

**THEMATIC MEASURES FOR REDUCING POST-HARVEST LOSSES OF VEGETABLE CROPS AMONG FARMERS IN BENUE STATE, NIGERIA**

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**ABSTRACT**

The survey was carried out to ascertain thematic measures for reducing post-harvest losses of vegetable crops among farmers in Benue State, Nigeria. Questionnaire was used to collect data from a sample of 96 respondents used for the study. Data were analyzed using frequency, percentage, mean score, and standard deviation. Findings of the study revealed that about 57% of the respondents were females while 42.7% were males, 46.9% of the respondents were aged 31–40 years, and majority (80.2%) were married with 75.0% of the respondents having farming as a major occupation. A greater percentage (78.1%) of the respondents had between 6 and 10 years of farming experience and mean household size of about six persons. Results show effects of post-harvest losses to include reduction in income generation (M=3.80), decrease in quality of produce (M=3.66), unstable supply of produce (M=3.39), high cost of vegetable (M=3.30), decrease in nutritional content of the produce (M=3.26), loss of investment made by the farmer (M=3.25), and reduction on availability of vegetables for household consumption (M=3.24). Adequate provision of storage facilities (M=3.85), proper cleaning of produce (M=3.65), proper packaging of produce (M=3.60), adequate transportation facilities (M=3.56), sale of produce immediately after harvest (M=3.45), and harvesting at the right time (M=3.45) were measures indicated by the respondents for reducing post-harvest losses of vegetable crops. The study therefore recommends that there is a need for provision of adequate storage facilities to prevent losses of vegetable crops after harvesting. It also highlights that good sanitation practices in all post-harvest operations are very important factors in eliminating sources of infection and reducing contamination.

**Keywords:** Measures, Post-harvest, Losses, Vegetable crops, Farmers, Nigeria.

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**INTRODUCTION**

The major sector of the Nigeria economy is agriculture which contributes more than 30% of the total annual GDP, employs about 70% of the labor force, accounts for more than 70% of the non-oil exports, and most importantly provides over 80% of the food needs of the country (Adegboye, 2004). The country produces a wide range of crops which are lost at one level or the other at post-harvest stage leading to wastage in human efforts, farm inputs, and investments. Post-harvest losses can be caused by a wide variety of factors, ranging from growing conditions to handling at retail level. Farmers in Nigeria produce a lot of crops to boost the economy but most are lost at post-harvest stage. Traditional techniques practiced by growers, traders, and the processors results in considerable deterioration of physical and nutritional qualities of harvested crops (Oni and Obiakor, 2002).

Post-harvest losses of these crops range between 20% and 40% as a result of inefficient methods of harvesting and processing/storage techniques (Mrema and Rolle, 2002). In Nigeria, especially in Benue state, losses of vegetable crops occur at all stages in the post-harvest chain, from harvesting, handling, storage, processing, packaging, transportation and marketing until crops are delivered to the final consumers. Post-harvest losses are not only of perishable crops but also grains, livestock, and fish. It is estimated that as much as 40% of vegetables are wasted after harvest. It becomes pertinent for post-harvest losses of vegetable crops to be reduced to the lowest minimum to boost food security in the country (Mrema and Rolle, 2002).

Post-harvest losses of fruits and vegetables are more serious in developing countries than those in well developed countries. An additional constraint to this situation is that in most developing countries, the number of scientists concerned with post-harvest food losses is significantly lower

than those involved in production research (Nyamulinda *et al.*, 2011). In the early days of horticulture in developed countries, heavy losses occurred in much the same manner as they do today in developing countries. Increasing industrialization in technologically advanced nations gradually brought about improvements in crop handling. Elaborate harvesting equipment replaced the crude harvesting tools. Collection centers were strategically established in major producing areas. Containers were remodeled to add more protection to the produce. Commercial storage plants were installed and grade standards adopted. Engineers and economists became more and more aware of raw material behavior (Nyamulinda *et al.*, 2011). Concomitant advances in refrigeration technology in the developed countries have made possible establishment of cold rooms for the entire post-harvest and handling operations. At the institutional level, post-harvest research was initiated. Pilot packing houses were installed, coupled with the development of intensive training programs, the improvement of product quality and reduction in post-harvest losses became the main concern of producers, middlemen, marketing specialists, and consumers. According to Atanda *et al.* (2011), enormous volumes of quality horticultural crops produced in technologically advanced countries are made available to millions of people through improved post-harvest handling. These handling procedures are not fully recognized in less developed countries. This therefore raises the following questions. What are socioeconomic characteristics of the respondents? What are effects of post-harvest losses on vegetable crops? And what are measures for reducing post-harvest losses of vegetable crops?

Specifically, the survey sought to:

1. describe socioeconomic characteristics of the respondents;
2. identify effects of post-harvest losses on vegetable crops; and
3. ascertain measures for reducing post-harvest losses of vegetable crops.

## METHODS

The research work was conducted in Benue State, Nigeria. The state lies within the lower Benue trough in the middle belt region of Nigeria. It has three geopolitical zones, namely, Zone A (Eastern zone), Zone B (Northern zone), and Zone C (Central zone). Benue state has an area of 2882 km<sup>2</sup> with a population of 4,253,641 people (National Population Census, 2006). Its geographic coordinates are longitude 7°47' and 10°0' East and latitude 6°25' and 8°8' North. It shares boundaries with other states, namely, Nasarawa state to the North, Taraba state to the East, cross-river state to the South-west and kogi state to the West. The state also shares a common boundary with the republic of Cameroon on the South. Benue state occupies a landmass of 34,059 square kilometer. It has 23 local government areas. The major tribes in the state are Tiv, Idoma, and Iggede. Other tribes that are found in the state include Etulo, Abakpa, Jukun, Atausa, Akweya, Nyifon, Ibo, and Hausa, among others. Benue state experiences two distinct seasons, wet, and dry season. The rainy season lasts from April to October with annual rainfall in the range of 100–200 mm. The dry season begins in November and ends in March. Temperature fluctuates between 21°C and 27°C in the year. The South-east part of the state adjoining the Obudu- Cameroon mountain range, however, has a cooler climate similar to that of the Jos Plateau. Farming is the major occupation of the indigenes with more than 75% of the population engaging in it. Benue state is the nation's acclaimed food basket because of its rich agricultural produce which include yam, rice, beans, cassava, sweet-potato, maize, soya bean, sorghum, millet, sesame, and cocoyam. The state accounts for over 70% of Nigeria's soya bean production. They also rear livestock such as pig, goat, sheep, and chicken. Fishing is also a major activity in the state. Fruits such as mangoes and oranges of various quantities are also produced in large quantities.

The population of the study consisted of farmers who grow vegetables in the study area. Zone B was selected purposively for the study out of the three zones as a result of large quantities of vegetables produced in the area. Two local government areas were selected from the zone using simple random sampling technique. Furthermore, two communities were selected from each of the local government areas using simple random sampling technique. Twenty-five respondents were selected from each of the local government areas using simple random sampling technique. This gave a total of 100 respondents. It was discovered that four copies of the questionnaire were not filled properly which were discarded in the course of data analysis, leaving a total of 96 respondents who were used for the study.

Copies of questionnaire were used for data collection. Data were analyzed using frequency, percentage, mean score, and standard deviation.

## RESULTS AND DISCUSSION

### Sex

About 57% of the respondents were females while 42.7% were males (Table 1). It shows that females were mostly involved in vegetable crop production. This could be because it is less laborious and less tasking compared to cultivation of other crops such as yam. This disagrees with Fakayode *et al.* (2012) who stated that about 71% of vegetable farmers were males while few (29.3%) were females.

### Age

Data in Table 1 reveal that 46.9% of the respondents were aged 31–40 years, 27.1% were within the ages of 21–30 years while 15.6% were aged 41–50 years, among others. The mean age of the respondents was 36 years. This implies that the respondents were young, energetic, and in their productive ages, hence, greater involvement in vegetable crop production. This is in line with Ajayi *et al.* (2008) who observed that the age range between 31 and 40 years accounted for 34.0% of the rural farming households whereas between 41 and 50 years accounted for 30.0%. He reiterated that the active ages of between 31 and 40 years are mostly the labor force engaged in food production.

### Marital status

Majority (80.2%) of the respondents were married while 19.8% were single (Table 1). This implies that the respondents involved in vegetable crop farming were mostly married women with greater responsibility who uses income from vegetable crop production to sustain members of their households. This agrees with Ajayi *et al.* (2008) who observed that about 89.0% of the rural farming household were married while the rest were single.

### Level of education

Table 1 reveals that about 44% of the respondents had secondary education, 21.9% had tertiary education, and 20.8% had primary education while 13.5% had non-formal education. This implies that the respondents were literate enough to be able to adopt any new innovation to boost their vegetable crop production. This agrees with Fakayode *et al.* (2012) who reported in their studies that half of the vegetable crop farmers had up to secondary education, some had tertiary education, among others.

### Household size

Entries in Table 1 indicate that about 83% of the respondents had household size of 6–10 persons while 16.7% had household size of

**Table 1: Distribution of respondents according to socioeconomic characteristics (n=96)**

Socio-economic characteristics	Frequency	Percentage	Mean score
Sex			
Male	41	76.3	
Female	55	23.7	
Age (years)			
<20	-	-	
21–30	26	27.1	
31–40	45	46.9	36.3
41–50	15	15.6	
Above 50	10	10.4	
Marital status			
Single	19	19.8	
Married	77	80.2	
Level of Education (years)			
Non-formal education	13	13.5	
Primary education	20	20.8	
Secondary education	42	43.8	
Tertiary education	21	21.9	
Household size (numbers)			
1–5	16	16.7	6.6
6–10	80	83.3	
11–15			
Major occupation			
Civil service	14	14.6	
Farming	72	75.0	
Trading	10	10.4	
Farm size (hectares)			
1–3	91	94.8	2.0
Above 3	5	5.2	
Farming experience (years)			
1–5	21	21.9	
6–10	75	78.1	8.2
11–15	-	-	
Estimated annual income (Naira)			
<50,000	35	36.5	
50,001–100,000	44	45.8	
100,001–150,000	7	7.3	81,802.0
150,001–200,000	7	7.3	
Above 200,000	3	3.1	
Non-farm occupation			
None	71	74.0	
Hair dressing	2	2.1	
Tailoring	2	2.1	
Petty-trading	20	20.8	

between 1 and 5 persons. The mean household size was about six persons. This implies that the respondents had a relatively large household size which could serve as source of labor used in vegetable crop production. This agrees with Mbah *et al.* (2016) who stated that large household size could provide labor for farming activities.

#### Major occupation

Majority (75.0%) of the respondents had farming as a major occupation, 14.6% were civil servants while 10.4% were traders (Table 1). This implies that farming is the dominant occupation of the people in the study area. This is in line with Muhammad *et al.* (2012) who revealed that most of vegetable crop farmers were full-time farmers while others engaged in other occupations such as civil service, petty trading, and tailoring.

#### Farm size

Results in Table 1 show that majority (94.8%) of the respondents had farm size of 1–3 hectares while 5.2% had above 3 hectares for cultivating vegetables. The mean farm size was 2.0 hectares. This implies that the respondents had access to considerable size of farm land which they use in cultivation of vegetables.

#### Farming experience

A greater percentage (78.1%) of the respondents had between 6 and 10 years of farming experience while 21.9% of respondents had 1–5 years of farming experience (Table 1). The mean farming experience was 8 years. This is as a result of the fact that majority of the respondents were middle aged, with few years of experience in vegetable crop production. This disagrees with Fakayode *et al.* (2012) who noted that the average year of involvement of farmers in vegetable farming was found to be 15.3 years.

#### Estimated annual income

Data in Table 1 show that 45.8% of the respondents earned between ₦50,001 and ₦100,000 from sale of vegetables, 36.5% earned less or equal to ₦50,000, 7.3% earned ₦100,001– ₦150,000, 7.3% earned ₦150,001–₦200,000 while 3.1% earned above ₦200,000. This indicates that the respondents obtained reasonable amount of money from the sale of vegetables which empowered them economically.

#### Non-farm occupation

Results in Table 1 reveal that about 74% of the respondents were not involved in any non-farm occupation, 20.8% of the respondents were involved in petty-trading, 2.1% were involved in hair dressing while 2.1% were involved in tailoring. This indicates that some of the respondents were engaged in non-farm occupations to be economically stronger to meet up with family responsibilities. The findings agree with Ajani (2012) who stated that rural farmers are engaged in non-farm occupations such as petty trading, tailoring, hair dressing, civil service, and among others to obtain additional income to empower themselves financially.

#### Effects of post-harvest losses on vegetable crop farmers

Results in Table 2 reveal major effects of post-harvest losses to include reduction in income generation (M=3.80), decrease in quality of produce (M=3.66), unstable supply of produce (M=3.39), high cost of vegetable (M=3.30), decrease in nutritional content of the produce (M=3.26), loss of investment made by the farmer (M=3.25), and reduction on availability of vegetables for household consumption (M=3.24). Others were scarcity of produce (M=3.22), malnutrition (M=3.19), reduction in market value of produce (M=3.18), loss of farm inputs such as fertilizer, herbicides (M=3.13), deterioration in appearance of the vegetable (M=3.00), diversification into non-farm occupation (M=2.82), and loss of scarce resources such as water used in production (M=2.60). This shows that post-harvest losses have several adverse effects on farmer income, availability, and nutritional quality of the produce. The findings agree with Ukoh-Aviomoh and Okoh (2005) who reported that food losses lead to loss of income and food supplied to rural families, thereby threatening household food security which can result in malnutrition.

**Table 2: Distribution of respondents according to effects of post-harvest losses on vegetable crops**

Effects	Mean score	Standard deviation
Reduction in income	3.80	0.45
Decrease in quality of produce	3.66	0.74
Loss of farm inputs such as fertilizer, herbicides	3.13	0.98
Reduction in availability of vegetables for household consumption	3.24	0.87
Loss of scarce resources such as water used in production	2.60	1.19
Malnutrition	3.19	0.89
Diversification into non-farm occupations	2.82	1.04
Decrease in nutritional content of produce	3.26	0.92
High cost vegetables	3.30	0.85
Unstable supply of produce	3.39	0.77
Reduction in market value of produce	3.19	0.84
Scarcity of produce	3.23	0.86
Loss of investment made by the farmer	3.25	0.81

**Table 3: Distribution of respondents according to measures for reducing post-harvest losses of vegetable crops**

Measures	Mean score	Standard deviation
Adequate provision of storage facilities	3.85	0.38
Proper cleaning of produce	3.65	0.65
Proper packaging of produce	3.60	0.72
Adequate transportation facilities	3.56	0.63
Proper sorting and grading of produce	3.39	0.65
Sale of produce immediately after harvest	3.45	0.68
Transportation of produce during cool hours of the day	3.30	0.89
Harvesting of produce at the right time	3.45	0.68
Proper handling of produce	3.31	0.85
Adequate provision of processing facilities	3.33	0.87
Drying of produce	3.17	0.83
Use of paper to wrap produce	2.60	1.01
Storing of produce in clay pots	2.63	0.99
Storing of produce in buckets	2.59	1.07

#### Measures for reducing post-harvest losses of vegetable crops

Table 3 shows measures for reducing post-harvest losses of vegetable crops which are adequate provision of storage facilities (M=3.85), proper cleaning of produce (M=3.65), proper packaging of produce (M=3.60), adequate transportation facilities (M=3.56), sale of produce immediately after harvest (M=3.45), and harvesting at the right time (M=3.45). Others include proper sorting and grading of produce (M=3.39), adequate provision of processing facilities (M=3.33), proper handling of produce (M=3.31), transportation of produce at cool hours of the day (M=3.30), and drying of produce (M=3.17), among others. This implies that thematic measures for reducing post-harvest losses of vegetable crops are centered mostly on harvesting, handling, packaging, transportation, and storage of the produce. The finding agrees with Atanda *et al.* (2011) who stated that transporting crops during the cool hours of the day by driving carefully over smooth roads will minimize damage to crops. The authors reiterated the need to sort out damaged crops from undamaged ones and removing dirt from sound crops before putting into transport containers.

#### CONCLUSION AND RECOMMENDATIONS

Majority of the respondents were females, young, married, literate, and having farming as a major occupation. Reduction in income, decrease in nutritional content of produce, diversification into non-farm occupation, reduction on availability of vegetables for household consumption, scarcity of produce, reduction in market value of produce, and among

others were effects of post-harvest losses of vegetable crops. Thematic measures for reducing post-harvest losses of vegetable crops include adequate provision of storage facilities, proper cleaning of produce, proper packaging of produce, adequate transportation facilities, sale of produce immediately after harvest, harvesting at the right time, proper sorting and grading of produce, adequate provision of processing facilities, proper handling of produce, transportation of produce at cool hours of the day, and among others.

The study recommends the need for provision of adequate storage facilities in order to prevent losses of vegetable crops after harvesting. It also emphasizes that good sanitation practices in all post-harvest operations are very important factors in eliminating sources of infection and reducing contamination. The study highlights that effective traditional methods for preventing and reducing post-harvest losses need to be identified and exploited since modern methods are not utilized fully in order to reduce losses and maximize profit.

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