Factors Militating Against Post-Harvest Losses on Mango Varieties in Lafia Local Government Area, Nasarawa State, Nigeria

By

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Abstract: Postharvest losses on mangoes are mostly caused by a number of factors in Lafia Local Government Area, Nasarawa State. The data were collected using a structured questionnaire which dwelled on the socio-economic characteristics of the farmers, problems and prospects of postharvest losses on mango. Fifty questionnaires were administered randomly to obtain the relevant information. Simple percentages were used as a basis of data analysis. A range of the mango farmers (both men and women) (54%) were grouped between 31-40 years old. A proportion of both men and women were randomly selected. The results showed that insects and diseases (30%), livestock /bats /rodents (16%), adverse weather conditions (14%), capital unavailability (8%), poor harvesting and poor handling (6%) each, lack of knowledge about postharvest technology, high perishability and poor storage facilities (4%) each, while distant market, low price and shortage of labour had (2%) each are some of the major factors that caused postharvest losses on mango in the study area. Results obtained in this study indicated that the need for breeders to develop high-yielding mango varieties that are adapted to cultivation in the North Central region of Nigeria, with relatively high resistance to attack by insects. It was also suggested among others that harvesting of fruits should be when they are mature and are about to ripen instead of waiting for the majority of fruits to ripen before harvesting thereby increasing susceptibility to insect pest attack.

Keywords: Factors, Postharvest losses, Mango, Lafia, Nigeria

INTRODUCTION

The mango is an erect, branched, and medium to large-sized tree with alternately arranged evergreen or nearly evergreen leaves, with a wide crown and inflorescences having numerous flowers (Van Eze, 1997). It is the second most grown fruits in the world. It is grown in commercial quantities in more than 90 countries worldwide. Worldwide production of mango fruits was forecasted to reach a volume share of 51 percent of total global major tropical fruit production in 2017 and is one

of the two tropical fruits that have witnessed the strongest growth in popularity.

Among the producing countries, India is the main global producer with 18.8 million Metric Tonnes (MT), followed by China (4.8 million MT), Thailand (3.4 million MT), Mexico (2.2 million MT) and Pakistan (1.6 million MT), Brazil (1.4 million MT) are placed 5th and 7th respectively in the world. Nigeria is the largest producer (917617 MT) of mango fruits in Africa and the 10th largest producers of mango fruits in the world. In Nigeria, the main producing states include Benue, Nasarawa, Plateau, Jigawa, Yobe, Kebbi, Niger, Kaduna, Kano, Bauchi, Sokoto, Adamawa, Taraba and FCT. However, Benue State is a top producer in the country (Avav and Uza, 2002; Altendorf, 2017).

Globally, mango is one of the tropical fruits with the biggest increase in demand, especially in developed countries. It has been revealed that between 1990 and 2017, the demand for mango fruits grew at about an estimated annual growth rate of 10 percent. Global exports of mango fruits were estimated to reach 1.7 million tonnes in 2017. This represented a 6.3 percent increase from 2016, considerably faster than the 4.6 percent average annual growth registered between 2007 and 2016 (Huang, 2010; Altendorf, 2017).

The mango tree produces a fruit with great diversity with respect to form, size, colour and quality (Morton, 1987). The fruit can be put to a number of uses. For instance, ripe fruits can be made into juice and preserves, while unripe fruits can be processed into pickles and Chutney (Samson, 1980). However, in Nigeria, most of the fruit produced is consumed as fresh fruit.

The fruit pulp which makes up 60-75% of fresh fruit weight contains 15% sugars, high amounts of vitamins A and some quantities of vitamins B and C (Samson, 1980). The sale of mango fruits and seedlings is a source for income to many farmers.

Mango fruits are prone to high post-harvest losses in developing countries such as Nigeria. These amounts of losses are approximated at about 30 percent in developing countries (Sambe, 2020). The massive postharvest losses of mango fruits are witnessed during harvesting, packaging, storage, transportation, retailing and consumption. This situation seems to have a huge impact on mango production and the nutritional quality of the fruits and the economic significance in terms of increasing farmers' income and Gross Domestic Product (GDP) of Nasarawa State and Nigeria.

The main objective of the study is therefore to investigate factors determining postharvest losses of mango fruits among farmers and control in Lafia Local Government Area.

METHODOLOGY

Lafia Local Government was created in 1976 with headquarters situated in Lafia town. The Local Government has an estimated population of 445,300 (Census, 2006). It lies between Latitude 8.506°N and Longitude 8.522°E of Greenwich Mean Time (GMT) and is located in the Guinea Savanna zone of North Central Nigeria at an altitude of 177m above sea level. The mean monthly maximum and minimum temperature range between 35.06°C-36.40°C and 20.16°C - 20.50°C respectively, while the mean monthly relative humidity and rainfall are 74.67% and 168.90mm, respectively (Banki, et al., 2019). It is also bounded by several Local Governments in Nasarawa State including Benue, Taraba, FCT, Kaduna and Niger. On the west, it was bordered by the Kokona Local Government, and Nasarawa Eggon local government area on the North. In the east it is bordered by Obi Local Government, Wamba Local Government Area by the North East and Doma Local Government Area by the South.

Lafia Local Government has 13 wards namely; Adogi, Arikya, Ashigye, Assakio, Akurba, Agyaragu-Tofa, Gayam, Chiroma, Shabu/Kwandare, Keffi-Wambai, Wakwa, Makama and Zanwa.

The Local Government also have 12 districts namely: Akunza, Akurba, Agabija, Agudu, Agyaragu, Agyaragu-Tofa, Alakyo, Lafia East, Lafia North, Lafia West, Lafia South and Lafia Central. It also has 8 chiefdoms namely: Shabu, Kwandare, Awuma, Adogi, Koron-Kuje, Assakio, Arikya and Lafia.

The local government is an agrarian local government with a large percentage of the population engaged in mango production and agro-allied activities. However, agricultural production in the area, typical for Sub-Saharan Africa (SSA) is hampered by the predominance of fragile ecosystem, seasonal climatic fluctuation, pests and diseases, drought stress, poor declining soil fertility accelerated by degradation of natural vegetation, lack of efficient soil-water management technologies, lack of adequate soil information, and limited use of modern inputs such as mineral fertilizers and improved varieties, resulting in postharvest losses in mango production.

Study Area

The study was carried out during mango maturity periods of February - June 2022 in five (5) wards of Lafia Local Government Area, (Akurba, Agyara-Tofa, Adogi, Keffi-Wambai and Assakio); purposely selected as the major mango producing areas in the Lafia Local Government.

The population of the study encompasses all mango farmers who currently inhibit in Lafia Local Government Area, Nasarawa State. The study employed a cluster sampling technique to select 50 mango farmers where large amounts of mangoes are produced. In each

of the wards, the researcher used a convenient sampling technique to select the respondents. In Agyaragu-Tofa, ten (10) respondents were selected, ten (10) in Adogi, ten (10) in Keffi-Wambai, ten (10) in Akurba and ten (10) in Assakio.

The selection procedure involved the researcher and his research assistants holding focus group discussions with the mango farmers, traders and mango consumers in the area. The researcher also used the purposive sampling technique to select four (4) key informants who were leaders of mango farmers' associations in Akurba, Agyaragu-Tofa, Adogi, Keffi-Wambai and Assakio wards in the Lafia Local Government Area as parts of the respondents.

Administration of Questionnaires

The method adopted in carrying out this research work involved the administration of structured questionnaires to the mango farmers within the areas of study. The questionnaire had its content questions that provided answers to the following seasonal variation, market price, diseases and pests, extension agents, soil factors, source of labour, land acquisition and types of mango grown and the effects on the productivity and availability of mango in the study area.

Data collected was by means of semi-structured questionnaires. In each of the five (5) wards, ten (10) mango fruits farmers were randomly selected and the questionnaires administered. A total of fifty (50) questionnaires were administered in the selected five (5) wards in the study area. The questionnaires were designed to obtain required information.

Table 1 :	Questionnaire Distribution Base on wards		
Wards	No. of Questionnaire Distributed	No. of Response	Response Rate(%)
Akurba	10	8	80
Agyaragu-Tofa	10	9	90
Adogi	10	6	60
Keffi-Wambai	10	10	100
Assakio	10	5	50
	50	38	76

Table 2 :	Socio-Demographic Data of Respondents		
	Variable	Frequency	Percentage
(a)	Age/Years		
	21-30	1	2
	31-40	27	30
	41-50	15	54
	51 and above	7	14
	Total	**50**	**100**
(b)	**Sex**		
	Male	46	92
	Female	4	8
	Total	**50**	**100**
(c)	**Marital Status**		
	Single	2	4
	Married	46	92
	Widowed	2	4
	Total	**50**	**100**
(d)	**Educational Qualification**		
	None	15	30
	FSLC	3	6
	SSCE	30	60
	NCE/Diploma	2	4
	Total	**50**	**100**

Source: Field survey, 2022.

Table 3: Major Mango Varieties Produced by Farmers in Lafia Local Government Area

Variety	Frequency	Percentage	Rank
Local Variety	27	54	1st
Hindi	4	8	4th
John Bull	6	12	3rd
Julie	3	6	5th
Peter	7	14	2nd
Rainbow	1	2	7th
Haden	2	4	6th
Total	**50**	**100**	

Source: Field survey 2022.

Interview with Farmers

Twenty (20) farmers were orally and randomly interviewed using a structured questionnaire to cover aspects of cultural practices related to mango production problems. This was done for those who cannot write and read and also for some information that was not contained in the structured questionnaire. These practices include timely weeding to avoid hidden places for insects to harbour and infest mango fruits and post-harvest handling. Where the respondents were not literate enough to answer in English, the researcher translated the questionnaire to Hausa language for the respondents to respond to. The data collected were subjected to descriptive statistical analysis as shown in Tables 1-3.

RESULTS

Table 1:	Shows the percentage distribution of questionnaires to the farmers who were involved in mango farming, and the percentage of questionnaire that was filled and collected from the respondents from five (5) wards (Akurba, Agyaragu-Tofa, Adogi, Keffi-Wambai and Assakio) in Lafia Local Government, Nasarawa State, Nigeria. Akurba had 80% of the farmers responded, Agyaragu-Tofa had 90% while 60%, 100% and 50% had respondents from Adogi, Keffi-Wambai and Assakio respectively. The result also shows that the average percentage of the respondents in the five (5) wards was 38.
Table 2:	Shows Socio-demographic characteristics of the respondents. In relation to age distribution, the table showed that majority (54%) of the farmers aged from 30-41 while those from the age of 21-30 were least (2%). Respondents between 41 -50 were 30% with second to the highest percentage; those aged from 51 and above came third (14%). In the sex distribution, 92% of the mango farmers were male while only 8% were female. About 92% of the farmers were married, while 4% each were widowed and single respectively. In relation to educational qualification, 60% of the respondents had Senior Secondary Certificate Examination (SSCE) qualification, while those who had no educational qualification were 30%. This was followed by 6%, who had First School Leaving Certificate (FSLC) in third position and 4% who acquired either National Certificate of Education or Diploma.
Table 3:	Shows different varieties of mango fruits cultivated in the study area. The local mango was the most common cultivated by the respondents in the area with percentage of 54% while the variety Rainbow was the least with 2%. The second most popular variety cultivated by the farmer in the study area was Peter with 14% of the respondents. The third variety was John Bull with 12% of the respondents. The fourth variety was Hindi with 8%. The fifth and sixth varieties were Julie and Haden with 6% and 4% of the respondents respectively.

Table 4: **Major Causes of Postharvest Losses of Mango Fruits Among Farmers in Lafia Local Government Area.**

Causes of Postharvest Loss	Frequency	Percentage
Lack of knowledge about postharvest technology	2	4
Insect and disease	15	30
Low Price	1	2
High Perishability	2	4
Poor harvesting	3	6
Poor handling	3	6
Poor storage facilities	2	4
Weather condition	7	14
Livestock/Bats/Rodents	8	16
Shortage of labour	2	4
Distant market	1	2
Capital unavailability	4	8
	50	**100**

Table 4: Shows major causes of postharvest losses of mango fruits among farmers in the study area. The major causes of postharvest loss in Table 4 is insect and disease with 30% of the respondents while low price and distant market were the least with 2% each. Other major postharvest losses of mango fruits encountered by mango farmers include: Livestock/Bats/Rodents, Weather condition, Capital unavailability, Lack of knowledge about postharvest technology, and poor harvesting practice. Poor handling, poor storage facilities and high perishability were also mentioned, but that had relatively low scores (Table 4)

Discussions

Observations on the field survey showed that the ages of the respondents who were between 21-30 were the least that participated in mango fruit production. In agricultural production, age is considered important especially where manual labour is involved. Since only 2% of the age class 21-30 is involved in mango fruit production, it therefore means that at this age, they may still be pursuing their formal education or engaged in apprenticeship in urban settlement. However, ages between 31-40 were the highest that involved in mango fruit production. There is a strong gender disparity in mango fruit production.

An overwhelming percentage (92%) of the farmers were male, while the remaining percentage (8) was women. A greater proportion of (92%) of those who are involved in mango fruit production were married men and women, thus having large populations that are engaged in mango production. This is in agreement with the report of Olajide and Lawrence, (2002) that the horticultural industry in Nigeria is divided along gender lines and is men-based.

It is also possible that married people were attracted to it as a way of supporting their expanding families as well as an enterprise in the economic life of families. With respect to educational level, 30% had no formal educational training in agriculture. Perhaps, this could be due to a lack of finances to train themselves or a lack of interest in formal education. A few (4%) attained tertiary education. This high literacy level has pleasant implications for extension work as enlightened farmers are known to be more open to an adoption of new or improved technologies than those without formal education (Williams *et al.*, 1984). Furthermore, results showed that the majority of the respondents engaged in the production of mango fruits which is a source of their major income (Table 3). Local variety constitute 54%, Peter 14%, John Bull 12%, Hindi 8%, Julie 6%, Haden 4% and Rainbow 2%. The highest number of farmers involved in local mango fruits production, this could be attributed to the suitability and choice of this mango variety in the study area as earlier stated by Martin (1979) and Purseglove (1968).

A higher number of pest and disease incidence were observed. (Table 4). Anthracnose is one of the several fruit diseases that affect pre- and postharvest quality (Ploetz, 2003). However, losses can be minimized by physically avoiding the entry of insects and rodents and maintaining the environment conditions that avoid the growth of micro-organisms. Control of diseases in mango can be achieved by the combination of pre-harvest and post-harvest pesticide application, and post-harvest temperature management. Control of diseases occurring on leaves, stems, and flowers (pre-harvest) are important in reducing post-harvest losses.

This study is agreeing with Ajayi and Nyishin (2006) that pests and diseases had the highest frequency of problems encountered by farmers in mango fruit production. It is also true that majority of the farmers, do not control pests and disease on their farms, leaving them at the mercy of these enemies. This may be due to non-availability of control strategies within the reach of the farmers or such strategies could be available but the farmers may not be aware Umeh *et al.*, (2004). Adverse weather condition is also very important in determining how fast mangoes will decay. The storm, rain, hailstorm and the resulting cold weather have caused damage 40% of mango (Umeh *et al.*, 2004). Selection of cultivar, rootstock and improvement of cultural practices are some control mechanisms against weather effects on postharvest losses on mango. Heat too is a factor that makes mangoes to spoil too fast that is when you pluck mangoes and you do not have a place to keep them and the fruits stay in the sun or where there is no air for a period of time, it can spoil. Poor methods of harvesting also pose postharvest losses in mangoes. When mangoes are plucked without using an aid like a long stick fitted with a net, leather or bag, some of them hit on the ground and soften on the spots may start decaying the next day.

This is in agreement with the report of Anda *et al.* (2016) that provision of preservation infrastructure for citrus could keep the fruits safe from being attacked by pests/diseases. However, the findings suggest that major causes of postharvest losses of mangoes were mostly due to natural factors such as heat, rain, disease, insects, animals and mango sap, which is a fluid that comes from the mango tree or fruits. Generally, there is evidence of a reasonable level of mango fruit production in the study area, and so scientific improvements are required in an area such as pests and disease centres, fruit harvest techniques, storage facilities and introduction of varieties with high export potential and performance of extension needs to be upgraded. Similarly, NITHORT (2000) identified other problems in orchard production as lack of soft loans, inadequate fertilizer, pests/disease, wind erosion had contributed to postharvest losses on horticultural crops.

Conclusion

It is worthy to point out that mango fruits suffered from a lot of post-harvest losses ranging from weather (heat or rain), animals such as bats and rodents, pests and diseases, poor harvesting techniques, handling during transportation and poor storage infrastructures.

Recommendations

In view of the findings, the study recommends among others the following:
1. There is the need to regain agriculture to its original position in the National economy through provision of soft loans to the farmers and establishment of juice processing factories by the government and private sectors to encourage the cultivation of mango in Nasarawa State.
2. There is the need for the extension agents to create awareness to the mango farmers on the need of spraying their mango against pests such as mango mealy bug. (*Rastrococcus invadens*).
3. Provision of preservation of infrastructure for mango farmers, which could keep the fruits in safe environment that will protect the fruits from attack from animals, insects, rodents and adverse weather condition; processing of mango fruits into semi-finished foods and provision of specialized air conditioned vehicles for transporting mango fruits for sale.

REFERENCES

Ajayi, A.R. and Nyishir, S.A. (2006). Mango variety production, marketing and consumption preferences among households in Benue State, Nigeria.

Altendorf, S. (2016) Global Prospects for Major Tropical Fruits: Short-term outlook, challenges and opportunities in a vibrant global market place, food outlook: Special Features, November 2017.

Anda, D.A, Abimiku, O.E, Yohanna, J.K. and Ajayi, F.A. (2016) Factors Militating Against the Realization of Citrus Fruits Yield in Nasarawa State, Nigeria. NSUK Journal of Science and Technology, Vol 6: Nol.pp 15-19.

Avav, T. and Uza, D.V. (2002). Agriculture. In: Pigeonniere, A.L. (Ed) *Africa Atlases: Nigeria* Les Editions J.A; Paris, pp. 92-95

Banki, T. C, Sani, Y, Ishaya, K. S, Sittu, W. J (2019) Analysis of Urban Land Use and cover change for sustainable Development: A case study of Lafia, Nasarawa State, *Nigeria Journal of Geographic Information System* Vol.11 N0. 14pp.

Census, (2016) National Population Commission
Huang, Sophia (2010), "Global Trade of Fruits and Vegetables and the Role of Consumers Demand", in

Hawkes *et al.,* Trade, Food, Diet and Health: Perspectives and Policy Options, Wiley Blackwell.

Martin, F.W. (1979). Perennial Edible Fruits of the Tropics, An Inventory, USDA Agricultural Handbook No.642

Morton, J. (1987). Mango. In: Morton, J.E. Fruits of the Warm Climates, Miami, Florida, 221-239pp.

NIHORT, (2000). 25 Years of Research into Horticultural Crops Development in Nigeria, 1975-2000.

Olajide, I. and Lawrence, O. (2002): Socio-economic and nutrional contributions of Horticulture to selected rural economics in Oyo and Osun State Policy Implication *Hort. Soc. of Nigeria*

Ploetz, R. C (2003). Diseases of mango. pp. 327-363. In: R. C. Ploetz (ed.) Diseases of Tropical Fruit Crops. CABI Publishing. Wallingford, UK. 544PP. Proceedings of the 23rd Annual Conference of the Horticultural Society of Nigeria, 337-343pp.

Purseglove, J.W. (1968): *Tropical Crops*, *Dicotyledons*: vol.1. Willey Publication, New York.

Sambe, Ngutor (2020) mango varieties and causes of postharvest losses Kwande LGA, Benue State. *NSUK Journal of Science and Technology*. Vol.16 (1) pp104-112

Samson, J.A. (1980). *Tropical Fruits*. Longman Group Limited, London. 250pp.

Umeh V.C., Olaniyan, A.A., Ker, J. and Andir, J. (2004). Development of fruit fly control strategies for small-holders in Nigeria, Fruits, 59:265-274.

Van Eze, S. (1999). *Fruit Growing in the Tropics,* 2nd Ed. Agrodok-series No.5. Agromisa Foundation, 88pp.

Willams, S.K.T, Fenley, JM and Williams, CEB, (1984). A Manual for Agricultural Extension Workers in Nigeria. 169pp.