

Full Length Research Paper

Effect of transportation and distribution of *Amaranthus* (*Amaranthus cruentus*) in Minna, Niger State, Nigeria

Tsado,* E. K., Jiya, M. J., Adesina, O. A., Saidu, A. and Jatto, A. A.

Department of Crop Production, School of Agriculture and Agricultural Technology, Federal University of Technology, Minna, Niger State, Nigeria.

*Corresponding Author E-mail: ektsado@yahoo.co.uk

Received 30 December 2019; Accepted 27 January, 2020

Amaranthus (*Amaranthus cruentus*) is an important agricultural vegetable that can be characterized by the type of handling from the field to the market and to the consumers. Being a perishable produce, it requires a good transportation, handling, and distribution system to enable *amaranthus* to be delivered to the market and to consumers in a quality state. The authors used a questionnaire survey method to arrive at the results that are presented. The result showed that there were more males than females respondents in the market but more women were involved in growing of *amaranthus*. Although the quality loss of

amaranthus that occurs during marketing can be often associated with mechanical damages, water loss, chilling injury and decay. Poor storage facilities were also rated as the next problem encountered. The study also established that poor road networks resulted in vehicular vibrations causing damage to the *amaranthus* transported as the next constraint.

Keywords: *Amaranthus*, perishable produce, vehicular vibrations, transportation

INTRODUCTION

Amaranthus cruentus is a vegetable crop belonging to the family Amaranthaceae and is herbaceous in nature (Olufaji, 1989). It is believed to have originated from South America (Saunders and Becker, 1984). *Amaranthus* are plants of the genus *Amaranthus*. There are approximately 60 species; all are annuals with small seeds (approximately 0.07 grams per 100 seeds). The cultivated forms are useful for producing nutritious grain and foliage, and as colorful ornamental (Brenner *et al.*, 2000).

It is used widely as pot herb and in some instances supplies a substantial part of the protein, minerals and vitamins in the diet (Martirosyan, 2003; Kra and Bani, 1988). The crop is used alternatively as drug therapy in people with hypertension and cardiovascular disease (CVD) (Martirosyan and Miroshnichenko, 2007). It also contains protein, phosphorus, calcium, and crude fiber and several carbohydrate and other vitamins, minerals,

and dietary fiber which are lacking in many vegetables and cereal crops (NRC, 1984). The seeds can be eaten as cereal grain which is a source of protein, while leaves can be cooked like spinach (Afolayan *et al.*, 2002).

Agricultural production is very important to the economy of developing nations as a whole and Nigeria in particular. It is the major occupation of the populace and people of the country while it provides employment directly or indirectly for at least 60% of the people in Ogun State according to Aihonsu, (1992). Despite the fact that Nigeria is basically an agrarian nation and the majority of the goods to be transported are mostly agricultural products which according to Igben (1977), are by nature often bulky, low-priced and highly perishable, must be conveyed from their areas of production to the zones of consumption with minimum delay and cost, as well as widely dispersed over the available land area (Upton, 1988). It therefore requires a correspondingly

wide-spread transport net-work to take produce from the farm to markets. Ajiboye, (1995) observed that inadequate supply and high cost of food stuff is as a result of inefficient transportation and distribution network. Inadequate transport provision leads to the total waste of over 25% of the total agricultural foodstuff produced (Olajide, 1972; Idah *et al.*, 2007).

Idachaba, (1980) in his study of food production problems in the rural areas, contended that transportation among other factors represents the most serious constraint to agricultural product and development in Nigeria. The role of transport is very crucial. It is a phase in production process which is not complete until the commodity is in the hands of the final consumers (Adefolalu, 1977). Availability of transport facilities is a critical investment factor that stimulates economic growth through increased accessibility, its efficiency and effectiveness (Ajiboye, 1994). All affects the basic function of production, distribution, marketing and consumption in many ways. Transportation also influences the cost of commodity consumed and the purchasing power of the consumers.

It is therefore against this background that an attempt is made in this paper to examine the ways how the transport situation in the study area affects agricultural products with emphasis on Amaranthus production. Amaranthus as a cash crop, generally believed to be indigenous to West Africa and is of more than forty varieties of which four are commonly and widely cultivated and edible (Lovely, 1980). The main aim of this study was to establish the effect of how transportation affects the nutritional value of amaranthus throughout the town of Minna, Niger State.

MATERIALS AND METHOD

Description of the study area

Niger State is located between latitude 8° 20' N and 11° 3' N and longitude 3°30' E and 7°20' E in the southern guinea savannah of Nigeria. The climate of Minna is of typical middle belt area. The State shares a common international boundary with the Republic of Benin at Babana in Borgu Local Government area of the State. Currently the state covers a total land area of 76,000 square kilometer of Nigeria total land area. This makes the State the largest in the country (Olayide, 1992). The five administrative areas of the state are: Bida, Suleja, Kontagora, New Bussa and Minna which is the State capital. This area experiences two distinct seasons, - dry and wet seasons. The mean annual rainfall varies from 1200 to 1300 mm. The duration of the raining season ranges from 140-190 days or more with mean temperature of 20°C - 29°C (Awoseyin, 2002). The maximum temperature usually occurs between December and January. Dry season in this area

commence in November. The main languages of the people are Gwari, Nupe and Hausa. The main occupation is mainly farming because of their fertile soil. The study presented here involves only market survey, in Minna the capital of Niger State. The central market was the market used for the study due to the large number of amaranthus marketers.

Sample technique

Photographs of some features, like; how amaranthus were harvested in field, the nature of the road on which the amaranthus vegetables were transported, and the packaging of the amaranthus vegetables for transportation are shown in (Plates I and II) in the appendix.

Method of data collection

The primary data used for the study was obtained by using a well-structured questionnaire (Annex 1) and oral interview of randomly selected amaranthus farmers in the study area. The questionnaire contained the social-economic characteristic of the farmers - their age, sex, marital status, educational qualification, number of years they had been growing amaranthus (experience), mode of transportation and how they distributed the vegetables to the market. All the data gathered was analyzed using simple descriptive statistics.

Data analysis

The analytical technique used in the analysis included the descriptive statistic, such as the frequency distribution and percentage of the socio-economic characteristic of amaranthus farmers.

RESULT AND DISCUSSION

Socio-economic characteristics of respondents in the study area

Gender

The result presented in Table 1, shows that majority of the (71.4%) respondents were male, while 28.6% were female. This indicates that male respondent were more involved in the distribution and transportation of Amaranthus than their female counterparts.

Age

The result from (Table 2) shows that 42.9% of the respondents were between 31-40 years, 28.6% of the

Table 1. The distribution of respondents based on their gender.

Gender	Frequency	Percentage (%)
Male	50	71.4
Female	20	28.6
Total	70	100

Source: field survey 2018

Table 2. The distribution of respondents according to their age

Age	Frequency	Percentage (%)
20-30	20	28.6
31-40	30	42.9
41-50	12	17.1
>50	8	11.4
Total	70	100

Source: Field survey 2018.

respondents were between the ages of 20-30 years of which suggested that the young people were more growing of Amaranthus. In the study, 17.1% of the respondents were between 41-50 years, while 11.4% of the respondents were the oldest in the study.

Educational level

The result from (Table 3) shows that 42.9% of the respondents had secondary school level education. This showed that they were educated. 28.6% of the respondents had only primary school education, 17.1% of the respondents have on any educational level study, while 11.4% of the respondents attended Islamic school. This did not agree with Tsado, (2015) who reported that 28% of the respondents in his work on vegetables had Islamic school education.

Table 3. The distribution of respondents on their education status.

Level of education	Frequency	Percentage (%)
Islamic	8	11.4
Primary	20	28.6
Secondary	30	42.9
Non	12	17.1
Total	70	100

Source: field survey 2018.

Farming experience

The result from (Table 4) shows that 44.3% of the respondents have being farming amaranthus for 11-15 year, 25.7% of the respondents have being farming 1-5 years, and 17.1% of the respondent had being growing

amaranthus for 6-10 years while another 9 respondents (12.9) said they had being growing amaranthus for above 20 years.

Table 4. The distribution of respondents based on their farming experience.

Years of farming experience	Frequency	Percentage (%)
1-5	18	25.7
6-10	12	17.1
11-15	31	44.3
Above 20	9	12.9
Total	70	100

Source: field survey 2018

Type of labour employed

The result from (Table 5) indicates that 47.1% of their family were engaged in harvesting of amaranthus, 28.8% of the respondent were hired labour, while 24.3% of the respondents used both their families and hired labour. This did not agree with the report by Tsado, (2015), who identify that 41% of the farmers respondents said they used hired labour in harvesting of their vegetables; another 33% used family labour in harvesting while only one farm used both family and hired labour

Table 5. The distribution of respondents based on their farming experience.

Type of labour used in Harvesting	Frequency	Percentage (%)
Hired labour	20	28.6
Family labour	33	47.1
Both	17	24.3
Total	70	100

Source: field survey 2018

Factors affecting the quality of marketable amaranthus and their channels of distributions

The result in (Table 6) shows the different types of material used in the packaging of amaranthus by respondents used in the study area. About 47.1% of the respondents showed that the materials they used for packaging were sack, another 28.6% of the respondents make uses of baskets while 21.4% of the respondents said they used bowls but about 2.9% indicated that they used other means. The result from (Table 7) indicates that 78.6% of the respondents preserved their amaranthus through applying of waters while about 21.4% of the respondents said they preserved their amaranthus by keeping it in cool places. The result from

Table 6. Distribution of respondents based on their various types of packaging materials.

Means of packaging	Frequency	Percentage (%)
Baskets	20	28.6
Sacks	33	47.1
Bowls	15	21.4
Other means	2	2.9
Total	70	100

Source: field survey 2018

Table 7. Distribution of respondents based on their various types of packaging materials.

Method of preservation	Frequency	Percentage (%)
Kept in cool place	15	21.4
Applying of water	55	78.6
Total	70	100

Source: field survey 2018

Table 8. Distribution of respondents based on the condition of roads.

Road condition	Frequency	Percentage (%)
Tarred	25	35.7
Untarred	35	50
Pothole ridden	1	1.4
Others	9	12.9
Total	70	100

Source: field survey 2018

(Table 8) shows the responds to the question on the nature of the road. About 50% of the respondents indicated that the road situation was untarred. Another 35.7% of the respondents showed that the road was tarred while 1.4% of the respondents said the road was full of pothole. About 12.9% of the respondents gave other reasons (on the types of road condition).

Table 9 shows the result on types of transports used for transporting vegetables to the markets. About 61.4% were the majority of the respondents and they make used of motorcycles as their means of transportation. Another 22.9% of the respondents used tricycle (Keke), another 8.6% of the respondents said they used motor car while about 7.1% indicated that the transported on foot.

Table 9. The distribution of respondents in the various types of transporting.

Means of transporting	Frequency	Percentage
On foot	5	7.1
Tricycle	16	22.9
Motor cycle	43	61.4
Motor cars	6	8.6
Total	70	100

Source: field survey 2018

This did not agree with a study by Tsado, (2015) who reported that 23% of farmers transported their vegetables on their head to the road side, 14% used bicycles, and 13% used motorcycles while 24% of the respondents used motor vehicles in transporting their produce to the farm gate. The result from (Table 10) shows the distance travel to the markets. About 52.9% of the respondents show that they travel between 6-9 kms to arrive to the market. Another 45.7% indicated that they travelled about 10-15 kms in transporting their vegetables to the market while one of the respondents 1.4% showed that she travelled 1-5 km in transporting their vegetables to the market. The group of people that travelled far to the markets was the one that used motor cars. The result from (Table 11) indicates that the majority of the respondents 48.6% spent about 1-2 hours on transits, another 34.3% of the respondents said they spent 30 min to 1 h on transit while about 17.1% of the respondents said they spent about 20-30 minutes in transit to the market. The result from (Tables 12 and 13) showed that 32.9% of the respondents were into consumption and wholesale marketing, another 28.6% of the respondents were into consumption and retail, another 21.4% said they took their vegetables to retail and wholesale, another 15.7% of the respondents indicated that they sell their vegetables at the retail marketing while 1.4% of the respondents said he sell his produce at the consumption markets.

Table 10. The distribution of respondents on the bases of distance travelled to the market.

Distance transported (km)	Frequency	Percentage (%)
1-5	1	1.4
6-9	37	52.9
10-15	32	45.7
Total	70	100

Source: field survey 2018

Table 11. Distribution of respondents base on the time spent on transit.

Time spent on transit	Frequency	Percentage (%)
20-30 min	12	17.1
30 mins-1 h	24	34.3
1 h-2 h	34	48.6
Total	70	100

Source: field survey 2018

Table 12. The distribution of farmers on the bases of the various type of marketing.

Types of marketing	Frequency	Percentage (%)
Consumption	1	1.4
Retail	11	15.7
Retail and consumption	20	28.6
Consumption and wholesale	23	32.9
Retail and wholesale	15	21.4
Total	70	100

Source: field survey 2018

Table 13. The distribution of respondents based on their marketing channels used.

Marketing channels	Frequency	Percentage(%)
Sales on farm	3	4.3
Local market	11	15.7
Sales in town	38	54.3
Sales on farm and local market	18	25.7
Total	70	100

Source: field survey 2018

Table 14. Distribution of respondents based on the constraints encountered during distribution of amaranthus.

Variable	Frequency	Percentage (%)
Poor storage	47	67.1
Poor road condition	18	25.7
Lack of man power	15	21.4
Disease and pest attack	38	54.3

Source: field survey 2018

Constraints encountered by respondents while distributing and transporting of amaranthus

The result in (Table 14) shows the various problems the respondents encountered while distributing and transporting of amaranthus. About 67.1% of poor storage was the greatest constraint the farmers reported. Another 54.3% of the respondents indicated disease and pest as the next major problem they encountered. Another 25.7% was showed as the poor road condition while 21.4% lack of man power was showed as the next constraint especially during harvesting of the amaranthus.

Table 13, shows that the majority 54.3 of the respondents distributed their products in the town, another 25.7% of the respondents indicated that they distributed amaranthus both in sale in town and local market, another 15.7% said they sell their produce in the local market while 4.3% of the respondents said they sell their product on the farm.

Conclusion and recommendation

There are more male in marketing of amaranthus than the female. More female in the study area were found to be involved in growing of amaranthus. The study also indicated that people that fell between the age group of 31-40years were mostly involved in the farming in the study area and the majority of the farmers had secondary and primary school education. This shows that the farmer will not find it found it difficult in the marketing discussion and also made the farmers to know the best method of storing and preserving of amaranthus without losing the value before getting to the market. The packaging materials they made uses of like baskets, sacks, and

bowls for transporting amaranthus in the study area were Tricycle, motorcycles and motor car. Human heads and other means were used for markets that were close to the farms. The major problems observed at the study area were that of distribution of amaranthus in Minna. The nature of poor roads, poor storage facilities, major road conditions and lack of man power for harvesting were the major constraints faced by farmers of vegetables.

Base on the problems identified, the following recommendations are provided:

- (i) Effective sized designed packages should be used for carrying fresh vegetables. Especially if they are to be transported for long distances over the type of roads that we have.
- (ii) For a long journey of distribution of fresh product for vegetables refrigerated closed vehicles should be used for transporting, except for very short journeys, such as local deliveries from farmers to whole sales and markets used.
- (iii) Thick layers of straw/woven mats or sacks should be padded with the vehicles. This can be used on the beds of small vehicles and other crops/loads should not be placed on top of the fresh vegetables.
- (iv) Adequate maintenance of road infrastructures should be done or provided by government so that the roads that are bad become properly usable.

Authors' declaration

We declared that this study is an original research by our research team and we agree to publish it in the journal.

REFERENCES

- Adefolalu AA (1977). 'Significance of Transportation in Rural Development in Environmental and Spatial Factors'. Proceeding of 20th Annual and Conference of Geography Association of University of Ife, Ile-Ife.
- Afolayan SO, Igbeka JC, Babalola O (2002). Effect of irrigation frequency on soil moisture potential and chemical properties, growth and shoot yield of large-green, Nigeria journal of Horticulture 6: 79-84.
- Ajiboye AO (1994). 'Rural Accessibility, and Transportation problems. A case study of Ijebu North Local Government Area. Ogun State'. Unpublished PGD in Transport Thesis, Department of Geography and Regional Planning, Ogun State University Ago-Iwoye.
- Ajiboye AO (1995). 'Transportation and Distribution of Agricultural Products. A case study of Kolanut production in Remoland Ogun State'. Unpublished M.sc Transport Studies Thesis Ogun State University, Ago-Iwoye.
- Awoseyin IA (2002). Effective research Methodology hand book. Mack mole Publishing Company Lagos. Pp.106-109.
- Brenner DM, Baltensperger DD, Kulakow PA, Lehmann JW, Myers RL, Slabbert MM, Sleugh BB (2000). Genetic resources and breeding of Amaranthus. Plant Breeding Reviews 19:227-285.
- Idachaba F (1980). 'The Green Revolution: A Food Production Plan for Nigeria'. Final Report Submitted to the Federal Ministry of Agriculture. The Green Revolution: A Food Production Plan for Nigeria. Vols. 1 and 2, Federal Ministry of Agriculture, Lagos, 1980.

- Idah PA, Ajisegiri E, Yisa MG (2007). Fruits and vegetables handling and transportation in Nigeria. *J. trop. Post-harvest*, 10(3):175-185.
- Kra E, Bani RJ (1988). Fruits and vegetables handling and transportation in Nigeria. *A. U. J. T* 10(3): 175-183.
- Lovely WG, Weber CR, Staniforth DW (1958). Effectiveness of the rotary hoe for weed control in Soybeans. *Agron. J.* 50:621-625.
- Martirosyan D, Miroshnichenko LA (2007). Amaranth oil for cardiovascular disease. *Functional Food center. Dallas. Amaranthus oil application for coronary heart disease and hypertension. Lipids in Health and Disease*, 2007, 6 6:1. doi:10. 1186/14786-511X- 6-1.
- Martirosyan DM (2003). Amaranth, Quinoa and lentils as a source of modern Diet and Functional Foods. In Book: *Non-Traditional National Natural Resources, Innovation Technologies and Products* Moscow, Russia. *Russian Academy of Natural Science* 10:91-100.
- National Research Council (NRC) (1984). *Amaranth: Modern prospects for an Ancient crop.* National Academy Press Washington D. C. and Okelena (2004) *Nigeria Journal of Horticulture Science* Vol 9, No 1 (2004).
- Olajide SO, Olayemi JK (1972). 'A Quantitative Analysis of Food Requirement; Supply and Demand in Nigeria. 1968-1985', Federal Department of Agriculture, Lagos.
- Olayide P (1992). *Food and condition of fresh water fish in Nigerian. Nature conservation preservation and management 1st edition published in Great Britain by Chapman and Hall 2-6 Boundary Row London, Pp. 126 – 127.*
- Olufaji AO (1989). Performance of four morphotypes of *Amaranthus cruentus* L. under two harvesting methods. *Tropical Agriculture*, 66 (3).
- Saunders RA, Becker R (1984). Amaranthus. A potential food and feed resource. In: "Advanced Science Technology" cereal chemist. St. Paul, MN. p. 352.
- Tsado EK (2015). Quality of post-harvest handling of marketable Okra fruits sold in Minna; Niger State, Nigeria; *European Journal of Agriculture and forestry research* 3(5):33-45.

Appendix



Plate I. Nature of the roads on which the plants were transported.



Plate II. Plates showing Amaranthus farm, and how plants are transported from the farms to the market.