



## Estimation of efficiency and transportation cost as factors in cereal marketing in a typical rural Nigeria

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**Abstract.** *This study estimated the efficiency of cereal marketing and effect of transportation cost on gross receipts of traded grains in a typical rural Nigeria. A total of 120 cereal marketers were selected through a simple random method. A structured questionnaire was used for collection of data which was complemented by oral interview and group discussion for a period of one month (24<sup>th</sup> July - 23<sup>rd</sup> August, 2019). Descriptive statistics, Marketing efficiency and Multiple Regression were employed in making data analysis. Results indicated that most of the respondents were males (70.85%), married (66.67%) with household size of 6-10 persons and within the age range of 40-49 years (51.67%) with a larger proportion (41.67%) having had secondary education. The majority (54.17%) had cereal marketing as their main occupation and sourced business capital from personal savings. The most prioritised method of transportation among the marketers was the use of motor vehicles, and maize was ranked as the most traded staple among the respondents. Regression results revealed coefficients of 0.3758 and 0.5296 for transportation cost and miscellaneous services which were both significant at  $p < 0.001$  as the most influential variables to gross receipts of cereal marketing in the surveyed area. Further, the findings showed a marketing efficiency of 728.80%, implying a very highly efficient or profitable marketing system among the cereal marketers. The most notable challenges experienced were high transportation cost (83.33%), insecurity, inadequacy of capital among the marketers, and poor transportation facilities in descending order. Conclusively, it could be said that slightly enlightened married men who sourced capital from their personal savings dominated cereal marketing in typical rural Nigeria. And the cereal marketing was confirmed to be highly efficient in the area studied. It is therefore, strongly endorsed that agencies that intend to improve cereal marketing in the area under consideration and other rural communities in the country should address the challenges highlighted.*

**Keywords:** grains, maize, marketers, marketing efficiency, profitable, respondents, rice

### Introduction

Transportation is said to basically involve the movement or conveyance of goods, humans and services from one point/area to another for the purpose of fulfilment of physical, social or economic need. The transportation systems broadly include waterways, highways and airways. However, the mode adopted by any group of people in an area would largely depend upon the major economic activity of a community, the geographical terrain of a locality, the level of financial capacity of the individuals as drivers of economy in that particular sphere, and of course more importantly, the commitment of government in terms of infrastructural development in a given area.

In agrarian communities of developing economies (sub-Saharan Africa) like that of Nigeria, Siziba et al. (2011) clearly noted that a robust transportation system serves as determinant of smallholder participation in cereal marketing, and therefore, an effective linkage between the producers

of agricultural commodities and markets, and also a source of agricultural resources like inputs to the farmers. However, Adamopoulos (2011) observed that there are huge disparities in transportation infrastructure and technology across nations and these differences are correlated systematically with the level of development. Be that as it may, the relevance of a reliable transport system in any farming community cannot be overemphasised. Tunde and Adeniyi (2012), Ijkeji for and Ali (2014), Afolabi et al. (2016) and Gban (2017) all reported the essence of transportation in rural agrarian set-up as playing an important role in the distribution of agricultural products, and immensely assisting in creating markets for agricultural produce and minimising spoilage and wastage of these farm products. In addition, Tunde and Adeniyi (2012) observed that it serves as a crucial factor in improving agricultural productivity, enhances quality of life of the people, facilitates interaction among geographical and economic regions; and opened up new areas to economic focus.

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However, Afolabi et al. (2016) noted that in spite of the immense benefits of transportation to emerging developing communities in the third world countries, the deplorable conditions or nature of this important infrastructure as vehicle of development in rural set-up is a major problem to contend with. As Ikejiofor and Ali (2014) affirmed that majority (94%) of the rural agricultural merchants mainly used roads and employed variety of vehicles to convey farm products to selling points, Abubakar (2015) reported that maintenance of a conducive passable roads invariably led to attainment of minimum amount of time and cost at various levels. Achieving this desirable feat in the current trend of calls for development by the general populace of Nigeria, demands the huge involvement of all the three tiers of the authorities (Local, State and Federal Governments) in massive opening-up of rural roads across the length and breadth of the country.

Although several surveys have been conducted in the field of transportation with remarkable success, very little has been done in addressing rural plight, and more especially the present focus of area of study. This survey therefore, mainly focused on estimation of efficiency and transportation cost as factors in grains marketing in typical rural Nigeria, with specifications on describing the socio-economic characters of the cereal marketers, methods of transportation of cereal, types of cereal sold, effects of cereal transportation on its marketing, efficiency of cereal marketing and challenges associated with cereal marketing in the study area. Amidst this foregoing scenario, this research was conducted for the purpose of unveiling relevant information for appropriate policy-making.

## Material and methods

### Study area

The study area, Mubi-South Local Government Area (LGAs), Adamawa State, Nigeria, is composed of villages and towns heavily involved in marketing of cereal, and known to possess characteristics of a typical rurality in the country. It is located on Latitude 11°5'N and Longitude 13°5'E. It has an altitude of 696 m asl with an annual mean rainfall of 1220 mm and a mean temperature of 15.2°C during Hamattan periods from November to February and 39.7°C in April (Adebayo and Tukur, 1999). Being on the border with the Republic of Cameroon, Gella, which is the capital city of the LGA, harbours a cereal international market.

As the bulk of the population in the LGA are farmers, economic activities mainly concentrate on production of cereal crops and trading on same. Cash crops including groundnuts, cowpea, beniseeds, among others, are grown, while cereal crops like rice, maize, millet and sorghum form part of traded items in the international market. Sideline economic activities like fishing and vegetable production in the dry season are conducted along Yedzaram River and many of its tributaries. These agricultural products are commonly transported to markets and consumption areas (Mubi et al., 2013).

### Sampling procedure and data collection

Simple random sampling method was employed in selection of 140 respondents who participate in cereal crops marketing in the LGA. They were made up of three classes of respondents namely, merchants, middlemen and itinerary traders. Data were collected through the administration of structured questionnaire served to the cereal marketers. However, of the 140 respondents selected and engaged, a total of 120 cereal marketers responded positively. Data were mainly collected on socio-economic variables of the respondents, methods of cereals transportation, types of cereal marketed, effects of transportation on cereal marketing and constraints relating to marketing of cereal in the area.

### Data analysis

The application of descriptive statistics was made in achieving the aspect of socio-economic characteristics of the cereal marketers, methods of cereal transportation, types of cereal marketing and challenges associated with cereal marketing in the area. Specifically, frequency distributions, mean and percentages were employed to achieve these. The use of Marketing Efficiency (ME) was made to realise the aspect of efficiency of cereal marketing in the area.

The tool is specified as:

$$ME (\%) = (GR / Me) \cdot 100 \quad (1)$$

Where:

ME = Marketing Efficiency, %;

GR = Gross Receipts;

Me = Marketing Expenditure.

The aspect of effects of transportation cost on marketing of cereal was achieved by the application of multiple regression analysis. The implicit form of the model is specified as follows:

$$Y = f(X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, X_{11}, U) \quad (2)$$

Where:

Y = Gross receipt from sales of cereals;

X<sub>1</sub> = Age of marketers (years);

X<sub>2</sub> = Gender (1 for male, otherwise 0);

X<sub>3</sub> = level of education of marketers (years);

X<sub>4</sub> = Marital status of marketers (1 for married, otherwise 0);

X<sub>5</sub> = Number in a household (number);

X<sub>6</sub> = Cost of transportation of cereal (₦);

X<sub>7</sub> = Tax on each bag (₦);

X<sub>8</sub> = Cost of stalls (₦);

X<sub>9</sub> = Cost of storage of cereal (₦);

X<sub>10</sub> = Cost of loading and offloading bags (₦);

X<sub>11</sub> = Cost of empty bags (₦);

U = Error term.

However, four functional forms of the model were used in order to find the best fit for the analysis based on factors related by Iheanacho and Iheanacho (2012) as, the number of significant variables in a model, the magnitude of the R<sup>2</sup>, the apriori expectation of signs of the coefficients and significance of the F-value. The explicit forms of the four functional forms

namely Exponential, Linear, Semi-Log and Double-Log are expressed as:

*Linear Function:*

$$Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + U \quad (3)$$

*Exponential Function:*

$$\text{Log } Y = a + b_1X_1 + b_2X_2 + b_3X_3 + b_4X_4 + b_5X_5 + b_6X_6 + b_7X_7 + b_8X_8 + b_9X_9 + U \quad (4)$$

*Semi-Log Function:*

$$Y = a + b_1\log X_1 + b_2\log X_2 + b_3\log X_3 + b_4\log X_4 + b_5\log X_5 + b_6\log X_6 + \dots + b_9\log X_9 + U \quad (5)$$

*Double-Log Function:*

$$\text{Log } Y = a + b_1\log X_1 + b_2\log X_2 + b_3\log X_3 + b_4\log X_4 + b_5\log X_5 + b_6\log X_6 + \dots + b_9\log X_9 + U \quad (6)$$

Where:

- Y = are as defined in equation 2;
- X<sub>1</sub> – X<sub>9</sub> = are as defined in equation 2;
- a = is the constant or intercept;
- b<sub>1</sub> – b<sub>9</sub> = are the coefficients;
- U = is as defined in equation 2.

## Results and discussion

This section of the study tabulates the findings of the survey according to the socio-economic variables of the cereal

marketers, types of transportation adopted by the respondents, the effects of transportation of these cereal on marketing output, the efficiency of cereal grains marketing in the area surveyed and constraints associated with cereal marketing.

### *Socio-economic attributes of the cereal marketers*

In the opinion of Audu et al. (2020), the socio-economic attributes of individuals in any rural community set-up assist policymakers immensely in the determination of kind of development packages that would be rendered to them. Further, it would also play a great role on the individuals' capacity to adopt simple or complex innovation with ease. The study of these socio-economic variables therefore, becomes absolutely imperative.

The selected socio-economic variables of the cereal marketers are shown in Table 1. Majority of the marketers were males with a minority accounted for by the female counterparts. The largest chunk of the compositions of this population were persons within their middle age group who were mostly married men. Pooling from the findings in Table 1, it could be stated that a total of 81.67% of the marketers had acquired formal education ranging from primary school to tertiary school, with only 18.33% who had undergone through informal type of education, implying that most of them were fairly enlightened personalities.

**Table 1.** Distribution of cereal marketers based on age, gender, marital status and household size (n=120)

Criterion	Frequency	%	Criterion	Frequency	%
Age (yrs.)			Marital status		
30-39	35	29.17	Married	80	66.67
40-49	62	51.67	Single	26	21.67
50 & above	23	19.16	Divorcee	14	11.67
Total	120	100.00	Total	120	100.00
Level of experience			Level of education		
1-5 years	11	9.17	Informal education	22	18.33
6-10 years	49	40.83	Primary education	33	27.50
11-15 years	30	25.00	Secondary education	50	41.67
16-20 years	20	16.67	Tertiary education	15	12.50
20 years & above	10	8.33	Total	120	100.00
Total	120	100.00			
Gender			Household size		
Male	85	70.83	1-5 persons	25	20.83
Female	35	29.17	6-10 persons	70	58.33
Total	120	100.00	11-15 persons	18	15.01
			16-30 persons	07	5.83
			Total	120	100.00
Major occupation			Source of funds		
Cereal marketers	65	54.17	Personal savings	70	58.33
Transporters	20	16.67	Inheritance	45	37.50
Farmers	35	29.17	Bank loan	05	4.17
Total	120	100.00	Total	120	100.00

Source: Field survey (2019)

A larger proportion of the cereal marketers had 6-10 years of experience in the business, with the majority having 6-10 persons in a household. The major occupation of the marketers was

actually selling cereal, and mainly used their personal savings in promoting this particular business. Similar studies of Afolabi et al. (2016) and Gbam (2017) which were conducted in Ogun and

Plateau States in the North-Central and Western parts of Nigeria, respectively, aligned with the findings of this survey.

#### *Methods of transportation and types of cereal sold in the area*

The mode of transportation and type of cereal traded in the studied area are shown in Table 2. The most popular method of transportation used by the marketers was the motor vehicles. Although considered slightly less of drudgery, a total of 54.17% of the respondents accounted for the means of this conveyance system, and considered to rank the first. This is followed by the use of motorcycles as second most relevant among the marketers. The engagement of bicycles and human portage recorded the third and fourth positions, respectively. Of the types of cereal sold by the marketers, multiple responses were observed. In other words, a marketer could be found selling two or more cereals at any point in time. However, maize grain was found to be the most traded cereal among the marketers, and therefore, considered the main staple within the community; and this further confirmed the assertion of Macauley and Ramadjita (2015) that maize has been found to be a major stable grown in different agro-ecological areas and farming systems, and consumed by people with diverse food preferences and socio-economic backgrounds in sub-Saharan Africa (SSA). Further, the important role of maize as staple on the black continent is likened to that of rice or wheat in Asia. This is more so when taking into account that an estimated 208 million people in SSA depend on maize as a source of food security and economic well-being. Rice ranked second most traded cereal among the marketers. This is another important staple that is being accorded prominence in Nigeria because of its ease in preparation as food, and especially with the current Federal Government of Nigeria's (FGN) policy of ban on its importation and encouragement of the indigenous farmers to embark on its production enmass. Also, sorghum, millet and wheat followed in descending order. These cereal crops were found to be traded in varying proportions in the area. However,

they have been found to be relevant as sources of food security.

**Table 2.** Mode of transportation and type of cereals traded in the area (n=120)

Item	Frequency	Percentage	Rank
<b>Mode of transportation</b>			
Human portage	09	7.50	4 <sup>th</sup>
Bicycle	19	15.83	3 <sup>rd</sup>
Motorcycle	27	22.50	2 <sup>nd</sup>
Motor vehicle	65	54.17	1 <sup>st</sup>
Total	120	100.00	
<b>Type of cereals sold*</b>			
Sorghum	40	33.33	3 <sup>rd</sup>
Millet	25	20.83	4 <sup>th</sup>
Rice	69	57.50	2 <sup>nd</sup>
Maize	90	75.00	1 <sup>st</sup>
Wheat	02	1.67	5 <sup>th</sup>

Note: \*Multiple responses were recorded;  
Source: Field survey (2019).

#### *Effects of selected inputs and transportation cost on gross receipts of cereal marketing*

Table 3 reveals the estimates of effect of selected inputs as marketing expenditure and socio-economic characters on gross receipts of cereals marketing in the area surveyed. Seven variables namely, age, gender, level of education, marital status, household size, cost of transportation; and miscellaneous services which alone comprised, tax on bags of cereals, cost of stalls for cereals, cost of storage of cereals, cost of loading and off-loading of bags of cereals, and cost of empty bags for cereals, were regressed on the gross receipts from marketing of these cereals. Of the four functional forms applied, the Double-log Function was chosen as the best fit due to the number of highly significant variables, high R<sup>2</sup> and the high level of significance of F-value. The R<sup>2</sup> of 0.7606 implies that 76.06% of the variation in the gross receipts (Y) was explained by the independent variables (X<sub>1</sub> – X<sub>7-11</sub>) included in the model.

**Table 3.** Effect of selected inputs on marketing of cereals in a typical rural Nigeria (Results of Double-log function)

Variable	Coefficient	Std. error	t-value	Level of significance
Constant	3.3547	1.0851	3.09	0.003
Age (X <sub>1</sub> )	.0708	.2570	0.08	0.003
Gender (X <sub>2</sub> )	.0218	.0087	2.48	0.016
Level of education (X <sub>3</sub> )	.0218	.0680	-0.67	0.503
Marital status (X <sub>4</sub> )	.0066	.0094	-0.70	0.486
Household size (X <sub>5</sub> )	.0700	.0817	0.86	0.395
Cost of transportation (X <sub>6</sub> )	.3758	.0933	4.02	0.000***
Miscellaneous (X <sub>7-X<sub>11</sub></sub> )	.5296	.0825	6.41	0.00**
<b>Overall model estimators</b>				
R <sup>2</sup> adjusted	0.7606			0.003**
F-value	11.04			0.000***

Note: \*\*\*= Significant at P<0.001; \*\*= Significant at p<0.05;  
Source: Field survey (2019).

The cost of transportation (X<sub>6</sub>) and miscellaneous services (X<sub>7-11</sub>) were significant at p<0.001 and p<0.01, respectively. What

this means is that, a unit increase in any of these variables would lead to the increase in the level of output (gross receipts) by the

corresponding value of the regressors. In other words, cost of transportation of cereals was the single most significant variable that influenced the gross receipts. Although the miscellaneous services ( $X_{7-11}$ ) had a higher value and also highly significant, it could be noted that this regressor had combined variables of five which include, tax on bags of cereals, cost of stall for cereals, cost of storage for cereals, cost of loading and off-loading of bags of cereals, and cost of empty bags for cereals. The lumping of these regressors was done to eliminate the tendency of experiencing multicollinearity. This finding further supports the report of Gbam (2017) who documented that about 92.00%, 93.30% and 66.60% of the agricultural crop marketers surveyed in Jos North, Nigeria, strongly agreed that transportation plays a significant role in marketing by conveying products to market, making available products to place of scarcity and reduction of spoilage and wastage, respectively.

#### *Determination of marketing efficiency of cereal trading in the area surveyed*

In order to determine the Marketing Efficiency (ME) of cereals

marketing in the area surveyed, components that formed Total Gross Receipts (TGR) and Total Marketing expenses (TMe) were captured and presented in Table 4. The TGR was made up of sales of maize, sorghum, millet, wheat and rice. Of these, maize contributed a whopping total of 98.92% of the TGR, indicating the staple as first in the ranking. This is followed by sorghum, rice, millet and wheat as 2<sup>nd</sup>, 3<sup>rd</sup>, 4<sup>th</sup> and 5<sup>th</sup> positions, respectively. However, the TMe was constituted by cost of transportation, tax, cost of stall, cost of storage, cost of loading and off-loading and cost of empty bags. Similarly, transportation cost accounted for 53.55% of TMe, and thereby showing its relevance in cereals marketing in the surveyed area, and therefore, ranked the first. The second in ranking was the cost of empty bags which recorded 13.92% of the TMe. The cost of loading and off-loading, tax on bags of cereals, cost of storage and cost of stalls accounted for 3<sup>rd</sup>, 4<sup>th</sup>, 5<sup>th</sup> and 6<sup>th</sup> positions, respectively. Also, in Table 4, a Coefficient of ME of 7.29 was recorded for cereals marketing in the area under consideration. The Coefficient of ME expenses shows that a unit of marketing expense contributes to the realisation of 7.29 units of gross receipts from the grain trade.

**Table 4.** Marketing efficiency and transportation cost among cereal marketers in the study area

Item of cost	Total cost (N)	Percentage	Rank
Gross Receipts (GR)			
Maize	15942200	98.92	1 <sup>st</sup>
Sorghum	76500	0.47	2 <sup>nd</sup>
Millet	20000	0.12	4 <sup>th</sup>
Wheat	8500	0.05	5 <sup>th</sup>
Rice	68000	0.44	3 <sup>rd</sup>
Total Gross Receipts (TGR)	16115200	100.00	
Marketing expenses (Me)			
Cost of transportation	1184000	53.55	1 <sup>st</sup>
Tax	218000	9.85	4 <sup>th</sup>
Cost of stall	109000	4.93	6 <sup>th</sup>
Cost of storage	130000	5.92	5 <sup>th</sup>
Cost of loading and off-loading	261600	11.83	3 <sup>rd</sup>
Cost of empty bags	307800	13.92	2 <sup>nd</sup>
Total Marketing expenses (TMe)	2211200	100.00	
TGR	16115200		
TMe	2211200		
Me	728.80%/7.29		

Note: US\$1 = N362;

Source: Field survey (2019).

#### *Challenges associated with cereal marketing*

The world over, there is no particular business without challenge(s), whether it is agricultural enterprise, manufacturing sector, mineral resources or marketing. The peculiarities in agricultural businesses are so distinct due to the nature of their patterns and products which largely involve biological processes that are mainly natural. However, the type of constraints experienced by owners of such businesses depends on the location of trade or its nature. In this study, these challenges are reflected in Table 5.

Table 5 shows the challenges that were experienced by the cereal marketers in the study area. A total of nine constraints to cereal marketing were documented. Of these challenges, high cost of transportation was the most (83.33%) severely felt among the

marketers. The next constraint reported was the insecurity among the various communities in the area. This particular challenge was not peculiar to the study area alone, but the whole north-east region of the country that has been affected by insurgents (Boko Haram) who raid cereal markets and cart-away several foodstuffs from time to time. A total of 73.33% of the cereal sellers were affected by this challenge. Also reported as a worrisome situation was inadequacy of capital to boost cereal trading among the marketers. Ranked as the third most experienced by the cereal traders, the problem has a direct link with the inability of the respondents to access financial aids in terms of soft loans either from private or public funding related institutions. Another setback to cereals marketing in the area was the poor transport facilities which accounted for 66.67% of the total marketers engaged in the

study, and ranked the fourth. This particular constraint was earlier reported by Bryceson et al. (2008), Abubakar (2015), Gbadamosi and Olorunfemi (2016), Enwerem and Ali (2016) and Nwafor and Onya (2019). What is imminent in these reports is that good rural roads facilitate development, open market access and improve the socio-economic well-being of the dwellers. However, the findings conclude that most of these roads were in deplorable conditions, and therefore, heavily contributed to retardation of developments in these affected areas.

**Table 5.** Challenges experienced by cereal marketers based on magnitude or ranking in the area surveyed (n=120)

Constraint*	Frequency	Percentage	Ranking
Insecurity	88	73.33	2 <sup>nd</sup>
Price fluctuation	70	58.33	5 <sup>th</sup>
High cost of transportation	100	83.33	1 <sup>st</sup>
Tax/Extortion	64	53.33	6 <sup>th</sup>
Inadequacy of capital	84	70.00	3 <sup>rd</sup>
Competition	54	45.00	8 <sup>th</sup>
Indiscipline	50	41.67	9 <sup>th</sup>
Betrayal of trust	60	50.00	7 <sup>th</sup>
Poor transport facilities	80	66.67	4 <sup>th</sup>

Note:\*= Multiple responses were recorded;  
Source: Field survey (2019).

Other notable challenges that deserve mention were price fluctuation, tax or extortion by government official and/or security personal at check points, betrayal of trust among the marketers, petty competition among the cereal traders, and indiscipline ranking 58.33%, 53.33%, 50.00%, 45.00% and 41.67%, respectively.

## Conclusion

Conclusively, from the findings of this study, it could be stated that slightly enlightened married men within the middle age range with average household size formed the bulk of the cereal marketers in a typical rural Nigeria. Similarly, the method of transportation mostly used and the type of cereal commonly traded were motor vehicles and maize, respectively. The cost of transportation and miscellaneous services were the most significant variables that influenced the gross receipts of cereal marketing in the area surveyed. The cereal marketing was found to be highly efficient. Challenges that mostly reported were high cost of cereal transportation, insecurity among marketers, inadequacy of capital for expansion, and poor transport facilities, among others. Therefore, improving cereal marketing in this area would, among other things, call for addressing the stated constraints by both the government and non-government agencies.

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