MAPPING THE LANDSCAPE AND ANALYZING THE SOCIO-ECONOMIC PORTRAITS OF TOMATO VALUE CHAIN IN KANO STATE, NIGERIA

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ABSTRACT

This study identifies and mapped out the tomato value chain actors and the roles played by each actor along the value chain. The actors identified include the Input dealers, Producers (farmers), Marketers (rural assemblers, wholesalers, and retailers), the Processors (hotel, restaurants, industries), transporters and Consumers. Other actors supporting the value chain as extension organizations and research institutes were also identified. Findings of this study (Table 1) reveals the socio-economic portraits like age, gender, educational status, major occupation among other. The study reveals the mean age of the value chain actors approximately as 39 years, 44 years, 44 years, 41 years and 43 years for input dealers, producers, marketers, processors and consumers respectively. The study also reveals that majority of the value chain actors in the area were male and married. The result implies that there is a wide disparity in educational attainment among the value chain actors as findings indicated that only the input dealers in majority (38.5%) attended the formal education system. While, majority of other actors attended the informal education system. Tomato value chain structure in the study area comprises of different forms of marketing channels through which tomatoes flows from initial point of production (farmers) to the end users (consumers). Among all the identified marketing channels, the channels with low number of market intermediaries were considered by the farmers as the most preferred channels because the more the number of market intermediaries the higher the value added and the lower the profit share realized by farmers.

Keywords: Tomato, Value chain, Socio-economic portraits, Marketing channels

INTRODUCTION

Tomato is an important crop in Nigeria and Kano State is a major tomato producing state. According to the National Horticultural Research Institute (NIHORT, 2023), Nigeria produced over 2.3 million metric tons of tomatoes in 2023 with annual demand of 3 million metric tons. Kano State is one of the largest producers of tomatoes in Nigeria (Usman, 2019), accounting for approximately 7.5% (44,020 ha) of the nation's total land area under tomato production (Plaisier *et al.*, 2019) contributing about 24% of the total production (NIHORT, 2023). Tomato serves as a source of food and nutrients for the state teaming population and as a source of income for farming family. According to the National Bureau of Statistics, Kano State is the third-largest tomato producing state in Nigeria, with an annual production of over 1.5 million metric tons (NBS, 2017). The country's capacity to meet the demand for tomato and tomato products year-round affect all actors along the tomato value chain right from input supply to distribution and consumption level. Aminu (2007), Ibrahim *et al.,* (2016) and Ilu *et al.* (2021) indicated that the sector faces many challenges due to several imperfections and problems which have to be rectified in other to stimulate the production and bring efficiency in marketing and processing. Despite its importance, tomato value chain in Kano State faces several challenges, among which include lack of functional processing facilities, lack of cold rooms for storage, high post-harvest losses, and lack of market information on demand and supply. These challenges result in low profitability for actors along the value chain, particularly smallholder farmers who lack access to credit facilities and improved agricultural practices (Amao *et al.*, 2022). A study by the International Food Policy Research Institute (IFPRI, 2018) reveals that improving the productivity and profitability of the tomato value chain in Kano State could contribute to reducing poverty and improving food security in the region. This study

therefore intends to fill the gap by identifying the key actors, flow and volume of products and value added at each stage of the Tomato Value Chain in Kano state.

Concept of Agricultural Value Chain

A value-chain can be defined as the full range of activities which are required to bring a product or service from conception, through the different phases of production (involving a combination of physical transformation and the input of various producer services), delivery to final customers, and final disposal after use (Christopher and Jonathan, 2011). Value chain analysis provides a deeper understanding of the chain structure and functioning by portraying the various chain actors and their intricate relationships. The agricultural value chain is a framework that describes the flow of agricultural goods and services from input suppliers up to table of the consumers. It involves a series of economic activities that add value to agricultural products, from the initial point of production to final consumption. The concept of agricultural value chain provided a holistic approach to analyzing the competitiveness and sustainability of agricultural systems. Farmers are linked to consumers' needs, working closely with suppliers and processors to produce specific goods to meet consumers' demand (Campbell, 2006). Similarly, through flows of information and products, consumers are linked to the needs of farmers. Under this approach and through continuous innovation, the returns to farmers can be increased and their livelihood enhanced. Rather than focusing on profit from one link alone, players at all levels of the value chain can benefit. Recent studies Tegbaru *et al.* (2021), highlight the importance of value chain development in promoting agricultural growth, reducing poverty, and improving the sustainability of agricultural systems. Tegbaru *et al.* (2021), Ferrer *et al.* (2020) and Gatzweiler *et al.* (2020) emphasizes the

importance of value chain development in promoting agricultural growth and reducing poverty in sub-Saharan Africa. The study argues that value chain interventions can improve the efficiency of resource allocation, reduce transaction costs, and enhance the competitiveness of agricultural products in domestic and international markets.

MATERIALS AND METHODS

The Study Area

This study was conducted in Kano state Nigeria, the state is located in northwestern Nigeria and lies between latitude 13ºN and 11 S and longitude 8ºW and 10ºE with a total land area of 20,760sq kilometers. The state has a total of 44 local government areas with a projected population of 15,462,177 million people (with 8,025,613 males and,436,564 females) at 3.38% increase (NPC/NBS, projection report, (2023). The state share boundaries with Katsina State (northwest) Jigawa State (northeast) Bauchi State (southeast) and Kaduna State (southwest). The State has a Sahelian climate with alternate dry-and-wet season and an annual rainfall of over 670mm to 830mm. Rainfalls from May to early September of every year with an average duration of 4 to 5 months period with a fluctuating temperature of 29ºC and 37ºC. The state has a vegetation of Sudan savannah sandwiched by Sahel savannah in the north and guinea savannah in the south which makes the state suitable for tomato and other vegetables production (Van der Waal, 2015). Agriculture is the most important pillars of the state economy with about 75% of the total working population engaged directly in farming activities (KNARDA, 2020).

Sampling Procedure

Kano state has a total of 44 local government areas with 3 agricultural zones as; Rano Zone, Dambatta zone and Gaya zone. Multistage sampling technique was use in drawing the sample size from the sample frame. With consultation of Extension Agents (EAs) in KNARDA, 4 LGAs were purposively selected form 2 agricultural zones (Rano and Danbatta zone) based on tomato production activities. Two (2) tomato producing communities were purposively selected from each of the 4 selected local government areas. Kura and G/Malam were selected in zone 1 (Rano zone), then Dambatta and Bagwai were purposively selected from zone 2 (Danbatta zone). These areas were selected for the study due to their high potential in tomato and other vegetables production in the state. To have full representation of all actors along the value chain, all existing links in the tomato value chain were identified during reconnaissance survey conducted in the study area. The survey showed that there were more than 15 vegetable farmer's groups called Water Users Association (WUA), under Kano River Irrigation Project (KRIP) area within Kura and Garin Malam LGAs and more than 11 within Danbatta and Bagwai (under Dambatta (Tomas) irrigation project area and Watari Irrigation Project (WIP) area respectively. The sample size was drawn from the sample frame using Slovin's formula as a random sampling technique formula as used by Yang *et al.,* (2020) and Ilu *et al.,* (2021).
$N = \frac{N}{1+N(e2)}$ where; n = Sample size, e = margin of error (0.05) and N = Total number of observations (population size). A simple random sampling technique was used in selecting respondents for the data collection. This brings to a list of 517 respondents (Table 1) that were randomly selected from various categories of the value chain nodes at selected communities in the study area.

Data Collection

Primary data was extensively used in this study. A combination of qualitative and quantitative techniques was used in collecting the relevant data. Data was obtained by administering structured questionnaire to randomly selected respondents along the value chain. In addition, Key Informant Interviews (KII), Focus Group Discussion (FGD), physical assessment of the services rendered by service providers was conducted to get clear understanding and perceptions about the entire tomato value chain activities in the study area.

Analytical Technique

The data collected was subjected to different forms of analysis using Microsoft excel and SPSS software as explained below.

Descriptive statistics and graphical mapping:

This tool was used to achieve objective of the study. Descriptive statistics include measures of central tendency, variability, and distribution, such as mean, median, mode, frequency and percentages. Graphical mapping including various types of charts, graphs, and plots, such as bar charts, pie charts, histograms, scatter plots, and box plots were used in mapping out the value chain actors.

RESULTS AND DISCUSSION

Key Actors and their Respective Activities in the Value Chain

This study identifies the key value chain actors and the role played by each actor along the value chain. The actors identified include the Input dealers, Producers (farmers), Marketers (rural assemblers, wholesalers, and retailers), the Processors (hotel, restaurants, industries) and Consumers.

Inputs Dealers

The input dealers are the suppliers of production inputs and are responsible for procuring large quantity of inputs from various representatives of input manufacturers and sell to farmers. Examples of such inputs include the fertilizers, agrochemicals (herbicides and pesticides), seed, packaging materials like baskets, farm tools such as cutlasses and hoes etc. The input suppliers sometimes conduct trainings, workshops and also render extension advisory services to farmers at various producing communities in the study area. Some of the trainings and advisory services are on the methods of application of the various inputs especially the agrochemicals that requires careful procedures. The findings of this study reveals that most tomato farmers (97%) in the study area source their inputs from an open market shops within their communities or in nearby by markets around their locality, while very few (3%) sourced their input from government warehouses in their LGAs.

Producers

These are the farmers who perform most of the value chain functions right from procurement of farm inputs, land preparation planting, harvesting up to post-harvest handling and even engage in marketing. Other major functions they perform in the value chain include ploughing, fertilization, irrigating the crops, weeding, controlling pest/disease, harvesting, sorting, and grading as well as other post-harvest handling. The farmers sells their tomato produce to the ultimate consumers through different marketing channels.

Marketers

Different types of marketers were operating at different categories along the tomato value chain in Kano. The category

of marketers identified by this research include Rural assemblers, wholesalers, and retailers respectively.

Rural assemblers

These are group of market intermediaries that assembled tomatoes from individual farmers at their respective villages, farms or producing communities. They are also called Farm-Gate Assemblers, they follow individual farmers to their farms and purchases any available quantity. The rural assemblers assemble bulk of the tomatoes (58%) purchase by wholesalers in rural assembly market. Activities of the rural assemblers at farm gate prevent individual tomato farmers from information about market demand and getting access to information on actual market prices compared to when farmers took their commodities directly to markets. The rural assemblers buy at low prices which sometimes may not be commensurate with the efforts and input utilized by farmers in the production process.

Wholesalers

These are category of marketers that bought tomato in large scale either directly from the farmers or from rural assemblers and re-sell to processors or retailers. they assemble bulk of the tomatoes, and sold to processors or retailers. wholesalers have better access to capital, storage, transport, and communication facilities than all other categories of marketers along the value chain. They are mostly located in the semi-urban centers.

Retailers

They are key actors in tomato marketing function. They supply tomato produce directly to the ultimate consumers. They are the last link on the value chain between the producers and consumers. They buy from all actors along the value chain but mostly buy from wholesalers and resell to the final consumers. Their main function along the value chain is buying of tomato and tomato produce, transport to retail markets/shops, sorting, and grading, displaying, and selling to consumers. They do not add much value to the produce like other actors do.

Processors

These are the value chain actors that include hotels, restaurants, and tomato paste production industries. They purchase directly from the farmers, rural assemblers, wholesalers or retailers. They add value to the product via changing the form of product from raw tomato to a form which is used as a spice for stew or as additive to different forms of food. Only one industrial processor (Dangote tomato processing plant) was found in the study area. The factory was recently established but yet to start production.

Consumers

These are the most important actors along the value chain after producers. They are the end target of all actors along the value chain. Producers purchase directly from all actors along the value chain. They are the end users of the tomatoes and tomatoes products. Individuals, Rural dwellers, urban dwellers, traders, restaurants, and hotels were identified as tomato consumers in the study area. Also called end users.

Service providers/Chain supporters

Service providers are the supporting actors that provide variety of services to the major value chain actors. They may not be directly involved in the value chain. Some of the basic services rendered by service providers include but not limited to conducting research, providing knowledge, providing access to inputs, extension services, trainings, market information, transportation services, financial services, technical support and advocacy among others. Many institutions support activities of the value chain in one way or the other. Kano state Agriculture and Rural Development Agency (KNARDA) is the state ADP with the mandate of conducting trainings and providing extension services to the various value chain actors. Information gotten from Key Informant Interview (KII) reveals that the state ADP is constrained by insufficient funds to organize field visits, inadequate number of extension staff, etc. these constraints limits the ADP's capacity to visit and organizes trainings for the value chain actors. Other supporting organizations include, Sasakawa Africa 2000, IAR, IITA etc. Transporters, Financial Institutions
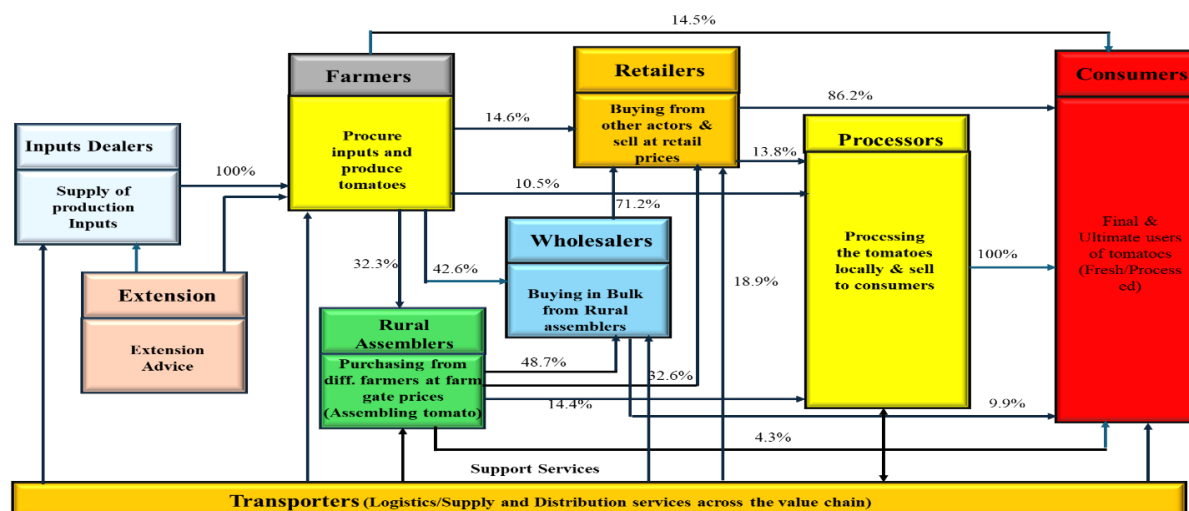

Figure 1: Map of Existing Tomato Value Chain Actors Operating in the study area
Source: Field survey, 2023

Socioeconomic Characteristics of Value Chain Actors

Table 1 provides information on socioeconomic status of the respective value chain actors operating in the study area. The mean age of the value chain actors was found to be approximately 39 years, 44 years, 44 years, 41 years and 43 years for input dealers, producers, marketers, processors and consumers respectively. Actors within this age range are believed to be in their youthful and active ages, implying that the value chain actors are capable of high productivity and are likely to utilize new production and marketing innovations. Gender is important in agriculture as it determines the type of farming activity a farmer performs as stated by Quisumbing and Doss (2021). This study reveals that majority (Input dealers (100%), Producers (87.4%), marketers (94.4%), processors (87.4%) and consumers (74.6%) of the value chain actors in the area are male. Findings in this study are in line with the report of Rachiel *et al.,* (2018) in their study on the assessment of production potential and postharvest losses of fruits and vegetables in Northern Region of Ethiopia who reported that majority (92%) of the respondents were male, 47% had age range of between 31-40 years, 67% were not educated. Also, Sani *et, al.,* (2023) has reported in his study on socio-economic characteristics and post-harvest loss storage facilities used by vegetable crops value chain actors in Adamawa state, Nigeria that majority (96.70%) of vegetable value chain actors (tomato, pepper and okra)were males and are within an average age of 40.2 years. Education increases the awareness of famers and other value chain actor

in respect of new technology and practice which finally increases their output and income. It is true that a person who is well educated is more likely to approach new technology more positively, logically and analytically as stated by Khan *et al.,* (2020). Findings of this study (Table 1) reveals that majority of the input dealers (48.5%) and processors (52.0%) have attended the formal education system and completed secondary school as highest level of educational attainment. While, majority of the producers (59.7%) and marketers (48.3%) attended the informal education system. The economic and social costs of school failure and dropout are high, whereas successful secondary education completion gives individuals better employment and healthier lifestyle prospects resulting in greater contributions to public budgets and investment. More educated people contribute to more democratic societies and sustainable economies, and are less dependent on public aid and less vulnerable to economic downturns as reported by Organisation for Economic Co-operation and Development (2012). That is, the higher the level of educational attainment, the more knowledge and skills gained, which in turn leads to a sound economic decision. This supports the findings of Paresh (2018), Ilu *et al.*, (2021), Mezgebo *et al.*, (2021) and Anang *et al.,* (2022) that level of education enhances the efficient use of scarce resources by value chain actors. The result implies that there is a wide disparity in educational attainment among the value chain actors.

Table 1: Socioeconomic Characteristics of Value Chain Actors (%)

Characteristics	Options	Actors				
		Input dealers (%)	Producers (%)	Marketers (%)	Processors (%)	Consumers (%)
Mean age of respondents	Mean	38.5	44	43.8	40.9	42.6
Gender	Male	100.0	87.4	94.4	87.4	74.6
	Female	-	12.6	5.6	12.6	25.4
Educational level	Primary Completed	15.4	24.6	15.0	10.0	15.6
	Primary Not Completed	-	3.6	10.3	10.0	-
	Qur'anic	23.1	49.7	38.3	40.0	11.1
	Secondary Completed	38.5	9.6	20.6	10.0	31.1
	Secondary Not completed	-	6.6	10.3	-	-
	Tertiary Education	23.1	6	5.6	30.0	42.2
Primary Occupation	Civil service	-	3	-	10.0	2.2
	Farming	46.2	83.8	43.9	40.0	77.8
	Marketing	53.8	13.2	55.1	20.0	20.0
	Student	-	-	0.9	-	-
	Restaurant		-	-	30.0	-
Secondary Occupation	Farming	61.5	-	42.1	30.0	33.3
	None	-	40.1	-	-	-
	Livestock keeping	-	10.8	-	-	13.3
	Marketing	-	2.4	28.0	30.0	2.2
	Motorcyclist	7.7	24	15.0	-	35.6
	Trading	30.8	19.2	14.0	10.0	13.3
	Restaurant	-	-	-	30.0	-
	Student	-	-	0.9	-	-
	Other petty job	-	3.5	-	-	2.2
Association membership	Yes	100.0	78.4	55.1	-	-
	No	-	21.6	44.9	100.0	-

Contact with Extension agents	Yes	100.0	85.6	38.3	40.0	-
	No	-	14.4	61.6	60.0	-
Access to Credit	Yes	38.5	36.7	-	40.0	25.6
	No	61.5	63.3	-	60.0	74.4
Credit Source	Cooperatives	-	-	-	-	11.1
	Family and friends	38.5	36.7	-	40.0	66.7
	Money lender	-	-	-	-	13.3
	No access	61.5	63.3	-	60.0	8.9

Source: field survey, 2023

Structure, Strength and Flow (%) of Tomato Along the Value Chain

Tomato value chain structure in the study area comprises of different forms of channels through which tomatoes flows from initial point of production (farmers) to the end users (consumers). Figure 3 reveals the strength and percentage distribution of tomatoes from one actor to another actor along the value chain.
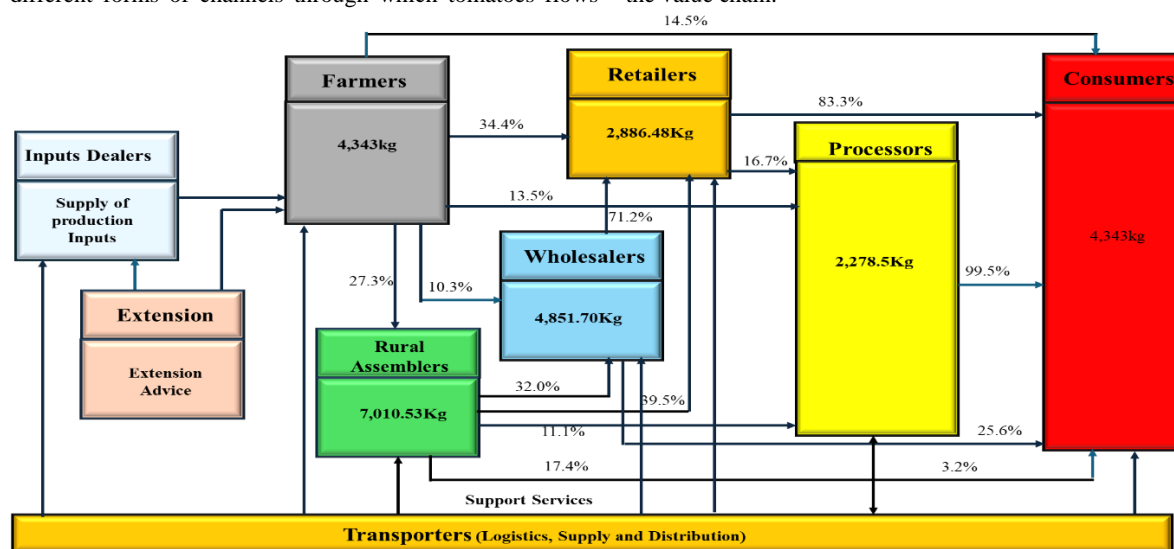

Figure 2: Structure, Strength and Functional Flow (%) of Tomato Along the Value Chain
Source: Field survey, 2023

Result on Figure 2 was used in identifying the structure and participants of five major marketing channels as listed below.
i.   Producers → Retailers→ Consumers
ii.   Producers → Retailers →Processors → Consumers
iii.   Producers→ Rural assemblers→ Retailers→ Consumers
iv.   Producers→ Rural assemblers→ wholesalers→ Retailers→ Consumers
v.   Producers→ Rural assemblers→ wholesalers→ Retailers → Processors → Consumers

Among all the marketing channels, channel-i and channel-ii were considered by the farmers as the most preferred channels because the channels have minimum number of market intermediaries. The more the number of market intermediaries the higher the value added and the lower the profit realized by the farmer. Most producers and consumers do not prefer to sale and buy their tomatoes through Channel-iv and Channel-v due to the high number of market intermediaries. Four market intermediaries (Rural assemblers, Wholesalers, Retailers and processors) buy at lower farm gate price from the farmers, add value to the produce and sell at higher price to the final consumers. It is identified as the longest channel in the value chain. The producer sells his produce at farm gate price to the rural assemblers who add value and sell to the wholesalers, add value and sell it to retailers, add value and finally sell to either processors or the ultimate consumers. This finding is in line with the report of Paresh (2018) in his study on Value Chain Analysis of Tomato in Jessore District of Bangladesh who stated that value chain mapping enables to visualize the flow of the product from production to end consumer through various actors. It also helps to identify the different actors involved in the tomato value chain and to understand their roles and linkages.

CONCLUSION

The potential of agriculture as an industry in Nigeria is emphasized to develop sustainable agricultural value chains which will help agri-business sector to gain a more advantageous position in the emerging markets. A holistic value chain assessment can be seen as a way of assessing all the value-addition activities in the tomato subsector and determine which segment of the value chain should be improved. Tomato production sector has provided job opportunities for youths and source of income for many farming families in Kano state. This paper identifies and mapped out the value chain actors and the role played by each actor along the value chain. The interdependence and linkages between actors along the value chain is very clear (figure 2) although there were some challenges and constraints from one point of the value chain to another.

RECOMMENDATION

For tomato value chain to be very efficient in the study area, all the identified links (value chain nodes) have to be strengthen by collective action of stakeholders like government, NGOs, research centers, development partners and cooperatives of the different value chain actors in the study area. This can be achieve through effective communication and information sharing among all stakeholders along the value chain in the study area.

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