JOURNAL OF
APPLIED SCIENCE AND DEVELOPMENT
(*An international academic research Journal of Applied Sciences and Development*)
ISSN (Print): 4121-8241, (Online): 2536-6939
Volume 15, Number 1, April 2024

THE EFFECTS OF POSTHARVEST LOSSES ON TOMATO FARMERS IN PLATEAU STATE, NIGERIA

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Abstract

This study examined the effects of postharvest losses on Tomato farmers in Plateau state, Nigeria. Primary data were collected from tomato farmers in two of the local government areas predominant in tomato production in the state – Jos south and Langtang North. Data were analyzed with relevant descriptive statistics, multiple regression and Likert type scale rating. The result showed that determinants of postharvest losses include; variety of tomato planted, mode of transportation and distance from farm to market as these have significant effect on postharvest losses among tomato farmers in the study area. Postharvest losses, especially harvest losses have, a significant effect on the income of the farmer. The study also identified that famers have a lot of constraints which include; insecurity, high cost of production, seasonality of products, lack of storage facility, no standard price among others. The study recommended that the government and extension agents should encourage farmers to form cooperative societies or become part of agricultural co-operative societies so as to enjoy produce storage and preservation benefits in contrast to losses. The government should also provide good road networks/reliable means of transportation to drive less risk of deterioration of fresh produce during transport.

Keywords: Food security, tomato, post-harvest losses, farmer-income

Introduction

Tomato belongs to the Solanaceae family. Tomato (*Solanum lycopersycum L*) is one of the most important vegetables worldwide. It is the third world's leading vegetable grown for fresh market and processing. It is a versatile crop of high economic value and is considered as one of the main ingredients in hundreds of dishes and other products all over the world (Oso, 2020). Tomato is regarded as a fruit in some quarters and as vegetable in others. Whichever way, tomato is a highly nutritious food ingredient used in the preparation of many foods. In terms of both – scale of production and level of consumption – Tomato is one of the most important vegetable crops (Ogunniyi & Oladejo, 2011).

Tomato accounted for about 60% of the global vegetable production at 177 million tonnes in 2016 (GrowAfrica, 2018; Oyebamiji, 2022; Amao, et al., 2022). Globally, about a quarter of tomatoes produced are used in the processing industry making tomato, the world's leading vegetable used for processing products such as pastes, juices and powders. Universally, Europe's continent has the highest tomato yield with some countries therein having tomato yield exceeding 400tonne/ha – ten times the global average. Specifically, the Netherlands, Belgium and United Kingdom have yields of 507.04tonne/ha, 506.90tonne/ha and 416.19 tonnes/ha respectively. In contrast, many countries in Africa have low tomato yield – Nigeria (3.91 tonnes/ha), Angola (2.70 tonnes/ha) and Somalia (1.44tonne/ha).

Many different vegetables are consumed in Africa but tomato clearly stands out as the most important both in scale of production and level of consumption (Ibrahim, Ahmed & Badamasi, 2020). Tomato is a major food component which is consumed in every household, with little or no cultural barrier and, virtually used by every tribe especially in Nigeria (Ogunniyi & Oladejo, 2011). This makes it a vegetable crop in high demand as compared to the different vegetables grown in Nigeria and Africa. Tomato accounts for about 18% of the average consumption of vegetables in Nigerian daily diets. It is a nearly indispensable constituent of the daily

diet of over 100 million Nigerians, as it is mainly used in the preparation of soups and stews which are essential complements to staples based on cereals and root crops. This invariably makes tomato a vegetable crop in high demand (Ruth et al., 2021; Ramdwar et al., 2017). Unvaryingly, tomato is not restricted compared with other vegetables but, universal in demand in Nigeria (Ibrahim, Ahmed & Badamasi, 2020). However, due to its perishable nature, it tends to suffer heavy postharvest losses leading to the loss of over 50% of what was initially produced (Ugonna, Jolaoso & Onwualu, 2015). Thus, rising tomato production in Nigeria has been driven by expansion in area under cultivation, which has increased by 5% annually in the last decade (Adedoyin, Alero, Yemi, & Bola, 2018).

Postharvest losses have recently achieved much public attention as part of worldwide efforts to combat global hunger and improve food security (Ron, 2018). Postharvest losses which refer to degradation in both quantity and quality of food product from harvest to consumption, arise from the fact that freshly harvested food products are living things that breathe and undergo certain changes during postharvest handling. Not only are losses a waste of food, but they also are a waste of human efforts and scarce resources (Hailu & Derbew, 2015). Postharvest losses are a major problem in tomato supply chains, especially in tropical climate, as up to 40% of harvested fruits are estimated to decay along the chain (Macheka et al., 2018).

Postharvest losses in tomatoes can be as high as 42% globally, and this can either be quantitative or qualitative. Even though emphasis in crop research nowadays is increasingly shifting from quantity to quality of produce, there is still little improvement in the quality of commercially produced tomato varieties, hence resulting in high quality losses. Post-harvest losses have been highlighted as one of the determinants of the food problems in most developing countries like Nigeria (Bada et al., 2021). Nigeria ranks as the 14th largest tomato producing nation in the world and has the comparative advantage and potential to lead the world in tomato

production and exports. The production of tomatoes 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. Over the last decade, the production of fresh tomato has grown by 25%, from 1.8million tonnes to 2.3 million tonnes, and out of what is produced, a large percentage is still lost due to deficiency of critical inputs, lack of improved technology, low yield and productivity, high postharvest losses and lack of processing and marketing infrastructure. Hence, the demand for tomato and its by-products far outweighs the supply.

Further, with a population of over 170 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 (Ugonna, Jolaoso & Onwualu, 2015).

Worrisome too, given food production is for consumption, postharvest operations of food produce become sine qua none to agri-food-produce successfully; store and process produce all, consequent on reaching and meeting the consumer needs efficiently. Thus, the need to study the extent to which postharvest losses affect income of tomato farmers so as to determine what could be done to curb loss- (post-harvest) burdens, thereby; increasing profitability, reducing food wastage, enhancing poverty alleviation whilst, increasing food availability and reduced hunger.

Again, in recent times, there has been a high level of increase in food consumption and demand in our society due to the, continuous rise in the population of both urban and rural dwellers (Owoo, 2021). Increasing agricultural productivity and sustainable food production are crucial to help alleviate the perils of hunger (African Development Bank, 2023). Consequently, postharvest losses must be curbed and addressed, if not, increased number of produce might just waste away, as one-third of food is

lost or wasted in postharvest operations (Kumar & Kalita, 2017). Thus, the need for this study.

Persistent post-harvest loss-crisis: case of tomato

Tomato is an agricultural produce that is in high demand and widely accepted in every part of Nigeria. Tomato is mostly grown in the Northern parts of Nigeria and is transported to other parts (east, south and west) of the nation. Despite input and financial aid of 200million to tomato farmers on the Plateau (Fadama lll project) to make available 5,975 metric tonnes of tomatoes for the rainy season by the World Bank in 2016 (The Guardian, 2016), and; that of 2022 by some investors from South-Africa, the director of press and public affairs to the governor of Plateau, regretted that the state was not able to meet up with domestic demands (Voice of Nigeria, 2022). Despite her high capacity for tomato production, massive production probably came with the burden-crisis of massive post-harvest losses since; the effects of postharvest losses were not addressed.

Again, persistent post-harvest loss-control for tomato does not come cheap compared with other crops given the high demand for tomato and tomato by-products. In fact, many factors influence the possibility of effective tomato postharvest management considering the form of tomato product and; the grading and standardization considered more desirable at the point of demand. Further, when postharvest losses occur, tomato-product form goes below standards yet, demand and price of tomato-product are affected. This informs earlier position that post-harvest operations must be as effective as possible in order to attract high demand for products (Fejza & Asllani, 2013).

Tomato production is a highly profitable business venture, but because of its perishable nature/high degradable tendencies, poor handling and packaging (Okpeke, 2015), producers and marketers inclusive are faced with the possibility of reduced profit and increased losses. Even with a large number of tomato producers in Plateau State, very little research has been

done on the topic in the study area. Therefore, this study examined the economic analysis of postharvest losses among tomato farmers in Plateau State, Nigeria. Specifically, the work i) described the socio-economic characteristics of tomato farmers in the study area; ii) identified the determinants of postharvest losses in tomato production; iii) identified the preservation practices adopted by the farmers to reduce losses; iv) determined the effect of postharvest losses on the income of tomato farmers; v) identified the constraints facing tomato producers.

Materials and methods

Plateau is the twelfth largest state in Nigeria. Approximately in the center of the country. It is geographically unique due to the presence of elevated hills surrounding the Jos [Plateau], her capital, and the entire Plateau itself (Abubakar, 2022). Plateau state is described as "The Home of Peace and Tourism". With natural formations of rocks, hills and waterfalls, it derives its name from the Jos-plateau. Plateau state is located in the north central zone of Nigeria. With an area of 26,899 square kilometres, the state has an estimated population of about three million people. It is located between latitude 08°24'N and longitude 008°32' and 010°38' east. Bare rocks are scattered across the grasslands, which cover the plateau. The altitude ranges from around 1,200 metres (3,900 ft) to a peak of 1,829 metres (6,001 ft) above sea level in the Shere hills range near Jos. Years of tin and columbite mining have left the area strewn with deep gorges and lakes (George, 2021).

Plateau state is subdivided into seventeen (17) LGAs: Barkin Ladi, Bassa, Bokkos, Jos East, Jos North, Jos South, Kanam, Kanke, Langtang North, Langtang South, Mangu, Mikang, Pankshin, Qua'an Pan, Riyom, Shendam and Wase (Government of Plateau State Nigeria, 2022). Most local governments in the state especially Pankshin, Barkin Ladi, Mangu, Lantang North, Jos East, Jos South, Bassa and Kanke are known for tomato production.

A multistage sampling was adopted for the selection of respondents for this study. First, two LGAs namely; Jos South and Langtang North were purposively selected for their long-standing fame with tomato production. Second, two (2) districts from Langtang north and two (2) districts from Jos south were randomly selected making a total of 4 districts. Two villages were randomly selected from each district giving a total of 8 villages. Eight (8) respondents were selected from each village in Langtang north and 17 respondents from each village in Jos south making a total of 100 respondents.

Primary data was used for this study. Structured questionnaires were used to obtain information regarding; the socio-economic characteristics of the tomato farmers, the determinants of postharvest losses among tomato producers, the preservation practices adopted by these farmers in loss-reduction, the effects of postharvest losses on farmer income and the constraints facing tomato farmers in the study area.

Data analysis

The data collected was analyzed using the relevant statistical tools in order to achieve the specific objectives of the research. Objectives (i) and (iii) was achieved using descriptive statistics, objective (ii) & (iv) was achieved using multiple regression analysis and objective (v) was achieved using Likert scale rating technique.

Model specification

Regression Analysis

Multiple regression analysis was used to ascertain the determinants of postharvest losses among tomato producers and the effects of postharvest losses on farmer's income. The multiple regression model can be expressed implicitly or explicitly.

The determinants of postharvest losses among tomato producers; mathematically/in the explicit form is expressed as;

$Y = bo + b_1X_1 + b2X_2 + b_3X_3 + bnXn + e$

Where;
Y= Total amount of tomato lost (kg)
bo = intercept of Y
$b_1 – b_6$ = regression coefficients
X_1 = Time of planting (month)
X_2 = Variety of tomato
X_3 = Maturity stage before harvest
X_4 = Source of market information
X_5 = Mode of transportation
X_6 = Accessible roads (Accessible roads = 1, otherwise = 0)
X_7 = Distance from farm to market (in minutes)
e = Error term
Effects of postharvest losses on tomato farmer's income; mathematically/in the explicit form is expressed as;
$Y= bo + b_1X_1 + b_2X_2 + b_3X_3 + bnXn + e$
Where;
Y= Income from tomatoes production per season (Naira)
bo = intercept of Y
$b_1 – b_3$ = regression coefficients
X_1 = Harvest losses (Naira)
X_2 = Transportation losses (Naira)
X_3 = Storage losses (Naira)
e = Error term

Likert scale rating

This is a psychometric scale commonly used in questionnaires and is considered the most widely used scale in survey research. In responding to a Likert questionnaire item, respondents specify their level of agreement or disagreement on a symmetric agree-disagree scale for a series of statements (QP, 2024). The scale is able to capture the intensity of their feelings on the perceived impediments/constraints to be weighed. A four-point rating in the

order; strongly agree (SA) = 4, agree (A) = 3, disagree (D) = 2, and strongly disagree (SD) = 1 was adopted. Thus, the mean score of the respondents was obtained as follows;

4+3+2+1 = 10

$\sum fx/\sum x$ = 10/4 = 2.5

The mean point of 2.5 was used as the decision rule. This means that any problem equal to or greater than 2.5 was considered a strong constraint in the study area.

Results and discussion

Socio-economic characteristics of tomato farmers

A wide range of socio-economic characteristics were considered as shown in Table 1.

Table 1: Distribution of socio-economic characteristics of tomato farmers

Variables	Frequency	Percentage	Mean
Age			
≤20 years	2	2	2
21-30 years	9	9	
31-40 years	44	44	
41-50 years	28	28	
50 years & above	17	17	
Gender			
Male	82	82	
Female	18	18	
Marital Status			
Single	12	12	
Married	87	87	
Widowed	1	1	
Religion			

Christianity	92	92	
Islam	8	8	
Level of Education			
No formal education	1	1	
Primary School attempted	3	3	
Primary School completed	17	17	
Secondary School attempted	8	8	
Secondary School completed	14	14	
Tertiary Education	57	57	
Member of market union/Cooperative			
Yes	21	21	
No	79	79	
Type of Labor used for harvest			
Family members	38	38	
Hired human labor	62	62	
Machinery	0	0	
Household size			
1-5	43	43	5.02
6-10	51	51	
11-15	5	5	
16 & above	1	1	
Price of a basket of tomatoes			
≤ 2000	4	4	4379.00
2100-3000	37	37	
3100-4000	41	41	
4100-5000	13	13	
5100-6000	3	3	
6100-7000	1	1	
7100 & above	1	1	

Size of farm		
1 hectare	69	69
≥10 hectares	5	5
2-9 hectare	26	26

Source: Field Survey, 2022

Table 1 shows the age of tomato farmers in the study area with, a larger percentage (44%) within the age range of 31-40 while, 28% were within the range of 41-50 years of age. Those within the range of 50 and above, made up 17%, while 21-30 made up 9% of respondents and 20 years and below made up 2%. The mean age was 41.07, this is quite similar to the findings of Abolusoro, Ogunjimi & Abulosoro (2014), where mean age of farmers was 45.6 years. The result indicates that respondents are predominantly middle-aged which implies that they can be very active, productive and innovative. Table 1 also shows that respondents (82%) were male and 18% female. This implies that there may be some sort of male-skewed tomato farm production in the study area. It could also be suggested in lieu that, men have more access to land than women in the study area. The finding is in line with that of Amurtiya & Adewuyi (2020) who stated that tomato production is a male-dominated activity amidst Emily (2015) who stated that men are 3 times more than women in agriculture especially in some parts of Africa. The result from the table (Table 1) showed that majority of respondents (87%) were married, 12% Single and 1% widowed. The finding agrees with that of Amurtiya & Adewuyi (2020) whose research on tomato farmers in Kano state showed that tomato farmers are mostly married (85.5%). Thus, implies that most tomato farmers through tomato farming can financially support their families and provide the needs of members of their family, whether it be food, clothing, shelter or education.

The result from table 1 shows only two religions were practiced amongst tomato farmers in the study area. 92% of respondents were Christians and 8% Muslims. These percentages show that Christians

dominate the area. Majority (57%) of farmers in the study area had tertiary education, 14% completed secondary school, 8% attempted secondary school, 17% completed primary school, 3% attempted primary school and 1% had no formal education. This implies that farmers in the study area may be more productive, innovative and easily accept technology according to Okoruwa, Ogundele & Oyewusi (2006). This is in line with the findings of Opara (2010) and Abu et al. (2011) who all concluded that basic formal education was the main source of higher agricultural productivity in Nigeria. Furthermore Adenuga et al. (2013) posited that tomato productivity was influenced by education level of the farmers.

The result in Table 1 also shows that 79% of respondents did not belong to any association or agricultural cooperative while 21% belonged to associations/cooperatives. This implies that majority of farmers who belonged to no cooperatives, may find it difficult to access loans, affordable inputs, grants and help from government, market information, better sales and other benefits as highlighted by Clementina, Paul, Ogbodo & Tochukwu (2022).

The result from table 1 show that harvesting was carried out manually via, using hired manual labor (62%) while 38% of the farmers used family members. This implies that a larger percentage of respondents used hired labor for tomato harvesting, therefore, tomato harvesting created job opportunities for people around and within the study area. 43% of respondents had a household size ranging from 1-5. 6-10 household size range respondents had a higher percentage of 61%. While 5% of the respondents had a household size ranging from 11-15, 1% of respondents had 16 and above household size range. The mean household size is 5.02. This implies that large household size may be an advantage to tomato production thus; vital part of labor in the overall production process.

The result in table 1 also shows the price of a basket of tomato. 4% of respondents sold at ₦2000 or less. 37% sold between ₦2100-₦3000, 41% sold between ₦3100-₦4000, 13% sold within ₦4100-₦5000, 3% of

respondents sold between ₦5100-₦6000, 1% sold within the range of ₦6100-₦7000 and 1% sold from ₦7100 and above. This shows that there was no standard price in the study area and tomato producers sold as they feel best. This may be unhealthy as farmers may sell at outrageously cheap prices and run at loss just to beat competition.

Table 1 also shows that farmers that cultivated 1ha of land were 69%. Those who cultivated 10ha and above were 5% while others (between 2ha and 9 ha) were 26% of respondents. The result that majority of respondents cultivate 1ha was in tandem to the study of Amurtiya & Adewuyi (2022) that revealed that all the respondents were small-scale farmers cultivating, 5 ha of land or below on, the average.

Preservation practices used by farmers in loss reduction

Table 2: Preservation practices used by farmers in loss reduction

Variables	Frequency	Percentage
Method of harvesting tomatoes		
Handpicking	99	99
Harvesters	1	1
Packing of tomatoes		
Wooden crates	1	1
Net bags	4	4
Baskets	95	95
Do you store tomatoes?		
Yes	39	39
No	61	61
Storage Method		
Cold room	10	10
Drying	28	28
Freezing	1	1
Others	0	0

Source: Field Survey, 2022

The result in Table 2 shows that 99% of respondents used handpicking in harvesting tomatoes while 1% used harvesters. This implies that majority of tomato farmers in the study area manually harvested tomatoes. This finding is in line with that of the Agricultural Marketing and Resource Center (2021) which stated that majority of harvested tomatoes are handpicked. 95% of respondents from Table 2, gather harvested tomatoes in baskets, 4% in net bags and 1% in wooden crates. This implies that majority of farmers in the study area used baskets to collect tomatoes, and according to Isaac et al. (2015) the, majority of farmers from Africa use wooden crates and woven baskets with hard and sharp surfaces which cause mechanical injuries to the harvested fruits.

From the result in Table 2, 39% of respondents store tomatoes, while 61% did not store tomatoes. The moment the tomatoes are disconnected from their natural nutrient supply, quality reduction sets in. This is due to a natural process that starts as soon as the biological cycle is broken by harvesting from the main-living plant source (Arah, Amaglo, Kumah, Ofori, 2015). This means that failure to sell tomatoes on time may lead to a large volume of postharvest losses in the study area. Out of the 39% of respondents that store tomatoes, 28% practiced drying, 10% used cold room and 1% used freezing method. This implies that majority of the respondents practiced drying method to preserve and store their tomatoes. Just as Edwinge et al. (2022) stated in their research, dried tomato slice does not meet generally the quality standards and expectations of consumers. In addition, during processing and storage, it undergoes alterations leading to certain organoleptic (color, taste, texture, aroma) modifications of the produce amidst invariably, nutritional quality changes of the derived products. This indicate that use-in processing via processing-type methods, such as dryer/exposure to drying conditions, sample pretreatment and edible

coating, are expected to maintain and preserve the color and fresh-appeal of the produce/products.

Determinants of Postharvest losses among tomato producers

Table 3: Regression on determinants of postharvest losses among tomato famers

Model	Unstandardized Coefficients		t	Sig
	B	Std. Error		
(Constant)	-25.409	86.773	-.293	.770
Time of planting	-1.045	9.857	-.106	.916
Variety of tomato produced	16.609	7.901	2.102	.038
Maturity stage before harvest	-8.883	9.285	-.957	.341
Source of market information	-16.576	8.587	-1.930	.057
Mode of transportation used	48.172	20.258	2.378	.019
Accessibility of road from farm to the market	17.400	17.725	.982	.329
Distance from farm to market (minutes)	.541	.224	2.421	.017

*Y = Total amount of lost tomatoes (kg) (post-harvest, during transportation and while in storage); *Y = dependent variable

From Table 3, the predictor variables that are not statistically significant were time of planting, maturity stage, road-accessibility status from farm to market, source of market information while variety of tomatoes, mode of transportation and distance from the farm to the market were significant. This implies that the variety of tomato planted, mode of transportation and distance from farm to market significantly contributes to postharvest losses in tomato production and can be considered determinants of post-harvest losses in the study area. This finding is in tandem to the findings of Al-Dairi et al. (2021) and EYE (2020) who posited in their research that long distance from farms to markets, transport system reliability, and presence of bad road affects postharvest losses. It is also in tandem to the findings of Tigist et al.

(2013) who posited that type of tomato variety cultivated significantly affected the level of postharvest losses incurred in tomato production.

Effect of Postharvest losses on farmers income

Table 4: Regression on effect of postharvest losses on tomato-farmer' income

Model	Unstandardized Coefficients		t	Sig
	B	Std. Error		
(Constant)	54336.239	9535.287	5.698	.000
Amt of basket lost during harvest (Naira)	-0.01909	.486	3.925	.000
Amt of basket lost during transportation (Naira)	-0.02645	1.752	1.510	.134
Amount of basket lost during storage (Naira)	-0.01622	1.757	.923	.358

*Y = Income of farmer

From Table 4, postharvest losses affect farmer's income. Table 4 shows that number of baskets lost during transportation and number of baskets lost during storage affected farmer's income but were however not statistically significant. Number of baskets lost during harvest affected the income of tomato farmers from tomato production per season and this was statistically significant. This implies that farmer's income in the study area was more affected by losses that occurred during harvest. This finding is in tandem with Coker et al. (2016) who stated that postharvest losses have been one of the key encumbrances to farmers' income in sub-Saharan Africa, and in particular, Nigeria.

Constraints facing tomato farmers

Table 5: Constraints in tomato farming

Constraints	Mean Score	Remark
High production cost	3.34	Strongly Agreed

Seasonality of products	2.89	Agreed
High degree of perishability	2.59	Agreed
Lack of storage facilities	3.49	Strongly Agreed
Inadequate market information	2.87	Agreed
No standard price	3.50	Strongly Agreed
Political instability	2.96	Agreed
Inadequate support from government	3.51	Strongly Agreed
High cost of transportation	3.54	Strongly Agreed
High level of competition	2.73	Agreed
Lack of processing plant	2.71	Agreed
Presence of market union interferences	2.92	Agreed
Inadequate technical knowledge	2.86	Agreed
Insecurity	3.52	Strongly Agreed

Source: Field Survey, 2022

Table 5 shows the constraints in tomato farming. The decision rule for a major constraint is having the mean score of 2.5 (cut-off) and above. Following the decision rule, the identified constraints based on the decision-mean level score of severity are; high cost of transportation (3.54), insecurity (3.52), inadequate support from government (3.51), no standard price (3.50), lack of storage facilities (3.49), high production cost (3.34), political instability (2.96), presence of market union interferences (2.92), seasonality of products (2.89), inadequate market information (2.87), inadequate technical knowledge (2.86), high level of competition (2.73), lack of processing plant (2.71), high degree of perishability (2.59).

Conclusion

The study analyzed the effect of postharvest losses on tomato farmers in Plateau state, Nigeria. The result of the study indicates that postharvest losses have a significant effect on tomato production [amount] and producers' income in the study area. Famers were predominantly male with majority of the farmers having attained tertiary education. The farmers use manual labor for farming, collect tomatoes in baskets and subscribe mostly

to drying as a means of storage. In fact, most of the farmers do not store at all. In addition, the study indicates that variety of tomatoes, mode of transportation and distance from the farm to the market are determinants of postharvest loses. Results also show that, postharvest losses significantly affect the income of tomato farmers in the study area. Further, constraints based on their level of severity are; high cost of transportation, insecurity, inadequate support from government, no standard price, lack of storage facilities, amongst others.

Recommendations

In the light of study results, the following is recommended:

1. More efforts should be made by the government and NGOs to curb postharvest losses. Instead of channeling all effort to increasing production, farmers should be enlightened on ways to reduce post-harvest losses. This is because, an increase in production without a decrease in postharvest losses will lead to an increase in losses, thereby frustrating all efforts to attain food security.
2. Government and extension agents should encourage farmers to form cooperative societies or become part of Agricultural co-operative societies that are able to provide farmers with, information, access to inputs, markets, adequate pricing and access to extension services all; to, aid better production and postharvest operations. Provision of wooden crates or net bags as against baskets is seemingly better for wooden crates and/or net bags higher tendency to cause less injuries to tomato fruits relative to baskets therein causing faster deterioration of tomato-fruits harvested.
3. Extension agents should educate farmers on better harvesting practices and use of safer packing materials as this can reduce harvest losses and prolong tomato shelf-life.
4. The government should provide storage and processing facilities to farmers. This will not only be beneficial to farmers but also the

nation at large, as it will make tomatoes available in and out of season at, a more stable price.

5. Good roads and means of transportation should be made available by the government as this will make tomato producers and marketers arrive their destination in time and at the cheapest possible cost.
6. The government and extension agents should introduce improved varieties of tomatoes (including the varieties used for tomato paste). This will help reduce post-harvest losses in tomato production. It will also increase the demand for raw materials by processing plants further creating jobs.
7. The government should encourage farmers educationally attainment in lieu of financially sustainability to practice mechanized farming. On the other hand, machineries and the technical-know-how should be made accessible to farmers as this will increase farmer efficiency
8. The government should place the security of food and food-farming sustainability as top priority because; farmers are an indispensable part of a nation that supply raw materials to almost every other sector of the nation.

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