



ASSESSMENT OF HANDLING LOSSES OF SOME MAJOR FRUITS AND VEGETABLES GROWN IN ADAMAWA STATE, NIGERIA

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ABSTRACT

The aim of the study was to assess handling losses in some fruits and vegetables in Adamawa State, in order to provide relevant information for formulation of policy and strategies for losses reduction in the areas. A sample of 280 farmers and traders were selected randomly from fourteen local government areas spread across the three Senatorial Zones of the state. A self – study questionnaire was designed and used to collect data; copies of the questionnaire were distributed and returned by hand. The data collected were analysed by percentages and other appropriate tools, the result interpreted at 5% level of significance. The study revealed that losses ranged from 21 – 37% in various fresh products, with a mean loss of 28%; while mean loss in dry products is 4%. Losses occurred in form of spoilage, wilting and mechanical damage. The causes of losses are poor harvesting practices, exposure of the products to the sun during transportation and storage under non - ideal conditions. Recommendations were made that could lead to reduction in these losses.

Keywords; Assessment, Handling losses, Fruits, Vegetables.

INTRODUCTION

Fruits such as mango and orange are juicy seed bearing structures of flowery plants that may be eaten as supplement to a meal or alone usually in raw form, while vegetables like sorrel and spinach are soft edible portions of plants which can be eaten alone or as part of a meal in cooked form (Tehinse, 1985). Vegetable production forms a substantial percentage (about 25%) of the major food crops cultivated in the tropics and so it is the source of livelihood for a considerable section of the population (Kra and Bani, 1988). In terms of value of production, vegetables rank even higher than all cereals except rice, all root crops, and all grain legumes. Fruit and vegetable production, marketing, processing, transport and export contribute significantly to employment and income. The importance of fruits and vegetables cannot be overemphasized due to the role they play in supplementing the important nutrients in our diet and also the health benefits derived from them. Fruits and vegetables can provide widely accessible sources of essential vitamins (particularly A, C, niacin, riboflavin and thiamine), and minerals (such as calcium and iron), as well as supplementary protein and calories. (F.A.O1990). Some vegetables, according to Asian Vegetable Research and Development Centre (1971), such as roots, tubers and leafy greens, are capable of producing protein and calories comparable to those of the most efficient staple cereal crops. Fruits and vegetables promote intake of essential nutrients from other foods by making them palatable. They also provide dietary fibre to improve digestion and health, and they are essential for properly balanced diets. In Nigeria, enormous quantities of fruits and vegetables are produced and staggering figures are sometimes given as estimated annual production. For example, figures like 3.8 million tonnes of onion, 6 million tonnes of tomatoes and 35 million tonnes of citrus have been quoted as annual production levels (Oyeniran, 1988). However, it is the amount of produce available to the consumer rather than the level of production that is more important. Fresh fruits and vegetables are inherently perishable. During the process of distribution and marketing, substantial losses are incurred which range from light loss of quality to total spoilage. Most fruits and vegetables are highly perishable and are often harvested and sold on the same day. Where they have been transported for some distance, however, it is essential that they be kept cool and moist. The use of containers which will protect



them from damage and overheating is therefore essential (Rice *et al*, 1993). A reliable form of transportation to the market is necessary if market supplies are to be maintained, but this is often difficult to achieve unless the grower also has the means of transporting his produce directly to market. In this situation, he is able to control all the essential operations of harvesting, washing, grading or trimming and packing in containers to the final presentation in the market. The marketing chain for fruits and vegetables in Nigeria typically consists of the farm gate buyers (or what you may call dealers) who buy the produce from the farmers, the wholesalers who buy from the dealers, and the retailers who buy from the wholesalers and sell to the consumers. In the case of the leafy vegetables the chain is shorter, the farmer in many cases selling directly to the retailers. With virtually no industries to process the fruits and vegetables in Nigeria, the farmers rely on the chain to dispose of their produce. There are daily surpluses, especially during the peak harvesting period, both at the farmer's end and at the retailer's end of the chain. These surpluses mostly go bad as a result of poor handling and lack of effective preservation method. When fruits and vegetables are transported over long distances, poor handling, poor packaging as well as bad roads cause considerable damage to the produce. These damages lead to spoilage. The aggregate spoilage from these sources could be substantial, and constitutes a considerable financial loss to the farmers and traders, as well as reduce the availability of the produce in the market. Such losses also represent a waste of human effort, farm inputs, investments and scarce resources such as water. The objective of this paper is to present a study conducted on losses assessment in some major fruit (mango, guava, pawpaw and orange) and vegetables (sorrel, tomato, pepper and spinach) in Adamawa State of Nigeria.

MATERIALS AND METHODS

The Study Area

Adamawa State is in the North-eastern zone of Nigeria, lying between latitude 8⁰N and 11⁰N and longitude 11.5⁰E and 13.5⁰E. It is bounded on the north by Borno state, on the south by Taraba state, on the west by Gombe and Taraba states and on the east by Cameroun Republic. It has an area of 39,742 square km. with a population of 3,106,585 (2006 census), the majority of whom are farmers. There are two notable vegetation zones within the state, the sub-Saharan zone, marked by short grasses and trees (in the north) and the northern Guinea Savannah with tall grasses and trees (in the south). The state tropical climate is marked by dry and wet seasons. The rainy season commences in April and ends in late October, with annual rainfall of 79mm in the northern part and 197mm in the southern part. The dry season runs from November to April.

Population of the Study Area

Sampling

A total of two hundred and eighty farmers and traders were selected for the study. Twenty respondents were selected from each of the fourteen local government areas, where Ten (10) farmers and Ten (10) traders were considered using simple random sampling technique. The local government areas selected from the three senatorial zones of the state (North, Central and South), were Demsa, Fufore, Ganye, Hong, Madagali, Maiha, Mayo-Belwa, Michika, Mubi North, Mubi South, Numan, Shelleng, Yola North and Yola South. .

Data Collection

Data collection in this study was by means of a self-study questionnaire. Copies of the questionnaire were administered by hand in some areas through intermediaries. Out of the 280 copies sent out. Five questionnaires were distributed for fruit farmers, five for vegetable farmers and ten questionnaires goes to the traders. 213 copies were returned, giving a return rate of 76 percent.

Data Analysis

The data collected were analysed by percentages to study the percentage losses of the fruits and vegetables by the farmers and the traders. and t-test for the comparison of the losses for farmers and traders, as well as the losses incurred by respondents due to various educational levels. The results were interpreted at 5% significance level which produced a t-value of 0.83.

RESULTS

The data collated and collected from the questionnaires were presented in the tables 1 - 15



Table 1: Stages of Harvesting

Stage of Harvesting	Number of Farmers	Percentage
Ripe	64	76
Unripe	0	0
Ripe and Unripe	20	24
Total	84	100

Table 2: Time of Harvesting

Time of Harvesting	FRUITS		VEGETABLES	
	No. of Farmers	Percentage	No. of Farmers	Percentage
Morning	33	79	60	97
Afternoon	0	0	0	0
Evening	9	21	2	3
Total	42	100	62	100

Table 3: Harvesting Methods for Fruits

Methods	Number of Farmers	Percentage
Sharking the tree	11	26
Plucking with pole/hook	21	50
Hand picking into container	10	24
Total	42	100

Table 4: Distance Travelled During Transportation

Distance in (Km)	No. of respondents	Percentage
Very close (1-30)	22	10
Close (31-60)	38	18
Fairly far (61-90)	102	48
Far((91-120)	22	10
Very far (Above 120)	29	14
Total	213	100

Table 5: Condition of Road travelled

Condition	No. of respondents	Percentage
Very good	26	12
Good	19	9
Fairly good	27	13
Poor	98	46
Very poor	43	20
Total	213	100



Table 6: Type of Vehicle used for transportation

Type of Vehicle	No. of Respondents	Percentage
Refrigerated van	0	0
Trailer/lorry	102	48
Pick-up van	66	31
Bus	30	14
Station wagon	15	7
Total	213	100

Table 7: Packaging Materials used for Transportation of Produce

Material	No. of Respondents	Percentage
Basket	147	69
Cardboard box	155	73
Wooden box	13	6
Plastic case	0	0
Sack	183	86
Total	213 *	100

* Respondents use more than one material; hence sum of numbers is more than 213 and sum of percentages is more than 100.

Table 8: Preservation Methods Used

Method	No. of Respondents	Percentage
Cold room	0	0
Refrigeration	0	0
Sprinkling of water	175	82
No preservation	38	18
Total	213	100

Table 9: Average Storage Periods for Fresh Produce

Produce	Storage Period (days)
Mango	7
Orange	7
Guava	3
Pawpaw	4
Tomato	4
Pepper	7
Spinach	2
Sorrel	1

Table 10: Respondents that Dry Produce

Produce	No. of Respondents	Percentage
Tomato	31	24
Pepper	22	36
Sorrel	17	23
Mean	-	28

Table 11: Respondents Using Preservatives

Response	No. of Respondents	Percentage
Using preservative	12	23
Not using preservative	41	77
Total	53	100



Table 12: Average Storage Periods for Dry Produce

Produce	Storage Period (Months)
Tomato	6 months
Pepper	6 months
Sorrel	6 months

Table 13: Losses encountered in Fresh and Dry Fruits and Vegetables

Produce	Loss (%)		
	Fresh	Dry	
Mango	32	N.A	Key: N.A = Not applicable * = Negligible
Orange	26	N.A	
Guava	30	N.A	
Pawpaw	31	N.A	
Tomato	37	8	
Pepper	22	4	
Spinach	21	N.A	
Sorrel	28	*	
Mean	28	4	

Table 14: Nature of Losses in Fresh Fruits and Vegetables

Produce	Spoilage	No. and Percentage of Respondents		
		Wilting	Mechanical Damage	Pest Damage
Mango	21 (32)	12 (18)	30 (46)	6 (9)
Orange	20 (22)	9 (10)	16 (18)	0 (0)
Guava	16 (42)	9 (24)	7 (18)	3 (8)
Pawpaw	13 (57)	7 (30)	7 (30)	2 (9)
Tomato	95 (74)	70 (55)	46 (36)	19 (15)
Pepper	56 (47)	40 (33)	14 (12)	6 (5)
Spinach	3 (5)	20 (32)	5 (8)	3 (5)
Sorrel	6 (8)	34 (46)	4 (5)	2 (3)

Table 15: Nature of Losses in Dry Fruits and Vegetables

Produce	No. and Percentage of Respondents	
	Spoilage	Pest Damage
Tomato	7 (17)	5 (12)
Pepper	2 (5)	1 (3)
Sorrel	0 (0)	2 (3)

DISCUSSION

The data collected showed that 76% of the respondent farmers harvest their produce ripe, while 24% harvest their produce either ripe or unripe. Most of the farmers harvest their fruits either in the morning or in the evening and their vegetables in the morning. No harvesting is done in the afternoon. Majority of the farmers allow their harvested fruits to fall to the ground from the tree. Among the remaining who harvests their fruits into containers, half pile the harvested fruits on the ground before eventual evacuation. Harvesting in the morning or evening when the ambient temperature is low is good practice, as this leads to low moisture loss from the produce. However, most of the farmers either allow their fruits to fall on the ground or pile them on the ground, or both. These practices are likely to cause



mechanical damage, especially on the bulk of the produce which is harvested ripe. Thus the farmers harvest their produce at the proper time, but engage in some poor harvesting practices.

Transportation

The produces are transported over distances that are generally fairly long on roads that are generally in poor condition. The types of vehicle used for transportation are Lorries, pick-up vans, buses and station wagons. No one uses refrigerated van.

The packaging materials mainly used for transportation of the produce are sack, cardboard box and basket. The poor condition of the roads on which the fruits and vegetables are transported very likely causes vibration of the vehicles which causes mechanical damage on the produce. With respect to packaging, it is not only the material that determines damage but also how the material is handled. However, the study could not gather information on the handling of the packages, particularly during loading and unloading, and their stacking in the vehicles.

Preservation

About 82% of the respondents apply evaporative cooling on the fresh produce in storage (by sprinkling water on it), while 18% do not apply any preservation method. No one uses refrigeration or cold room. The average storage periods for fresh produce are 1 day for sorrel, 2 days for spinach, 3 days for guava, 4 days for pawpaw and tomato and 7 days for mango and pepper. About 28% of farmers and traders who deal on tomato, pepper and sorrel dry part of these products. Only 23% of those who dry their products use preservatives in storing the dry products. The dried products are stored for up to 6 months. Without the use of cold storage, fruits and vegetables in the study area are stored under less than ideal conditions (Table 2.1), and these conditions favour deterioration. Drying, which elongates the shelf life of the produce, is not practiced by majority of respondents, possibly due to the task involved and the consumers' preference for fresh products.

Loss Levels

Table 4.13 shows that the losses encountered in fresh produce range from 21% for spinach to 37% in tomato, with a mean of 28%; these values are within the range of values quoted for Nigeria and developing countries in general. The values are within the lower half of the range quoted (20 – 70%) possibly partly due to the fact that the fruits and vegetables are not kept for too long in storage. The losses in the dry products are only 0 – 8%, with a mean of 4%. These low values confirm the effectiveness of drying method of preservation, even with the much longer storage period.

Nature of Losses

Table 4.14 shows that spoilage (rottening) is the most important form of loss in all the products except mango and the leafy vegetables (spinach and sorrel), although for mango it is also an important form of loss. Wilting is an important form of loss in guava, pawpaw and all the vegetables. Mechanical damage is high in mango, pawpaw and tomato. Pest damage is not an important form of loss in any of the products, although it is highest in tomato. The prominence of spoilage is likely due to the less than ideal condition under which the products are stored. Wilting is probably due to the fact that majority of the vehicles used in transportation of the produce are open vehicles (Lorries and Pick-up vans) which expose the products (if not covered) to the sun. Mechanical damage is likely due to the poor harvested practices among majority of the farmers, and probably compression during transportation. The spoilage of dried tomato is probably due to improper drying. However, there is no important form of loss in the dry products.

Influence of Social Factors on Loss

(a) Occupation

The *t* value is not significant, implying that the two groups incur the same loss. The farmers harvest their produce; they handle, and are therefore in a position to control what happens to the produce all through from harvesting to sale. On the other hand, the trader has control over the produce from the point it is delivered to him. It was therefore thought that the farmers would incur lower loss than the traders. However, this was not supported by the result.

(b) Education Level

This study reveals that educational level does not influence loss. Since education is known to sharpen behaviour, further studies would bring more ideas and appropriate handling devices leading to lower losses.



CONCLUSION

The study was carried out in Adamawa state to determine the level and causes of handling losses in mango, orange, guava, pawpaw, tomato, pepper, spinach and sorrel. The study revealed that losses in the fresh fruits and vegetables range from 21% in spinach to 37% in mango, the average loss in all produce being 28%. The loss in dry produce (tomato, pepper and sorrel) is 4%, confirming the effectiveness of drying in controlling losses in these products. The losses incurred are in form of spoilage (rottening), wilting and mechanical damage, with spoilage being the most serious form generally. In the leafy vegetables wilting is the most serious. The causes of loss are poor harvesting practices of allowing the fruits to fall on the ground from the tree, exposing the produce to the sun during transportation and storage under condition that are not ideal. Neither the occupation of the handlers of fruits and vegetables (farmer or trader) nor their educational level influences loss, contrary to expectation.

RECOMMENDATIONS

- 1) The farmers who grow fruits should be discouraged from allowing the produce to fall on the ground from the tree during harvesting. Hand plucking into containers should be encouraged. This task can be carried out by an appropriate government agency responsible for agricultural extension.
- 2) Produce transported in open vehicles should be covered to provide protection from the sun, in order to control moisture loss.
- 3) An evaporative cooling system for transportation of fruits and vegetables should be developed. Such system, placed in an open van, will have a small water pump drawing power from the electrical system of the vehicle. A wind breaking device will be necessary to reduce the air speed when the vehicle is in motion to a level appropriate to the water supply rate. A system of this nature will reduce spoilage and moisture loss during transportation.
- 4) More of the tomatoes, pepper and sorrel should be dried to reduce loss in storage.
- 5) Government should pay greater attention to road maintenance. Good roads will prevent mechanical damage of the produce through vibration.

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