Iosr Journal Of Agriculture And Veterinary Science (Iosr-Javs)
E-Issn: 2319-2380, P-Issn: 2319-2372. Volume 18, Issue 3 Ser. 1 (March. 2025), Pp 45-49
www.Iosrjournals.Org

Assessment Of Traditional Methods Used In Reducing Post-Harvest Losses Of Tomato Amongs Tomato Farmers In Zone B Area Of Benue State, Nigeria

Ogbu, Eriba Sunday
Department Of Agribusiness And Extension, Akperan Orshi Polytechnic,
Yandev, Gboko
Benue State, Nigeria

Abstract
The study analysis of traditional methods of reducing post harvest losses of tomatoes was conducted in zone B area of Benue State, Nigeria. The objectives were to analyze socio economic characteristics of the respondents, evaluate traditional methods and determine factors influencing post harvest losses. The study area is located along longitude 8º4"E and 10ºE, latitude 6º30"N and 8º10"N. The state has three agricultural zones, A. B and C. Multistage, purposive and simple random sampling techniques were used for data collection using Yaro-Yamane's proportionate sampling procedure. Data was analysed using descriptive statistics such as mean, frequency counts, percentages and multiple linear regression. Result of socio economic characteristics revealed that, majority of the respondents fall within the age group of 50-60 years, 75% were females, 39.81% had between 20-30 years of experience, majority of them attended formal education, and 37.96% had income of between 251,000-300,000. Result of traditional methods used was salting, smoking, sun drying, dewing and zeer pots. Factors influencing post harvest losses revealed Adj R^2 58%, harvesting time and temperature, harvesting and transportation methods were statistically significant at ($p \leq 0.01$) and ($p \leq 0.05$). The study concludes that, tomato farmers use traditional methods of salting, smoking, zeer pots, dewing and sun drying to reduce post harvest losses and that, harvesting time, methods, temperature and transportation influences post harvest losses on the farm, the study recommends that, farmers harvest at favourable weather condition, favourable time, and appropriate transportation methods in order to reduce post harvest losses recorded by tomato farmers in the study area.

Keywords: *post harvest losses, Tomato, Farmers, traditional methods*

Date of Submission: 13-03-2025 Date of Acceptance: 23-03-2025

I. Introduction

Vegetable production is a source of livelihood for many farmers in sub-Saharan Africa (Makerumbwa, 2017) but the situation of low agricultural productivity in Africa and Nigeria is worsened by high post-harvest losses (World Bank, 2011). Small holder vegetable farmers in developing countries encounter high incidences of post-harvest losses from the farm to the retail stage. In addition, it has been noted that not much improvement has been attained in trying to reduce the percentage loss in post-harvest in most developing countries (Kitinoja *et al*., 2011). In sub-Saharan African, various studies have estimated that smallholder vegetable farmers lose approximately 30% to 40% of their produce before they reach the final consumers (Korsten, 2006; Weinberger *et al*., 2008; Kareth *et al*., 2013). These statistics indicate a very grim picture as far as the issue of post-harvest losses of vegetable is concerned. Tomato is one of the most important vegetable crops in Nigeria cultivated by 60% of farmers. Chukwenta (2014) reported that one-third of tomatoes produced are wasted in Nigeria which accounts for 41% per year. Most of these losses occur early in the tomato value chain at the post-harvest stage. The percentage of post-harvest losses of tomatoes will further worsen if the issue of post-harvest losses is neglected. Tomatoes are highly perishable fruits exposed to a wide range of post-harvest constraints including pests, diseases, and transportation and processing hazards that often result in losses along the value chain. Losses of as high as 50% can be recorded between harvesting and consumption after storing for 90 days (Kitinoja and Gorny, 2010). The methods of reducing post-harvest losses of tomatoes have evolved alongside human civilization and the art of preserving tomatoes has been a crucial aspect of culinary traditions. In developed states, modern methods such as forced air cooling, freezing, dehydration, canning, fermentation, etc have been used to reduce post-harvest losses of tomatoes while in developing countries they use mostly traditional methods in reducing post-harvest losses of tomatoes e.g. sun drying, salting, cooling under shades,

dewing, adjustment in harvesting time, etc. it is against this background that, this study seeks to assess traditional methods of reducing post harvest losses of tomato in the study area.

II. Material And Methods

The population for the study was tomato farmers in Zone B area of Benue State. Multistage, purposive and simple random sampling techniques were used for the selection of samples for this study. In the first stage, four LGAs were selected in Zone B, in the second stage, two council wards were selected from each of the selected LGAs, and in the third stage, and two tomato producing communities were selected purposively based on the concentration of tomato farmers who produces fresh tomatoes in the study area. Simple random sampling technique was used to select 360 tomato farmers based on the registered tomato farmers with All Farmers Association of Nigeria (AFAN), Benue State Chapter. The sample size was determined with the use of Yaro-Yamane's proportionate sampling technique:

$$n = \frac{N}{[1 + (Ne^2)]}$$

Where: n = required sample size
N = population sample
e = error limit at 5%
1 = constant value

LGAs	Council Wards	Communities	Registered Tomato Farmers AFAN	Sample Size	Interval
Buruku	Mbapen	Nege	260	21	
		Ortese	170	14	
	Mbaya	Adego	280	23	
		Usen	300	25	
Gboko	Yandev	Kyado	480	40	
		Genyi	300	25	
	Mbatyu	Tse-Kucha	280	23	
		Mbakpoo	375	31	
Guma	Saav	Pavi	217	18	11.91
		Ginde	200	16	
	Kaambe	Agesha	331	27	
		Tulen	200	16	
Tarka	Mbachaveikyondo	Asukunya	310	26	
		Chia	240	20	
	Mbaigba	Tarhembe	120	10	
		Mtsor	300	25	
4	8	16	4,363	360	

Source: AFAN, 2024

Sources/Methods of Data Collection

The data for the study was collected from primary sources through administration of study questionnaires to the respondents.

Methods of Data Analysis

Data for the study was analysed using descriptive statistics such as mean, frequency distribution tables, and percentages in order to identify the socioeconomic characteristics of tomato farmers and traditional methods of reducing post harvest losses of tomato while multiple linear regression model was used to determine factors influencing post-harvest losses recorded by tomato farmers.

$$Y = P_0 + P_1X_1 + P_2X_2 + P_3X_3 + P_4X_4 + \ldots . P_7X_7 + \varepsilon_0$$

Where: Y = quantity of post-harvest losses of tomatoes (dependent variable)
X_i^n = independent variables
P = parameter estimates
ε_0 = error term
X_1 = age (years)
X_2 = sex (dummy 1=male 2= female)
X_3 = harvesting time (dummy 1=morning 2=afternoon 3= evening)
X_4 = harvesting temperature (°C)
X_5=method of transportation (dummy, head=1, wheelbarrow=2, motorcycle=3 and vehicle=4)
X_6 = farming experience (years)
X_7 = contact with extension agents (number of visits in a month)

III. Results And Discussion

Socio Economic Characteristics of the Respondents

Age Distribution of the respondents

The result of age distribution of the respondent is presented in table 1. the result revealed that, 42.60% of these interviewed for the study were within the age group of 51 to 60 years, while 30.56% of the respondents fall within the age group of 41 to 50 years and only 12.96% of the respondents fall within the age group of 30 to 40 years and 13.89 % of the respondents were 61 years and above. This implies that tomato farmers in the study area are young adult farmers who are still active to contribute their own quota to agricultural activities in the study area. The result of the sex distribution of the respondents reveals that majority of these interviewed for the study were females as represented by 75% of the respondents while only 25% of the respondents were male, this implies that vegetable farming is mostly done by females farmers in the study area since they are the majority. The result of the occupation of the respondents reveal that majority of these interviewed for the study were farmers as represented by 77.78% while 11.11% of the respondents mixed farming with trading and 8.33% of the respondents also mixed farming with civil service occupation and 2.78% of the respondents performed other occupations in the study area. Result of educational attainment of the respondents revealed that 13.88% of the respondents had no formal education 12.03% were primary and secondary school leavers 55.55% had OND, ND and NCE while 18.58% of the respondent had H.N.D, BSC and masters degree. Since those with OND, ND, and NCE are more, it then mean that, majority of the respondents had access to formal education and can therefore at least read and write , which can enable them plan and achieve better result in farming. The result of farm experience of the respondents revealed that 39.81% of the respondents have been into farming between 21 to 30 years while 26.85% of the respondents have been farming for between 11 to 20 years and 19.44% of the respondents were into farming for 10 years and below and only 13.90% of the respondents have been farming for 31 years and above. This result implies that farmers in the study area are well experienced in tomato farming. The distribution of the respondents according to household income generated revealed that, 30.56 % of the respondents earn in the range of N200, 000 to N250, 000 in a year, the result also revealed that, Majority of the respondents earn between N251, 000 to N300, 000 as represented by 37.96% of the respondents, while 15.74% of the respondents revealed that, they earn between N301,000 to N350,000 in a year from their tomato farming activities in the study area. The result also reveal that 11.11% of the respondents earn between N351,000 to N400,000 in a farming season while only 4.63% of the respondents earn N401,000 to N450,000 and above within a farming season in the study area. The implication of this result is that, farmers in the study area could achieve higher income if the area able to increase productivity.

Table 1. Socio economic characteristics of the respondents

Variable	Frequency	Percentage
Age		
Less than 30-40 years	14	12.96
41-50 years	33	30.56
51-60 years	46	42.60
61 years and Above	15	13.89
Total	**360**	**100**
Sex		
Male	27	25
Female	81	75
Total	**360**	**100**
Farm Experience		
Less Than 10 years	21	19.44
11-20 years	29	26.85
21-30 years	43	39.81
31 years and above	15	13.90
Total	**360**	**100**
Educational Attainment		
No formal education	60	55.55
Primary education	20	18.52
Secondary education	15	13.89
Total	**360**	**100**
Income		
Less than 200,000-250,000	33	30.56
251,000-300,000	41	37.96
301,000-350,000	17	15.74
351,000-400,000	12	11.11
401,000-450,000 & above	5	4.63
Total	360	100

Source: Field Survey 2024

Results of Traditional methods of reducing post-harvest losses at the farm stage.

Result of traditional methods of reducing post harvest losses of tomato in the study area is presented on table 2, the result revealed that majority of those interviewed use salting as a method of reducing post harvest losses of tomato as represented by 25.83% of the respondents, and also 23.06 % of the respondents use sun drying as a traditional method of reducing post harvest losses of tomato while 21.67% of the respondents use smoking methods to reduce post harvest losses of tomato in the study area, 16.39% of the respondents use dewing as a method of reducing post harvest losses of tomato while 12.22% of the respondents use Zeer pots as methods of reducing post harvest losses of tomato in the study area and only 0.83% of the respondents use other methods of reducing post harvest losses of tomato in the study area. This study collaborates previous study by, Asare and Twum (1997), fresh produce contains up to 95percent moisture content to support both enzyme activity and growth of microorganisms. The aim of sun-drying is to reduce the microorganisms. According to Ali (2012) the tomato paste can be kept for just a week. Salting is a process of adding salt to food in order to keep it from spoilage. Salting uses the phenomenon of dehydration; that is when salt is added to food, the value of adding salt to foods for preservation has been well known for centuries by tomato and other vegetables in the study area.

Table 2 Traditional methods of reducing post-harvest losses at the farm stage.

Variable	Frequency	Percentage
Sun drying	83	23.06
Salting	93	25.83
Smoking	78	21.67
Dewing	59	16.39
Zeer Pots	44	12.22
Others	3	0.83
Total	360	100

Source: Field survey, 2024

Factors influencing Post Harvest Losses of tomato by the respondents

The result of factors influencing post harvest losses of tomato by tomato farmers in zone B area of Benue State is presented on table 3. Four functional forms were tried, which included linear, semi-log, double log and exponential forms. The models were examined in terms of appropriateness. The linear functional form was found to be the best fit. The equation was significant at 1% level with a coefficient of determination (R^2) of about 58.The value of the R^2 implies that about 58% of the losses incurred by the respondents is explained by the seven variables included in the model. Four variables were significant with their signs conforming to econometric criteria, meaning a positive relationship exists between these variables and the dependent variable, increase by the coefficient of any of these variables leads to an increase in the dependent variable which is post harvest losses of tomato at the farm stage. Harvesting time, harvesting methods, temperature and transportation methods of tomato farmers were statistically significant at ($p \leq 0.01$) and ($p \leq 0.05$) respectively and also positive implying that an increase in losses during delay in harvesting time, high temperature, poor method of transportation will lead to an increase in the total post harvest losses of tomato at this stage by the magnitude of their coefficients 1.91%, 0.24% and 0.31% respectively by tomato farmers. The coefficients of farm experience was statistically significant at 1% but negative implying that, decrease in the number of years of experience of these farmers will lead to increase in the value of the dependent variable by the magnitude of its coefficients -0.18 % respectively, variables of sex and extension contact were statistically not significant but positive implying that these variables are contributing positively to the dependent variable. Variable of age was not statistically significant but negative implying that, as age increase, the dependent variable which is post harvest losses will also decrease by the magnitude of the coefficient. This study agrees with previous studies by, Dzahan and Onu (2022) that post harvest losses of farm produce is influenced by the some of the socio economic factors such as age ,sex and education etc , and that if this is improved upon this will reduce post harvest losses in the study area.

Table 2. Result of Factors influencing Post Harvest Losses of tomato by the respondents

LnPHLT	Coef.	t
lnage	-0.2107877	-1.37
lnsex	0.1639969	1.23
lnhtime	1.912085	18.69***
lntemp	0 .2430581	2.26***
lnmts	0.3144806	5.16***
lnfexp	-0.1819781	-2.70***
lnextc	0 .0135759	0.27
_cons	2.444701	4.00***
Adj R-squared = 0.5897		

Source: Field survey, 2024

IV. Conclusion

The study analysis of traditional methods of reducing post harvest losses of tomatoes was conducted in zone B area of Benue State, Nigeria. The objectives were to analyze socio economic characteristics of the respondents, assess traditional methods and determine factors influencing post harvest losses. Result of socio economic characteristics revealed that, majority of the respondents were young adults, more females were involved in tomato production in the study area, this study also concludes that farmers were well experienced; majority of them attended formal education, and were low income earners. Result of traditional methods used was salting, smoking, sun drying, dewing and zeer pots. Factors influencing post harvest losses revealed that, harvesting time and temperature, harvesting and transportation methods were statistically significant at one and five percent respectively. The study concludes that, tomato farmers use traditional methods of salting, smoking and sun drying to reduce post harvest losses and that, this study therefore recommends their continuous usage. This study also concludes that, harvesting time, methods, temperature and transportation influences post harvest losses on the farm, the study therefore recommends that, farmers should harvest at favourable weather condition, farmers should also harvest at the right time, and the use of appropriate transportation methods is also encouraged in order to reduce post harvest losses recorded by tomato farmers in the study area.

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