CARD International Journal of Agricultural Research and Food Production (IJARFP)
ISSN: 2536-7331 (Print): 2536-734x (Online)
Volume 2, Number 4, December 2017
http://www.casirmediapublishing.com

DETERMINANTS OF POSTHARVEST LOSSES AMONG TOMATO FARMERS IN GBOKO LOCAL GOVERNMENT AREA OF BENUE STATE

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ABSTRACT

The study determined the factors affecting postharvest losses in tomato in Gboko Local Government Area of Benue State, Nigeria. Using non-probability sampling technique, 170 farmers were selected but 164 completed their questionnaire. The primary data for the study were analysed using descriptive statistics, regression, and independent samples test of means' difference. Findings showed that tomato farming is male dominated as most families used family labour. While farming experience statistically reduced postharvest losses in tomato, farm size led to increase in postharvest losses. It was concluded that average postharvest loss among tomato farmers in Gboko LGA was quite large, as well as revenue lost due to postharvest losses. The study, therefore, recommended that both male and female farmers be trained on the management of postharvest losses in tomato; farmers with long farming experience should be involved in the training to share their experiences; and farm size should be as minimal as the farmers can manage so that postharvest losses do not increase.

Keywords: Tomato, Postharvest Losses, Gboko, Revenue, Management.

INTRODUCTION

Tomato (*Lycopersicum esculentum*) is a both a cash and food crop grown in the forest, transitional or derived savannah and savannah zones. With an annual total area of one million hectares is reportedly used for its cultivation, Nigeria ranked 12th in production with total output of 1,560,000mt in 2014 (Babalola, Makinde, Omonona and Oyekanmi, 2010; Arah, 2014; FAO, 2014). The optimum temperature for tomato harvesting of about 20 o C can be attained either in the early hours of the morning or late in the evening. Harvested fruit must be pre-cooled to remove excessive field heat if harvested at times other than the recommended periods. This, according to Arah (2014), can be achieved by assembling harvested fruits at a central point with a cooling system in place.

Tomato ranks high among high value food produce in Africa and Nigeria. Ayandiji, Adeniyi and Omidiji (2011) noted that fresh fruits such as tomatoes are very important sources of vitamins which are essential for healthy human diet; tomatoes are rich in minerals, vitamins, essential amino acids, sugars and dietary fibres, containing much vitamin B and C, iron and phosphorus. Tomatoes constitute a sizeable source of income for farmers across the globe. Aidoo, Danfoku and Mensah (2014) indicated that tomato production is a source of livelihood and income for most farmers, distributors and marketers in Ghana.

Tomato also has health benefits. Studies have shown that tomato contains higher amounts of lycopene, a type of carotenoid with anti-oxidant properties which is beneficial in reducing the incidence of some chronic diseases like cancer and many other cardiovascular disorders. This anti-oxidant property and its health benefit have raised the interest in tomato research and its consumption as a crop with medicinal properties. Although lycopene is believed to be the main contributing compound in tomatoes responsible for lower risk of prostate cancer different studies have also shown that consumption of tomatoes and tomato-base foods can be linked to reduced incidence of a variety of cancers in general (Arab and Steck, 2000 in Arah, 2014; Basu and Imrhan, 2007 in Arah, 2014; Freeman and Reimers, 2010 in Arah, 2014; Arah, 2014).

The crop is often harvested and marketed fresh. It is consumed in raw, cooked and processed forms. According to Babalola *et al.* (2010), the use of tomato is about 18 percent of the average daily consumption of vegetables in Nigeria. Tomato may be eaten fresh as salad or they may be pressed into pastes or purees, which are used for cooking in soups or stews and producing fruit drinks.

At harvest, tomato has high moisture content. This makes the fruits vulnerable to deterioration in the absence of effective preservative and processing facilities and technologies. Thus, tomatoes are highly susceptible to postharvest losses. Apart from economic losses, postharvest incidence, associated with postharvest handling and storage conditions, adversely affect the quality and nutritional value of the crop. The perishability of tomatoes is also of great concern to processing industries, especially where the industries are cited far away from the area of high concentration of tomato production.

Postharvest losses in tomato commence from harvest and handling operations. The major cause of postharvest losses in tomatoes is physical damage which occurs during handling and transportation, physiological decay, water loss, and glut in the market (Ayandiji *et al.,* 2011). Aidoo *et al.* (2014) cited inappropriate storage facilities and rough handling during harvesting as causes of postharvest losses in tomato as the factors increased the possibilities of contact of tomato fruits with the soil, leading to contamination by organisms. Babalola *et al.* (2010) stated the longer the distance of the farm from the market, the greater the losses experienced due to congestion of tomato fruits and the resultant build-up of heat. Aidoo *et al.* (2014) also noted that the variety of tomato cultivated affects the level of postharvest losses as different varieties possess varying characteristics such as firmness and disease resistance.

According to Adarkwa (2011) in Aidoo *et al.* (2014), postharvest losses in tomato manifest in loss of quality attributes such as appearance, firmness, taste and nutritional value. The foregoing shows that socioeconomic and production characteristics are implicative in tomato postharvest loss and management. As asserted by Babalola *et al.* (2010), in developing countries like Nigeria, storage, packaging, transport and handling techniques are practically non-existent with perishable crops and so, this allows for considerable losses of produce. As more fresh fruits are needed to supply the growing population in developing countries, as more produce is transported to non producing areas and as more commodities are stored longer to obtain a year round supply, post harvest loss prevention technology measures and empirical research are paramount and imperative.

Two important components of food security are availability and quality (Ogbanje *et al.*). Food supply can be improved by increase in production and substantially by reduction in postharvest loss. Where great effort is concentrated on availability component, especially in the developing countries like Nigeria and Benue State, the decline in food production can be largely attributed to food losses. It follows that reduction in post harvest losses increases food availability as well as food quality. Post harvest losses render ineffective, the efforts of government and the World Bank in tackling food insecurity. In other words, studies on postharvest loses, especially of perishable crops that are on daily demand are complementary to global efforts in tackling food problems and poverty. It is against this background

that this paper examined the determinants of post harvest losses in tomato production Gboko Local Government Area of Benue State.

The study investigated socioeconomic characteristics of tomato farmers, ascertained the causes of postharvest losses, analysed tomato production, income and losses, and evaluated postharvest loss management among tomato farmers. It was hypothesised that socioeconomic and production characteristics have no significant effect on postharvest losses; and there is no significant difference between postharvest losses and transportation mode.

MATERIALS AND METHOD

The study was carried out among tomato farmers in Gboko Local Government Area of Benue State. The local government area was chosen because of the high level of tomato production. As at the time of this study, the population of tomato farmers could not be ascertained. Hence, non-probability sampling technique was used to select 10 farmers from each of the 17 council wards in the LGA. Data for the study were obtained from primary source with the aid of standard questionnaire. Of the 170 copies of the questionnaire distributed, 164 were completed, retrieved and used for analysis. The data were analysed using descriptive statistics, multiple regression, and independent samples test of means' difference.

The linear functional form of the multiple regression used for the study is specified as

$$Y = b_0 + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + e_i$$

Where:

Y = tomato postharvest losses (kg)
X_1 = Age of farmer (years)
X_2 = Farming experience (years)
X_3 = years of formal education
X_4 = farm size (ha)
X_5 = days to the store or market
X_6 = household size
X_7 = number of extension visits
X_8 = type of labour (1 = family labour; 0 otherwise)

RESULTS AND DISCUSSION

Tomato farming is a male-dominated enterprise in Gboko Local Government Area of Benue State. As shown in table 1, males constituted

64.0% of the respondents. In developing countries, males dominate agricultural production due to the labourious nature of traditional farming system and land ownership or inheritance structure. The later cedes landed properties to males and puts household assets under the ownership of the household head. This finding is in line with Aidoo *et al.* (2014) tomato farming in Offinso district in Ghana was dominated by males (77%). Most of these farmers were married (54.9%) and used family labour (62.2%) for most farming operations. In subsistence farming, marriage is an asset as it is source of labour for farm work.

Table 1: Socioeconomic characteristics of tomato farmers

Sex	**Frequency**	**Percentage (%)**
Male	105	64.0
Female	59	36.0
Total	164	100.0
Marital Status		
Single	90	54.9
Married	74	45.1
Total	164	100.0
Labour type		
Family	102	62.2
Hired	62	37.8
Total	164	100.0

Source: Field survey, 2016

The summary statistics of the socioeconomic characteristics of tomato farmers in table 2 put farmers' average at 40 years old. This is the active and prime age at which farmers substantially contribute personal labour to farm work. Average household size was quite large (14). This is typical of farming communities in rural Nigeria and a system where a household comprised some members of the extended family. The result further showed that farmers had average years of formal education of about 8 years, depicting that they had, at least, primary education. Average farming experience was as low as 5.5 years, meaning that most of the respondents got into tomato farming in recent time. The advent of farmers into this enterprise could be informed by the viability of the enterprise as most households in the LGA have one thing or the other to do with tomato production. Tomato farmers

in the study area received about three visits from extension agents in the last farming season. Visit from extension agent is important as it affords farmers new technologies and strategies for dealing with challenges in farming.

Table 2: Summary statistics of socioeconomic characteristics of tomato farmers

Descriptive Statistics	N	Minimum	Maximum	Mean	Standard Deviation
Age (years)	164	27.00	66.00	40.20	9.46
Household size	164	6.00	21.00	14.58	3.38
Years of formal education	164	-	35.00	7.83	5.76
Farming experience	164	2.00	15.00	5.52	2.59
Number of extension visits	164	1.00	3.00	2.55	0.59

The analysis of tomato output and postharvest losses in table 3 showed that average farm size among farmers in the LGA showed that average farm size was 1.16 ha. This is typical of small-scale farmers in Nigeria where farm holdings range from less than one to five hectares. For tomato production, this low farm size not be too small since the crop produces fruits several times in a cycle. Another reason could be that tomato fruiting and ripening are irregular and frequent, requiring constant monitoring to minimise waste due to its high perishability. This result is, however, lower than Aidoo *et al.* (2014) where average farm size was 2.12 ha. Large farm size requires adequate for proper management that would minimise postharvest losses.

Average output of tomato was 3,153.04 kg. This result is also lower than 6,143.80 kg for major season and 4,871.68 for minor season in Aidoo *et al.* (2014). Average tomato output loss in the study area was 41% of total output. This is higher than the 39.7% reported by Aidoo *et al.* (2014) for Offinso district in Ghana. This loss substantially reduced the quantity of tomato sold to 59% of total output. The consequence is that total revenue obtainable would have been lowered. For instance, average revenue lost was ₦262,386.28 relative to average revenue of ₦368,273.42 per farmer. In a small-scale farming system, this amount is colossal.

Table 3: Tomato output and postharvest losses

Descriptive Statistics	N	Minimum	Maximum	Mean	Standard Deviation
Farm size (ha)	164	0.10	2.50	1.16	0.64
Output (Kg)	164	1,030.00	9,860.00	3,153.04	1,547.32
Household consumption (Kg)	164	16.00	145.00	45.88	21.32
Quantity of loss (Kg)	164	422.30	4,042.60	1,292.75 (41%)	634.40
Quantity sold (Kg)	164	590.70	5,672.40	1,814.41	891.84
Total Cost of Production (₦)	164	36,050.00	345,100.00	110,356.49	54,156.31
Total Revenue (₦)	164	118,140.00	1,307,150.00	368,273.42	187,644.47
Profit (₦)	164	72,145.50	990,750.00	257,916.93	136,514.63
Value of Loss (₦)	164	84,460.00	926,600.00	262,386.28	133,470.45

The analysis of the determinants of tomato postharvest losses in table 4 showed that the t-ratio of farming experience was negative and statistically significant ($p < 0.01$). The implication is that increase in farming experience reduced the quantity of postharvest losses in tomato. Farming experience confers on the farmers the techniques of minimizing losses and improving productivity. The result also showed that farm size significantly ($p < 0.01$) increased the quantity of postharvest losses in tomato. Due to the perishability of tomato crop, large farm size would increase pressure on farmers, and since the farmers are largely uneducated, large farm size would increase losses.

The R^2 of the model showed that the independent variables in the model accounted for 48.5% of the variations in tomato postharvest losses. Variables other than those in the model would have been responsible for 51.5% of the variations in tomato postharvest losses. The F-statistic (18.231) of the model was statistically significant ($p < 0.01$), showing that variables in the model jointly and statistically affected postharvest losses in tomato.

Table 4: Determinants of tomato postharvest losses

Independent Variables	Coefficients	Standard error	T-ratio	P-value
Constant	2417.037	374.423	6.455*	0.000
Age (years)	-5.174	4.501	-1.149	0.252
Farming experience	-146.389	14.747	-9.927*	0.000
Years of formal education	3.151	7.458	0.423	0.673
Farm size (ha)	201.256	59.232	3.398*	0.001
Days to storage and market	-35.995	32.335	-1.113	0.267
Household size	-14.067	11.289	-1.246	0.215
Number of extension visits	-49.691	63.989	-0.777	0.439
Labour type	117.039	78.367	1.493	0.137
R Square	0.485			
F-statistic	18.231*			
P-value of F-statistic	0.000			

* Statistical significance at 0.01 level of probability

In table 5, the difference in postharvest losses was tested between male and female farmers was tested with the aid of independent samples test of means' difference. The result was statistically insignificant, implying that postharvest losses in tomato did not differ among male and female farmers. The homogeneity in postharvest losses observed in this study suggest that postharvest losses could be general management problem among the farmers.

Table 5: Difference in postharvest loss in tomatoes between male and female farmers

Gender	N	Mean Quantity of loss (Kg)	Mean Difference	F-statistic	P-value
Male	105	1,263.7	80.7	0.219	-0.781
Female	59	1,344.4			

The difference in postharvest losses according to variety of tomato planted showed that postharvest losses incurred by farmers who planted local variety exceed that of farmers who planted improved variety by 72.79 kg. The F-statistic was statistically significant ($p < 0.01$), implying that the difference in postharvest losses observed was not due to random error.

Table 6: Difference in postharvest loss in tomatoes according to variety of tomato planted

Samples	N	Mean Quantity of loss (Kg)	Mean Difference	F-statistic	P-value
Local variety	101	1,854.64	72.79	27.516	0.000
Improved variety	63	942.26			

CONCLUSIONS AND RECOMMENDATIONS

From the findings of the study, it was concluded that average postharvest loss among tomato farmers in Gboko LGA was quite large, as well as revenue lost due to postharvest losses. Farming experience is an important factor in reducing postharvest losses, while large farm sizes could complicate the management of postharvest losses in tomato. The study, therefore, recommended that both male and female farmers be trained on the management of postharvest losses in tomato; farmers with long farming experience should be involved in the training to share their experiences; and farm size should be as minimal as the farmers can manage so that postharvest losses do not increase.

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