

Effects of Postharvest Losses on Selected Fruits and Vegetables Among Small-scale Farmers in Gboko Local Government Area of Benue State, Nigeria

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ABSTRACT: The study examined the effects of postharvest losses on selected fruits and vegetables among small-scale farmers in Gboko Local Government Area of Benue State. Purposive sampling was adopted in selecting four different local fruits and vegetable markets, in each of the markets selected 30 respondents (fruits and vegetables producers) were selected randomly, making a total of 120 respondents. Structured questionnaire was administered on the respondents through interview. Data collected were analyzed through descriptive statistics and multiple regression. Results of the findings revealed that 55% of the producers were female, 38.2% were age between 21-30 years, 85.8% had family size of between 1-5 persons, 36.7% attended tertiary institutions, 62% were farmers and 56.7% had farming experience of between 1-9 years. The results further revealed that 48.5% lost about \$30.5 on annual basis, 35% lost at least 1,000Kg of fruits and vegetables on annual basis, 57.5% lost produce due to non-availability of buyers, 55% of the produce were tomatoes, there was a significant difference between effects of postharvest losses and socio-economic characteristics of the respondents at ($P < 1$). It is recommended that government should provide infrastructure for fruits and vegetables processing industries to be established in the area to avoid fruits and vegetables wastages.

KEYWORDS: postharvest, losses, fruits, vegetables, farmers.

INTRODUCTION

In Agriculture, post harvest handling is the stage of crop production immediately following harvest. It includes storage, cleaning, packing, transportation and sorting [1]. The most important goals of postharvest handling are to keep the produce cool, thereby avoiding moisture loss and slowing down undesirable chemical changes and to avoid physical damage such as bruising to delay spoilage. This in turn will help ensure increased food security as food security goes beyond food production to include distribution and marketing, adequate and stable supply, and accessibility to food. Usually, losses occur from poor storage conditions in the markets and poor packaging during transportation. Due to the physiological form of fruits and vegetables, they deteriorate easily in transit and storage, especially under conditions of high temperature and humidity and as a result, heavy losses occur in these crops [2]. Physiological form of fruits and vegetable encourages increased pace of metabolic activities, which is quickened by higher temperatures prevalent in tropical countries. Respiration brings about loss of considerable quantity of the main nutritional ingredient-ascorbic acid in vegetables. Losses of fruits and vegetables also occur in transit due to long distance to markets, poor and inadequate infrastructure, and the method of transportation [3].

According to [4], in developing countries postharvest losses of fruits and vegetables are more serious than those in developed countries. In most developing countries the number of scientists concerned with postharvest handling research is significantly lower than those involved in production research. The handling procedures used in technologically advanced countries to reduce post harvest losses are not fully recognised in developing countries. [4] further suggests that in developing countries, for perishable crops like fruits and vegetables, storage, packaging, transporting and handling technologies are practically non-existent, hence considerable amount of produce are lost. [5] outlines the multiple effects of post harvest loss as going beyond the loss of the actual crop to include loss in the environment, resources, labour needed to

produce the crop and livelihood of the individuals involved in the production process. Post harvest loss tends to prevent adequate supply of and accessibility to fresh agricultural produce, thereby causing an increase in the price of such produce at certain period in the year and leading to a glut at another time.

In Nigeria post harvest losses of fruits and vegetables amounts to 35-45% of the annual production [6]. This is because in Nigeria, generally handling procedures are not fully recognized and understood. Understanding factors that contribute to post harvest losses of fruits and vegetables is very critical, these factors include environmental conditions such as heat, drought, mechanical damage during harvesting and handling, improper post harvest sanitation, unsuitable packaging materials, poor cooling and storage practices [7]. To achieve self sufficiency in food, there is an urgent need to match all efforts at increasing crop production with equal if not greater efforts of post harvest technology to save the crops that are produced from deterioration and wastages [8; 9; 10].

It is distressing to note that much is being devoted to planting crop, so many resources are spent on irrigation, fertilizer application and crop protection measures only to be wasted in few days after harvest. Fresh horticultural produce is highly perishable with some estimates suggesting a postharvest loss of 30 to 50% in fruits and vegetables. The loss occurs due to poor pre-production and post-harvest management as well as lack of appropriate processing and marketing facilities. These losses have several adverse impacts on the farmer income, consumer prices and nutritional quality of the produce. Nigeria with a population of over 150 million people is considered an agrarian nation because over 80% of her population engages in agricultural activities. However, about 90% of Nigerian farmers engage in subsistence agriculture without adequate capital to expand their farms and store their farm produce after harvest so that agro-processing facilities could access them all year round. Due to the dearth of infrastructural facilities such as good roads, processing and storage equipments as well as inadequate marketing information, huge quantities of these agro raw materials waste uncontrollably.

Absence of farm storage facility and proper pack house/packing station results in the perishable produce being marketed immediately after harvesting without primary processing and adequate packaging [11]. The solid wastes originating from horticultural crops in the rural areas can create drainage problems, as well as invite stray animals near garbage dumps. These bio-wastes also deteriorate very rapidly causing unhygienic conditions, increasing atmospheric pollution and provide a breeding ground for pests. The loss of food in the post-harvest system is not new; it has always been a problem for mankind. In these days of rapidly enlarging population in the poorest countries of the world where food is already short, there is an increasing urgency to do a better job of conserving food supply in order to alleviate hunger and malnutrition [12]. Efforts to reduce post harvest losses of high perishable produce such as fruits and vegetables in developing countries are considered crucial not only to avoid wastage but also to reduce the cost of preventing food losses [13]. Fruits and vegetables preservation is considered to be the less costly option compared to producing a similar additional amount of food of the same quality. Hence, cutting the cost of post harvest losses will reduce prices for the consumers and increase the farmers' income [13].

Appropriate post harvest handling practices are important to minimize post harvest losses and to maintain the quality of fruits and vegetables. Potential post harvest handling activities include packaging, pre-treatment, pre-cooling, washing with water and sorting [11]. The function of packaging is to protect the produce from mechanical injury and contamination during marketing. It also prevents moisture loss, and facilitates in chemical treatment and ethylene absorption [14]. Pre-treatment of fruits are mostly carried out to protect the produce from decay causing factors such as microorganisms [11]. Rapid pre-cooling of commodities with short post harvest shelf life will maintain the produce in a condition acceptable to the consumer because rapid lowering of temperature could help slow down the rate of metabolism and therefore extend the shelf life of the produce [15]. Usually, cleaning and washing are the only preservation treatments applied to minimally process fresh fruits and vegetables. Cleaning could also involve removal of foreign materials like twigs, stalks, dirt, sand, soil, insects, pesticides and fertiliser residues from fruits and vegetables, as well as from containers and equipment [16]. In addition, sorting is carried out to discard decayed or injured produce and therefore to limit the spread of infection to other units, especially if no post harvest pesticides are used [17].

METHODOLOGY

Gboko is one of the 23 Local Government Areas (LGAs) in Benue State, It is located between longitude 8° and 9° East and latitude 7° and 9° North with a land mass of about 4,000 square kilometres and a population of about 358,936 people [18]. The LGA is largely inhabited by Tiv (one of the local tribes in the study area) people who are predominantly farmers. They produce a variety of crops like yam, groundnut, soybeans, maize, rice, sorghum, tomatoes, pepper, garden eggs, okra, citrus, mangoes, cashew, and pears among others. Gboko LGA experiences tropical climate with dry and rainy seasons. Purposive sampling was adopted in selecting four different local fruits and vegetable markets, in each of the markets selected 30

respondents (fruits and vegetables producers) were selected randomly, making a total of 120 respondents. Structured questionnaire was administered on the respondents through interview. Data collected were analyzed through descriptive statistics and multiple regression.

The formula for multiple regression model is given by:

$$Y = A + B_1X_1 + B_2X_2 + B_3X_3 + B_4X_4 + B_5X_5 \text{ ----- (1)}$$

Where

Y = post-harvest loss experienced by farmers in kg (dependent variable)

A = constant

B₁, B₂, B₃, B₄ and B₅ = coefficients of the variables

X₁ = Age

X₂ = level of education

X₃ = years of farming experience

X₄ = annual income

X₅ = family size

RESULTS AND DISCUSSION

Table 1: Selected Socio-economic Characteristics of the Respondents

Variables	Frequency	Percentage
Sex		
Female	66	55.0
Male	54	45.0
Age (years)		
21-30	46	38.2
31-40	36	30.0
41-50	19	15.9
51 and above	19	15.9
Family size		
1-5	103	85.8
6-10	13	10.8
11 and above	4	3.4
Educational status		
Tertiary education	44	36.7
Secondary education	38	31.7
Primary education	21	17.5
No formal education	17	14.1
Major occupation		
Farming	73	62.0
Civil service	17	14.1
Others	16	12.3
Artisan	13	10.8
Fishing	1	0.8
Farming experience (Years)		
1-9	68	56.7
10-19	33	27.5
20-29	14	11.7
30 and above	5	4.1

SEX

Results in Table 1 show that majority of 55% of the respondents were female. Female were more involved in fruits and vegetables production in the area because it is relatively less laborious and less tasking compared to cultivation of other crops like yam, groundnut, soybeans, rice, etc which most male are engaged in their cultivation. Most of the agronomic practices such as weeding, harvesting, fertilizer application and selling of the produce are mostly done by female which make them participate in large number in producing fruits and vegetables. The production and sell of fruits and vegetables also provide weekly income for the ladies who sell fruits and vegetables and use the money for buying of kitchen utensils and condiments for cooking. This finding is similar to that of [19] who stated that the women are mostly involve in farm activities that are less laborious.

AGE

Results in Table 1 reveal that reasonable proportion (38.2%) of the respondents were between 21- 30 years. This means that the producers were young and very active farmers. Age of a farmer is said to influence farmer's maturity and decision making ability. Age of a farmer also help in making decision on the type of crops planted. Planting of fruits and vegetable crops has to do with age group that is very active because during harvest, fruits and vegetable are harvested between two to three times in a week. This kind of farm activity is more suited for people who are energetic which is why young people were more involved in farming fruits and vegetables.

FAMILY SIZE

Results in Table 1 show that majority 85% of the respondents had family size of between 1- 5 persons. This means that the respondents do not provide for themselves only but also provide for their dependants. Most rural households in Nigeria are large because of the kinship structure and the extended family system. This means extended family system is practise in the study area, where parents and other relations dwell together as a household. The implication of this finding is that a large family size, more family labour would be readily available. This finding is similar to those of [20] who stated that most rural farm families in Nigeria are between 6-10 persons.

EDUCATIONAL STATUS

Results in Table 1 depict that a reasonable (36.7%) proportion of the respondents attended tertiary institution. This shows that there is a relative high literacy level among the farmers. The relative high level of literacy among the farmers could be attributed to the high concentration of tertiary institutions in the study area; there are four tertiary institutions in Gboko town and the quest for acquisition of higher educational certificate which has made many people to enrol for programmes in the higher institution. This confirms [21] who observed that there was relatively high literacy level around Gboko and Makurdi towns as a result of existing tertiary educational institutions in the area.

MAJOR OCCUPATION

Results in Table 1 reveal that majority (60.0%) of the respondents were farmers. In Nigeria particularly in Benue State, a lot of people are engaged in farming on small-scale as their major occupation primarily because the soil is very fertile, the climatic conditions is also good for production of many crops. The involvement of many people in farming in the state has made Benue State earn the slogan "food basket of Nigeria". The soil fertility is good for production of many crops which cannot be produce neither in the northern or southern parts of Nigeria.

YEARS OF FARMING EXPERIENCE

Results in Table 1 depict that a major (56.7%) proportion of the respondents had farming experience of between 1- 9 years. Experience is very important in farming business especially when dealing with fruits and vegetables which are perishable agricultural produce. An experience farmer would be aware of when to plant his crops, when to harvest, most agronomic practices required for quality yield. In terms of marketing an experience farmer knows where to get marketing information and when to sell his produce to maximize profit.

Table 2: Distribution of Respondents According to Monetary Value of Produce Lost in a Season

Amount of Money Lost	Frequency	Percentage
≥ 5,000	57	48.5
5,001 - 10,000	24	21.0
10,001 - 15,000	9	7.5
15,001 – 20,000	7	4.8
20,001 and above	23	18.2
Total	120	100

Results in Table 2 depict that a reasonable (45.8%) proportion of the respondents lost about (\$30.5) on annual basis. This could be attributed to non-availability of processing facilities, poor pricing, non-availability of buyers and poor or no storage facilities in the area. When there are no buyers available, fruits and vegetables brought for sale got rotten and spoil in large quantity. Fruits and vegetables get spoiled easily because they contain high water content therefore need proper storage facilities to prevent spoilage; but due to lack of storage facilities, non-availability of buyers among others, farmers' energy is wasted and income is lost. Lack of processing facilities within the production area also leads to non-availability of buyers because if the produce bought there is no facility to process or store it for future use. This implies that money and other resources are lost since there is no market to sell the produce. This confirms [22] which stated that 10 million tons of food per annum conservatively estimated at over ₦825 billion is reported to be lost to spoilage and wastage occasioned by the lack of postharvest management.

Table 3: Distribution of Respondents by Annual Output (Kg)

Quantity (kg)	Frequency	Percentage
≥ 1,000	42	35.0
1,001 - 2,000	26	21.7
5,001 and above	22	18.3
3,001 – 4,000	14	11.7
4,001 – 5,000	9	7.5
2,001-3,000	7	5.8
Total	120	100

Results in Table 3 show that a reasonable proportion (35.0%) of the respondents produced ≥1000kg of fruits and vegetables on annual basis. This reveals that the respondents were subsistence farmers who produced on small-scale. In most African countries a large population of people are involved in agricultural production at the subsistence level, the practice of agriculture at subsistence level has made provision of farm equipment and machinery difficult, it has also discourage agricultural mechanization. The situation is made worse by inadequate infrastructure, making the processing of raw materials a very difficult task. Also due to lack of application of appropriate technology, the subsistence farmers' output is generally very low.

Table 4: Distribution of Respondents by Factors Responsible for Postharvest Losses

Reasons for Postharvest Losses	Frequency	Percentage
Non-availability of buyers	69	57.5
Poor pricing	32	26.7
Others	15	12.7
Roads not motorable during rainy season	4	3.1
Total	120	100

Results in Table 4 show that majority (57.5%) of the respondents stated that non-availability of buyers is a major factor responsible for postharvest losses. The absent of agro-processing industries in the area in particular and northern part of Nigeria in general has made many perishable agro-commodities to be wasted in the hands of farmers as people coming from other parts of the country do not reach the market in time as a result of bad condition of roads or deliberately delay as a strategy to get to the market late and buy at cheap price. Also non-availability of many buyers equally creates an opportunity for the few who are in the market to pay lower prices for the produce. These discourage many farmers from planting

perishable crops. This confirms [23] who reported that the problem of inadequate buyers for perishable crops exist in many locations and is accentuated by lack of communication between producers and retailers, and lack of marketing information especially from the angle of the farmers.

Table 5: Distribution of Respondents According to the Most Prevalent Crops Lost During Harvest Season

Variable	Frequency	Percentage
Tomatoes	66	55.0
Pepper	22	18.3
Amaranthus	18	15.0
Mangoes	8	6.7
Okra	6	5.0
Total	120	100

Results in Table 5 show that majority (55.0%) of the respondents stated that tomatoes were mostly lost during the harvest season. This is due to non-availability of storage facilities and the high water content of the fruit which make them spoil easily after harvest. The wastages that take place during the harvest of fruits and vegetables affect farmers' economic status as the money incurred for production compare to amount of money realized during harvest does not worth embarking on this farm business. This finding collaborates [24] who stated that postharvest loss estimate figure for fruits and vegetables are difficult to substantiate, especially in developing countries like Nigeria. It is, however, estimated that losses as high as about 40-50% to tomatoes and about 20-30% of pepper occur at postharvest storage annually.

Table 6: Effects of Selected Socio-economic Characteristics on Postharvest Losses

Variable	Coef.	t. ratio	Signf.
(Constant)	-	- 0.673	0.502
Age	0.030	0.245	0.807
Level of education	0.168	1.961	0.052
Years of farming experience	0.178	1.465	0.142
Annual income	0.292	3.234	0.002*
Family size	0.142	1.490	0.139
R ²	0.202		

* Significant at 1%

Results in Table 6 show that annual income of the respondents is significant at 1%; this means there is a significant difference between effects of postharvest losses and socio-economic characteristics of the respondents. This means increase in annual income of the respondents will lead to loss of more fruits and vegetables because farmers will produce more and there will be more losses.

CONCLUSION AND RECOMMENDATIONS

In developing and indeed tropical countries, both qualitative and quantitative losses of agricultural produce occur at all stages in the postharvest chain, from harvesting, through handling, storage, processing, transportation and marketing until crops are delivered to the final consumers. Postharvest losses are more serious on perishable crops. It is estimated that Nigeria postharvest losses of fruits and vegetables amounts to 35-45% of the annual production. Hence, the elimination of postharvest losses of agricultural produce is very important to boost food security. In a developing country like Nigeria where that standard of living of many people is very low there urgent need to finding solutions to the problems of postharvest losses for farmers to maximize profit and make fruits and vegetable available throughout the year. It is recommended that government should provide infrastructure for the private sector to establish fruits and vegetables processing industries.

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