = Rate of Return on Investment for Lamban Zango

$$\begin{aligned} RRI &= \frac{\pi}{TC} \\ &= \frac{700}{4900+200} \\ &= \frac{700}{5100} \end{aligned}$$

0.14

RRI = Rate of Return on Investment for Tundun Saibu

$$\begin{aligned} RRI &= \frac{\pi}{TC} \\ &= \frac{100}{3100+150} \\ &= \frac{100}{3250} \end{aligned}$$

0.03

RRI = Rate of Return on Investment for Soba

$$RRI = \frac{\pi}{TC}$$

$$= \frac{50}{3450+300}$$

$$= \frac{50}{3750}$$

0.01

RRI = Rate of Return on Investment for Makarfi

$$RRI = \frac{\pi}{TC}$$

$$= \frac{100}{2900+200}$$

$$= \frac{100}{3100}$$

0.08

RRI = Rate of Return on Investment for Maigana

$$RRI = \frac{\pi}{TC}$$

$$= \frac{300}{3500+200}$$

$$= \frac{300}{3700}$$

0.08

RRI = Rate of Return on Investment for Giwa

$$RRI = \frac{\pi}{TC}$$

$$= \frac{200}{3900+300}$$

$$= \frac{200}{4200}$$

0.05

Table 3: Gross Margin of Tomato in the Study

Markets	TVC	TR	GM
Kidandan	200	500	300
Anchau	250	700	450
Lamban Zango	200	900	700
Tundun Saibu	150	250	100
Soba	300	350	50
Makarfi	200	300	100
Maigana	200	500	300
Giwa	300	500	200

Field Work, 2022

The gross margin analysis was used to determine the net profit of tomato marketers in the study area. The breakdown of the costs and returns are as shown in Table 3. It could be deduced from the table that the highest cost of tomato per basket was found in Lamban Zango which was ₦4,900 and also has the highest net marketing margin of ₦700. This could be as a result of its proximity to urban centres. It is closer to Zaria metropolis and Kaduna city centre with high population. The rate of return on investment was 0.14 for Lamban Zango tomato marketers which means that one Naira invested in marketing of tomato in Lamban Zango yielded 14 kobo returns. Meanwhile, the cheapest price for tomato was found in Makarfi which was ₦2,900. The rate of return on investment was 0.03 for Makarfi tomato marketers which means that one Naira invested in marketing of tomato in Makarfi yielded 3 kobo returns. It could be said that tomato marketing was highly profitable in the study area. This confirms Sanusi and Dada (2016) that tomato enterprise was profitable in his study area.

Conclusion and Recommendations

In terms of productivity in the study area, the study revealed that tomato trading is highly profitable most especially in Lamban Zango market which enjoy close proximity to Zaria Metropolis and Kaduna metropolis with high population and easy accessibility to transport. The study also shows high market efficiency especially in Lamban Zango market. The high market efficiency implied that wholesalers in Lamban Zango market got higher coefficients of marketing efficiency because they run marketing activities more efficiently than others, perhaps due to their closeness to the urban retailers and efficient price control. This result could therefore be seen as highest pricing efficiency in fresh tomato marketing in the study area.

Based on the foregoing, it is recommended that government should make effort towards stabilizing the price and supply of gasoline. This should be by way of ensuring efficiency and available in all nooks and crannies of the country. While those found sabotaging governments' effort, in that regard, should be made to face the full wrath of the law. The issue of extortion through multiple taxes at all kinds of check point should be addressed by the concerted efforts of various state governments (inland revenue offices). In other words, state governments should come up with an agreed pattern of collecting revenues from itinerant transporters in such a way that multiple taxations and or extortions could be curtailed. Tomato marketers should strengthen themselves by forming cooperative groups whereby tomato could be purchased in bulk on behalf of members at a reduced purchase cost. In addition, stakeholders should improve the transportation system in order to reduce transportation cost and deterioration during transportation. Due to the perishable nature of tomato, the government at all level should repair and reconstruct major and minor roads so as to avoid post-harvest losses due to mechanical injury.

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