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AN EMPIRICAL EVIDENCE ON CAUSES AND MITIGANTS OF TOMATO POST-HARVEST LOSSES IN KANO STATE, NIGERIA

Abdullahi, Z. Y.¹, Safiyanu S. A.¹, Sanusi, S.O.², Suleiman,¹ I., Umar U. S.¹, Dahiru, A.,¹ Gaya, A. Y.,¹ Aliyu, A. S.,¹ Mamman, B.Y.,³ Mohammed, H.,⁴ Abdulhamid, U.M.,⁵ Onibudu, M. Y.,³ Wudil, A. H.³ and Danbatta, B. A.⁶

¹Department of Agricultural Economics and Extension, Kano University of Science and Technology, Wudil

²Department of Agricultural Economics and Extension, Federal University Gashua, Yobe State

³Department of Agricultural Economics and Extension, Federal University Dutse, Jigawa State

⁴Department of Agricultural Extension and Management, Binyaminu Usman Polytechnic, Hadejia, Jigawa State, Nigeria.

⁵Department of Management Science, Kano State College of Arts and Science (CAS, Kano)

⁶Department of Agric Economics, Audu Bako College of Agriculture, Danbatta.

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ABSTRACT

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This study examined causes of post-harvest losses of tomato in Kano State and different ways through which these losses could be reduced. A random sample of 320 respondents were selected from three markets which includes; Thomas, Kwanar Gafun, and Yan kaba markets. The sample comprises of Farmers, wholesalers, traders and consumers selected from each of the markets mentioned above. Data collected were analysed using both quantitative and qualitative tools. The results obtained show that farmers have incurred higher level of losses compared to wholesalers recorded 80% lost, traders lost between (15-30) % and the consumers only lost between (0-5) % of the tomatoes being in their possession. Most of these losses are being caused by the pest termed Tuta absoluta disease of tomato, which affected all the cultivated tomatoes during the period of this study in Kano region (2016). The result of the research shows that there was poor coordination among the actors of the value chain, which resulted in the lack of government support in tomato business, and there were no processing industries as well as storage facilities in the study areas. The research recommends that provision of storage facilities, establishment of processing industries and subsidy by the government will be of significant impact in reducing the post-harvest losses. Also all the actors involved in the tomato value chain should be encouraged to organize themselves into different cooperative groups so that they can benefit from financial inclusion and trust building.

* Corresponding e-mail:
zaharaddeen Yusuf abdu llahi@gmail.com
Tel: +2348031823702

INTRODUCTION

Tomato is the most important part of the people's diet, consumed every day in Nigeria, because it is nutritious and contains vitamins (A & C). Containing a high amount of lycopene; this is a chemical which is a cure for cancer (Morris and Kamarulzaman, 2014).

Estimating the production losses of fruits and vegetables in developing countries was difficult. Post-harvest losses of fruits and vegetables, in some African countries have been estimated to reach up to 50% with tomato included among other vegetables (FAO, 2011)¹.

Both qualitative and quantitative losses occur in tomato between harvest and consumption, hence minimising losses is more sustainable than increasing production (FAO, 2015). Production and marketing of tomato are major occupations which predominated parts of Kano State where there are dams; Dambatta, Kura, Garin Malam. The production takes place in raining and dry seasons (Irrigation farming) to meet the requirements of the state population and even export some amount (Kadar & Rolle, 2004). Increasing production is not as important as reducing post-harvest losses. These losses are caused by poor storage facilities, poor handling management, inadequate transportation and high temperatures. Mostly these losses occur at every stage of the tomato value chain; which includes producers, whole sellers, retailers, and consumers. Poor food supply value chain contributes immensely to post-harvest losses of tomato in Kano (FAO, 2004). Post-harvest perishability is a major threat to tomatoes marketing (Abimbola, 2014). In Nigeria, postharvest storage and processing have been identified as the leading causes of seasonal fluctuations of supply and price, high-quality loss and socio-economic loss to producers. In Nigeria, tomatoes are harvested at vine-ripe due to lack of ripening facilities to handle mature-green to turning stages. However, as tomatoes ripen and senesce during transportation, greater care is required to minimise physical damage (FAO & World Bank, 2010). Processing the fruits into preserved products could perfect the situation. Unfortunately, processing equipment is lacking, and some families prefer to use fresh tomato for cooking (Etebu, Nwauzoma & Bawo, 2013). Depending on the target market, tomato handling, transportation and marketing may require sophisticated technologies and facilities (Abimbola, 2014). However, simple recommendations exist to extend shelf life at ambient conditions (Abimbola, 2014). General recommendations by FAO, (2010) are that tomatoes can be harvested at the mature-green stage and ripened under controlled conditions. An efficient agricultural marketing system ensures that both the producers and consumers attain equilibrium benefits (Morris

and Kamarulzaman, 2014). Assessment of tomato marketing efficiency would require information on post-harvest perishability (Abbot and Markham, 1986). Ineffective transportation of tomato to the market is one of the problems of its marketing as it leads to high degree of spoilage. The rural growers and marketers of fresh tomato fruits recognise the perishability of the product. Consequently, it is sold rotten in a hurry, sometimes at uneconomic rates. Perishability implies deterioration or loss of natural quality or marketable life or commercial quality. Merchantable life is expressed is the number of days after storage that the fruits maintained sufficient quality. Spoilage of fresh tomatoes is capable of increasing total cost, which may eventually translate to lose to the marketer. Tomato production and marketing could lessen poverty and boost food security. However, more research should be conducted on post-harvest losses/perishability of tomato because it is a source of hindrance to both producers and marketers in rural Africa. Before now, approaches to the determination of post-harvest losses of tomato were apprehensive with difficulties. As a result, information on losses was estimated but not exact. Such calculation may be faulty at best. The problem of post-harvest losses may worsen the marketing risks and fears of tomato marketers anywhere in the world. Therefore, this paper has examined the constraints to the postharvest losses of tomato. The overall objective of this research is contributing to the debate on reducing the post-harvest losses of tomato. The specific objectives are to; -

1. determine the percentages of post-harvest losses at the stages of tomato value chain
2. identify and describe the key players that suffered most of the losses and the underlining reasons for the losses
3. identify and describe constraints of the tomato supply chain

Methodology

Study area

The Study Area was conducted in Kano, the centre of commerce and the largest city in terms of land mass and population.

Moreover, is the most populous state in Nigeria, with about 9,383,682 million people (Census, 2006). The urban area of Kano covers 137 km² and comprises six local government areas (LGAs)²; Fagge, Dala, Gwale, Tarauni and Nasarawa with a population of 2,163,225 at the 2006 Nigerian census. The Metropolitan

covers 499 km² and comprises eight LGAs the six mentioned above plus Ungogo and Kumbotso with a general population of 2,828,861 at the 2006 Nigerian census. The primary occupants of the city are Hausa. As in most parts of northern Nigeria, the Hausa language is widely spoken in Kano

Table 1: Sampling Across Three Markets of the Study Area

Market	Sample Frame	Sample size (50%)
Thomas	150	75
Kwanar Gafan	350	175
‘Yan Kaba	140	70
Total	640	320

Source: Field Survey, 2016

Sampling procedure

Multi-stage sampling has been used to select three local governments in Kano State, which are containing the major Tomato markets; Nasarawa, Kura, and Dambatta Local Governments. Within each of these local governments, one market was purposively selected from each of the LGAs², it was due to their higher population of tomato marketers i.e. ‘Yan Kaba market in Nasarawa, Kwanar Gafan in Kura and Thomas market in Dambatta Local Governments. Questionnaires were randomly administered to respondents from each of the markets (3200). Moreover, this was done with the aid of marketers list obtained from the tomato marketers' association of the three markets. Seventy (70), Hundred and Seventy-Five (175), and Seventy-Five respondents were selected at random from each of the markets; a sample that comprises of ten farmers, twenty wholesalers, ten retailers, and ten consumers (met at the point of buying). Table 1, is a summary of sampling across those markets. Furthermore, four key respondents were selected according to their work experience and availability for interview, and all primary research was conducted between the 30th, May to 1st, July, 2016 by the researcher.

Primary data were collected using well-structured questionnaire, and the questionnaire consists of close and open

ended questions about the research objectives. The questionnaire was designed to elicit data to achieve the stated objectives of this study.

Qualitative research methods were mainly used for this study, due to their appropriateness in revealing the key information, and the insights and experiences of the respondents involved in the survey (Etebu *et al.*, 2013). The one hundred and fifty interviews took place in the respective markets of the respondents, while, the four other interviews took place at the offices of the interviewees. Several follow-up questions were asked to ensure that responses were correct. This study aimed to ensure both research methods and data collection procedures were reliable. Questions were targeted at the tomato marketing agents and professionals at different levels.

Descriptive statistics such as frequencies and Percentages were used for this research the post-harvest phenomenon.

RESULTS AND DISCUSSION

Tomato Supply chain in the Study Area

The supply chain of tomato has changed as a result of the one hundred percent loss incurred by the farmers in this study area; here is the supply chain of the tomato before the occurrence of the Sharon pest;

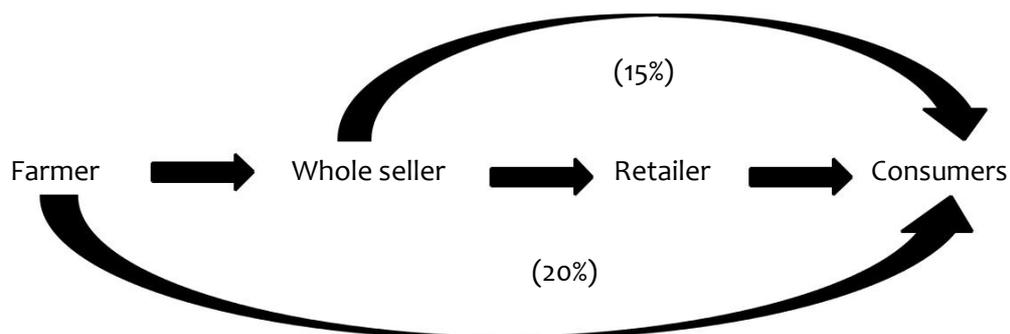


Figure 2: Supply Chain Without losses

Source: Field Survey 2016

There was no supply of tomato, after the disease incidence. However, the whole sellers decided to import the tomato from outside the country i.e. from places like Ghana,

Cameroon and Niger to bridge the supply gap created by the disease infestation. Therefore, figure 4 represents the new supply chain contrary to the above supply chain;

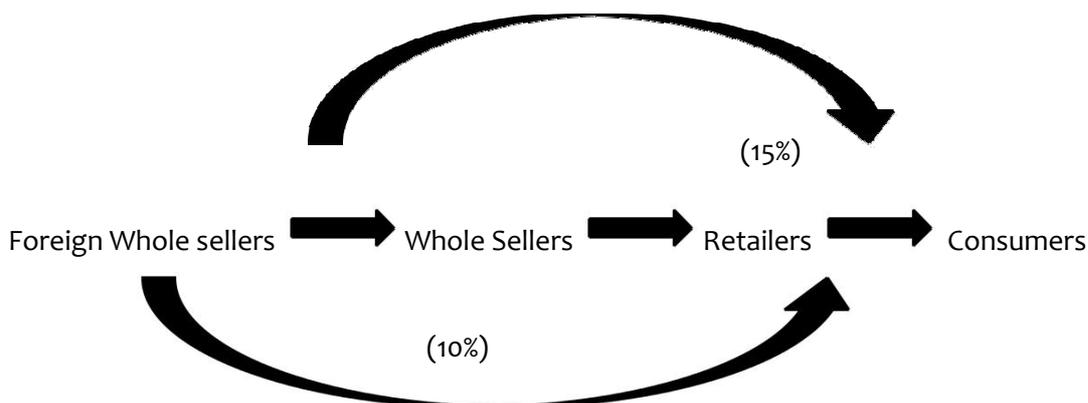


Figure 3: Supply Chain with loss

Source: Field Survey 2016

Furthermore, supply chain with losses is showing the transformed chain in the absence of the farmers, but an inclusion of foreign wholesalers, but an inclusion of foreign wholesalers from which the tomato has been imported. Hence, with no local supply of tomato, foreign wholesalers supplied all the tomato. In the case of figure 3, farmers either supply tomato to wholesalers, and or directly to the consumers (20%). While in figure 3,

foreign wholesalers supplied tomato to wholesalers, and at times they supplied directly to retailers. Moreover, the foreign wholesalers have come down from Niger to Plateau State, Kafancan Local Government and therefore this make it easy for local retailers to purchase the tomato directly from foreign wholesalers.

Characterizing the Value Chain

Table 2: Socio-economic profile of the respondents

		Farmers (30) %	Wholesalers (60) %	Retailers (30) %	Consumers (30) %
Sex	Male	100	98.3	88.7	53.3
	Female	0.0	1.7	13.3	46.7
Age	18-21	6.7	8.3	0.0	13.3
	22-31	33.3	46.7	43.3	43.3
	32-41	43.3	26.7	33.3	26.7
	42-51	13.3	11.7	13.3	13.3
	52 & above	3.3	6.7	10.0	3.3
Educational status					
	No formal education	50.0	43.3	50.0	6.7
	Primary certificate	33.3	28.3	36.7	33.3
	Secondary certificate	16.7	13.3	13.3	20.2
	Tertiary	0.0	1.7	0.0	40.0
	Preferred not say	0.0	13.3	0.0	0.0

Source: Field Survey 2016

Figures in Parentises: Number of the respondents

Table 2, presents the socio-economic profile of all the respondents involved in this study. Result obtained revealed that; 46.7% consumers, 13.3% of the retailers, 1.7% whole sellers are female, and 100% of the farmers are male. This implies that female are not participating in the farming activities of tomato, and they are the significant part of the consumption. Result show that; 20% of the retailers are widow, which is the highest compares to others (16.7% and 1.7%) it implies that females are mostly involved in the retail of the tomato, because of their proximity to the local markets. This is in line with the findings of the; Abimbola (2014), who found the female retailers to be 25%, in his study on

assessment of tomato post-harvest loss in Imo state. The majority of whole sellers, retailers and consumers (46.7%, 43.3% and 43.3%) fall into the age category of between 22-31 years, while, 43.3% the farmers are within the age group of between 32-41 years. This implies that farming activities are mostly done by the youth who are at their most productive time. This result agrees with the findings of Yaro (2014) who reported 55% of the farmer's ages were between 30-40 years, in his study on Analysis of the post-harvest losses of tomato, in Kano metropolis. 50% of the farmers, retailers and 43.3% wholesalers, are having no formal education, this is probably due to the culture in the study area.

Reasons for the losses in the Study Area

Table 3: Constraints Militating against the Tomato Producers, Marketers and Consumers Leading to the Post-Harvest Losses

Problem	Frequency	Percentage%	Rank
Tuta absoluta (Sharon pest)	75	53.33	1 st
Inadequate government support	150	33.33	2 nd
Lack of processing Industries	70	8.00	3 rd
Inadequate storage facilities	25	5.33	4 th
Total	320	100	-

Source; Field Survey, 2019

The producers, marketers and consumers as shown in Table 3 identified constraints causing the post-harvest losses. This result revealed that Sharon Pest Disease is the most serious problem militating the tomato business (1st) and Lack of processing Industries (4th) in the study area also contribute much concerning higher PHLs.

Similar to the findings of Vilas, Chinnappa, and Mahadevaiah, (2006) who reported pest attack as 1st in the ranking of the causes of Post and pre-harvest losses. While, Robert, Rita, & James, (2014) and (Etebu et al., 2013) argued that lack of storage facilities to be the 1st causal factor of post-harvest and pre-harvest losses.

Percentages of the Losses along Supply Chain

Table 4: Losses along the Supply Chain with Foreign Wholesalers (foreign farmers).

Markets	Foreign Whole sellers (NA) %	Wholesale (60) %	Retail (30) %	Consumption (30) %
Thomas	NA	75	20	5
Kwanar Gafan	NA	77	25	4
‘Yan kaba	NA	80	30	0

Source: Field Survey, 2016.

NA: Not Available

Figures in Parantises: Number of the respondents

Losses occur at all the stages as product travels across the supply chain, and literature has shown that highest losses are recorded at farm level (45%) (Morris & Kamarulzaman, 2014). In line with the findings of the research mentioned above, this study revealed that 55% losses took place at farming, whole sell 25%, 10% trading stages, and very rare losses have been reported at the consumption stage (0-5 %) (Figure 5). Farmers (30/30) have pinpointed the Sharon pest to be the most problematic and happened to destroy all of their tomato crops during the time of this study. This resulted in 100% loss of tomatoes, 25/30 of the farmers reported that there is no cure for the pest affecting the tomato at this very time. The season has been termed as zero production period (17/30 respondents), which is the first in the history of tomato production in the study area. As a result of the production problem probably all the agents involved in the tomato supply chain directly or indirectly have been affected in one way or the other. Hence, there was a temporary breakage in the supply chain of tomato (shown in figure 3 and Table 3). Meanwhile, the need for importation of tomato arose to meet the demand for tomato in the state. Importation involved the following cost; Transport, Handling, packaging and Risk bearing ability. Whole sellers, having

incurred a higher cost and bearing greater risk had slightly increased the prices, to realise a profit.

The vast majority of the respondents up to 75% reported that government does not consider the tomato business as something important; despite the fact that almost more than 100,000 people are engaged in one form of tomato business or the other in Kano. The marketers (Whole sellers and Retailers) stated that government do not compensate them for the losses incurred. The level of losses is 100% at the farm stage in all the markets, and this is because of the pest disease incident that takes place during the period of this study. All the interviewed farmers (30/30) reported that a new pest called Sharon pest has attacked their tomato crops and subsequently it leads to the perishability of the tomato. Hence, there was no supply of tomato by the farmers. Therefore, this created a short break in the supply chain. Zero losses were recorded at wholesale, retail and consumption stages.

Demand and Supply versus Post-Harvest Loss

“The higher the quantity demanded, the lower the price and vice versa.” (Varian,1996). Contrary to the stated law the result of this study revealed that; the higher the quantity supplied, the higher the quantity demanded and the higher the price.

However, a study by Yaro (2014) who investigated tomato marketing in Kano State, found similar results in this study, this attributed to the period of the survey. Shehu

(2013) also found similar results, in his study on the groundnuts haulms (Harawar Gyada). Further discussions on the possible reasons for the findings will follow in the next section.

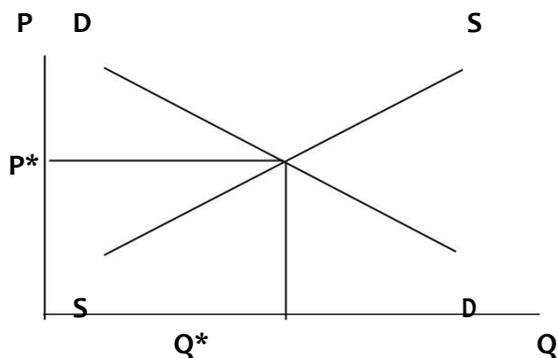


Figure 4: Demand and Supply
Source: adopted from Varian (1996)

The above figure (4) is a graphical presentation of the established law of demand and supply when the invisible hands of the market are assumed to determine the quantity supplied (SS), and quantity demanded (DD)

provided that the price remains at equilibrium (P^*) (Varian, 1996). Where, P^* represent the price at equilibrium and Q^* represent the quantity demanded and supplied at the equilibrium

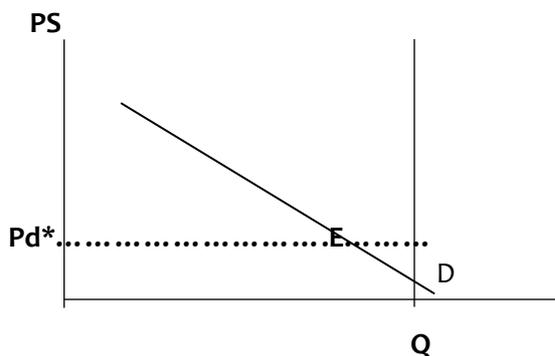


Figure 5: Demand and Supply
Source: Field Survey 2016 (authors conception)

Figure 5, shown the real picture of what happened during the period of this study. It is similar to the first graph of the demand and supply and only differs regarding the tomato quantity supplied and the presence of excess stock in the market resulting in the market failure. This failure is termed as the excess supplied of the tomato in the market, which prevents the equilibrium position to be reached. E is representing the excess supply of tomato, and there was low demand due to the Pd^* price charged by the wholesalers. Probably the entire E (excess quantity) amount of tomato is lost as there are no

modern storage facilities available for the traders (Abdullahi and Yaro, 2014).

CONCLUSION AND RECOMMENDATIONS

This study revealed how the initial supply chain was broken due to the level of losses incurred by the farmers as the consequences of the Sharon Pest, and therefore the supply chain have been transformed to include foreign wholesalers. Meanwhile, there was a tomato supply gap created which has been bridged by the new supply chain. Hence the traders have formed a new relationship with the foreign producers (wholesalers).

This study was able to relate the post-harvest losses with demand and supply curves. It also determined the percentages of the losses along the supply chain. Moreover, farmers have been identified as the people that suffered most of the losses at the time of this research (2016).

Plant pathologists in research institutes and Universities with government support should embark on conduct through research on the

newly emanated disease of tomato in the study area.

Government should inject and invest fund in agricultural programme in the state particularly Kano State Agricultural and Rural development authority (KNARDA), to assist farmers and boost tomato production and marketing in the State. Communication and cooperation should be enhanced among the key stakeholders in tomato value chain industry through capacity building.

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