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SPATIAL PATTERN AND STRUCTURE OF RURAL MARKET FREIGHT GENERATION IN SOUTH WESTERN NIGERIA

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Abstract

Periodic rural market centres play a significant role in rural economy of developing countries particularly in Nigeria. It is therefore necessary to study the spatial impact of rural markets especially as it relates to the generation and flow of economic goods across the space. A questionnaire survey was carried out on 1375 marketers in 25 sampled rural markets centres. The results show that agricultural goods are dominant constituting over 73% of volume of goods generated by the rural market and there is spatial variation in the volume and composition of goods generated. The analysis of determinants of rural goods generation also revealed that out of five variables analysed only two variables are very significant in modelling rural goods generation in the study area. These are Sale Catchment Area (SC) and Volume of Vehicular Traffic (VT). The Sale Catchment Area (SC) is significant at 1% level, while (VT) that is, volume of vehicular traffic generated by each rural market is significant at 5% level. They both accounted for 48% of the model of rural goods generation in the region. The study recommends that good rural roads and rural marketing facilities should be provided to enhance rural market accessibility and mobility. The paper concludes by suggesting further search for other explanatory variables such as population, agricultural output and the level of patronage in each market centre that can help in modelling goods generation by rural periodic markets in the area.

Keywords: Rural Market, Rural Goods, Generation, Spatial Pattern, Freight Transport

Introduction

Road freight transport and rural market centres in South Western Nigeria are intricately interrelated. Road freight transport provides linkages between rural farm locations and rural market centres on one hand, and between rural market centres and consumption areas on the other (Aloba 1988). Furthermore, rural marketcentres also serve as nodes for freight loading, distribution and transportation (Olayiwola and Adeye, 2005). The interactions of these economic activities affect the structure and organization of rural landscape. How, when and to what extent these interactions affect the rural landscape are major issues of interest to economic geographers (Aloba, 1988).

The crucial role of rural market to the development and sustenance of rural economy has long been acknowledged (Skinner 1964 and Adalemo 1974). The transaction, which takes place in the rural market centres and through which they interact with the hinterland as well as other places has an integrative function in the society (Skinner 1964). The rural market centres play this role by being a major source of fresh agricultural products, point of exchange of goods and services, generator of rural employment opportunities, terminal for rural freight transportation and channel for rural goods distribution. Perhaps, this is why Barwel (1996) asserted that measures to improve transport system and location of rural market centres would automatically

increase the accessibility to marketing facilities for everybody in the rural community, which has direct impact on the patronage level enjoyed by rural market centres.

The effect of this interaction on the rural landscape is manifested in the location and distribution of rural markets as well as freight flow pattern, which in turn is affected by the nature of the transport system that serves them. The need to understand and explain the role of transport in shaping economic landscape of rural areas have led scholars over the years to conduct studies on the influence of transport on the spatial economy (Omopariola 1990; Aderamo et al, 2010 and Adedeji et al, 2014).

Aderamo, and Magaji (2010), for instance, focused on the influence of road transport in the distribution of social facilities in Edu Local Government Area of Kwara State, Nigeria. They discovered that transport, particularly road transport is poorly developed and it adversely affects the peoples' access to social facilities like schools, health centres, water, markets, etc Nkasiobi (2011) on the other hand, examined the spatial inequality of social facilities such good road, water, electricity, health and educational facilities in rural communities of Imo State, Nigeria. Usman, et al (2013) also examined the impact of rural roads and transport services on agricultural production in Kwara State, Nigeria. Their findings show that farm size, distance to major market, farming experience, age and nature of transport services available are important in predicting agricultural production in the area.

Methodology

The south western Nigeria comprises of six states namely: Lagos, Oyo, Ogun, Ondo, Osun and Ekiti States. Out of these six states, three of them were selected randomly namely; Oyo, Ondo and Ogun in

There are other researchers who focus on the impacts of rural accessibility and mobility in alleviating or aggravating rural poverty. The relationship between rural transport and rural poverty has been studied severally by different scholars (Ogunsanya 1988, Nikals 2009). Adesanya et.al. (2002), for instance, observed that many rural areas in Nigeria are difficult to access and rural dwellers have great difficulty in moving from one place to another particularly in transporting their agricultural produce; these difficulties contribute to the problem of rural poverty. In the vein, the concern of Benjamin (2012) was the challenges of marketing goods in rural areas which are caused by poor transportation system, low purchasing power dispersed nature of rural populace.

From the foregoing, it is evident that most research attention has been on the road transport infrastructure and its impacts on rural socio-economic activities with little or no attention on the spatial and structural flow of rural goods as well as the main determinants of freight traffic generation in the rural areas. Most studies on freight traffic flow have been mainly on urban goods with less emphasis on goods produced in the rural areas (Ogunsanya, 1988). Efforts have been made to develop series of models for estimating freight production in urban areas, whereas studies on rural freight production and flow pattern has been grossly neglected (Ojekunle, 2006). The above gap is what this research intends to fill. This paper therefore focused on the analysis of structure and the determinants of rural freight generation pattern by rural markets in the south western Nigeria.

order to reduce the cost implication of data collection. It is also assumed that the three states selected are adequate to represent the entire region apart from being centrally located, they possess all the ecological, geographical and socio-economic characteristics that can be found in the

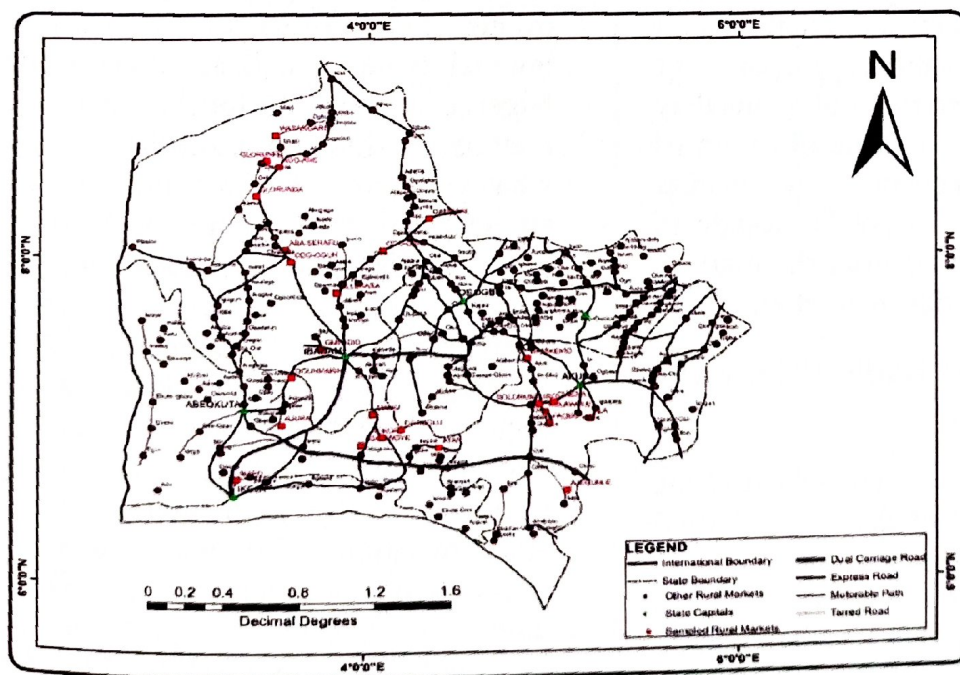
entire region. In order to gather information on the number, names and location of rural market centres in the study, local newspapers that provide information on rural markets (i.e. "Iroyin Yoruba", "Isokan", "Akede" "Gboungboun," etc) were consulted. These local newspapers usually carry reliable information on the number of existing rural markets in the south Western Nigeria and the days of their operation. From the review of the local newspapers and other documents collected from ministries of rural development in the three states selected, a total of 248 rural market centres excluding the markets located in the urban centres were identified in the study area. Figure 1 shows the map of rural markets in the south western Nigeria.

The next stage was the selection of rural markets among the sampled states. There are two issues involved here. The first is the determination of the sample size since all the markets cannot be surveyed. The second is the choice of the actual markets to be surveyed. In respect of the first one, a

10% sample was deemed appropriate. Previous works such as Fadare (1992) lend credence to this sample size. For the choice of the actual market, a random sampling procedure was adopted. This was done by assigning number to all the rural markets identified in each State, one out of every ten markets in each state one was selected as a sampled rural market. By doing this, ten (10) rural markets were selected in Oyo state, 8 were selected in Ogun state and 7 were selected in Ondo state making a total of 25 sampled rural markets. Figure 1 shows the map of the study area, the location of rural market centres and the sampled rural markets.

a. Reconnaissance Survey

In order to facilitate the collection of the required data, a reconnaissance survey was carried out to identify the actual location of the sampled rural market centres before the actual commencement of the main survey. This assisted in guiding the conduct of the survey especially in the recruitment of the field assistants within each locality.



Source: Authors' compilation from field Survey in 2015
Figure 1: South Western Nigeria showing rural market locations and Sampled Rural Markets

(b) Questionnaire Survey

To elicit information on rural marketers, a set of questionnaire was designed to collect the required data. In order to determine the sample of the marketers, the size of each market has to be defined. Conventionally, the size of a market may be defined by physical extent, variety of products, number of buyers and sellers or the number of stalls. Of all these, stalls are easier to estimate. In previous studies, the size of the market has been appropriately defined by the number of stalls (see Ogunsanya, 1987; Sada and McNulty, 1974). An advantage of the stall is that they are well arranged in rows and by type of goods sold. Thus, a systematic sampling of one out of every ten stall was adopted to collect the data. The first stall to be interviewed was selected randomly. The questionnaire was administered to the users of the stall which are either buyers or sellers, and a total of 1,375, questionnaires were administered. However, after removing the defectives ones, only 1,138 marketers' questionnaires were used for the analysis. The questionnaire was devoted to rural marketers to elicit data on their origin, destination, purpose of patronising the market, types of goods they come to sell or buy, the state of origin of marketers, the frequency of market patronage the weight of goods brought to the market or purchased from the markets and challenges faced during marketing.

(c) Freight Vehicular Traffic Volume and Characteristics Data

A traffic flow count was conducted at the entry points or gates of the selected rural market centres. A manual traffic counting procedure was carried out between 6.00am and 6.00pm on a market day and a non-market day with the assistance of field assistants recruited within each locality. This data collected were used to determine the volume and characteristics of traffic attracted and generated by the sampled markets.

Standardisation of Freight Measures

It was discovered during the preliminary field survey that various standards of measures were used in packaging and loading of goods in rural market centres. These include baskets, sacks, bags, bunches, cartons and pieces. For instance, yams were packed in pieces, plantains and banana were in bunches, drinks and beverages are in cartons, rice, beans, corn/maize gari and cocoa were packed in sacks and bags, while tomatoes and kolanut were packed in baskets.

Other agricultural products such as, palm oil and vegetable oil are stored in kegs of different sizes mostly in 20 - 25 litres. Clothing and wears were packed into sacks of different sizes. These various standards of measures used by marketers posed the problem of standardising the various measures into a single unit of measurement for the purpose of aggregation and comparability, data collection and analysis

This type of problem is, however, common with a research works on commodity movement in developing countries like Nigeria. For example, Onakomaiya (1970) in his study of the spatial structure of internal trade in delicacy food stuffs in Nigeria, adopted the bucket and balance method in which he immediately weighed whatever commodity that was selected for survey. Also, Mabogunje (1974) had to do an on-the-spot measurement of commodities by different units in their study of inter-state commodity flows in Nigeria. This type of approach would require a weighing machine to each field assistant, which is rather an expensive exercise. This measurement and standardisation problem was also encountered by Ogunsanya (1979) in his study of freight transport in Lagos metropolis. The approach used by him in resolving this problem has been adopted in this study. In this approach, Ogunsanya (1979) measured the weights of the various types of commodities that are marketed and transported in the urban market

centres. This was done by obtaining the weight of a randomly selected freight types. The weights were summed up and an average weight was then computed. This method was used during the field work and the average weights of different freight types were obtained.

Thus, the term standard weight refers to the weight resulting from the average weight of randomly sampled related commodities. The above procedure has made it possible to convert all the goods that were originally packed in different measures into a standard unit of weight measurement. This makes for easy comparison. The raw data collected in the field were factored using the standard weight adopted to estimate the volume of goods generated and attracted by the sampled markets. It is not unlikely that this procedure may have introduced some errors, either as a result of over estimation

or underestimation. It has been adopted in the absence of any other more favourable solutions and with the belief that occasional underestimate and overestimates often cancel out in the final analysis.

Result and Discussion

Composition and Volume of Goods Generated in Rural Marketing

Market structure can be analysed based on the types and volume of goods they generate. Central place theory asserts that markets are structured in a hierarchical form such that higher order market will generate higher order goods as well as higher volume of goods, while a lower order market will generate a lower order goods and a lower volume of goods. It is possible to view the structure of rural markets in this way through an analysis of the volume of goods they generate.

Table 1: Goods Quantity (in Tons) By Types Generated on Market Day By the Sampled Rural Market Centres

SITC CODE	Types of Goods	Quantity	Percentage
-003	Food crops	5157	50.9
004-005	Cash crops	1544	15.2
006-010	Animal live stocks	742	7.3
011-020	Drink & beverage	390	3.9
060-065	Wear goods	1173	11.6
066-070	Electrical/electronics	109	1.1
071-080	Transport equipment	103	1.0
081-090	House-hold goods	750	7.4
091-100	Others	163	1.0
	Total	10131	100

Source: April, 2015

The goods are classified according to the International Trade and Commodity Classification (SITC) code. Table 2 shows that food crops, such as, yam, maize gari, cassava, guinea corn, among other perishable food crops constitute the greatest proportion of goods generated in the rural market centres represent about 51% of the total goods generated. This is followed by cash crops, such as cocoa,

coffee, palm oil, palm kernel, kolanut with 15.2%. The above result is not surprising since the major goods marketed in rural areas are agricultural products.

The goods with least volume is transport equipment such as vehicle spare parts and mobile facilities such as bicycles, motorcycles etc which accounts for only 1.0% of the total volume of goods transported in the study area.

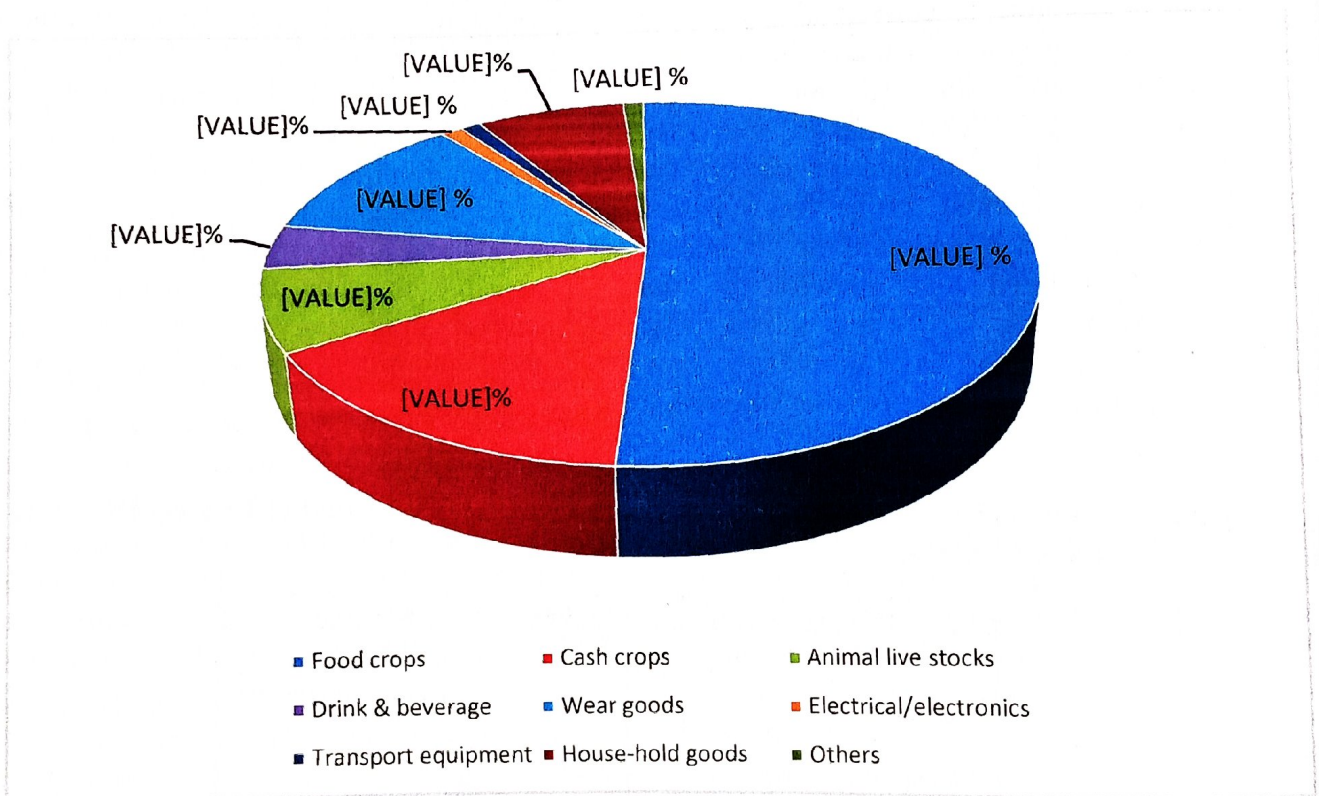


Figure 2: Goods Types Generated by Rural Market in Percentage
 Source: Field work, April 2015

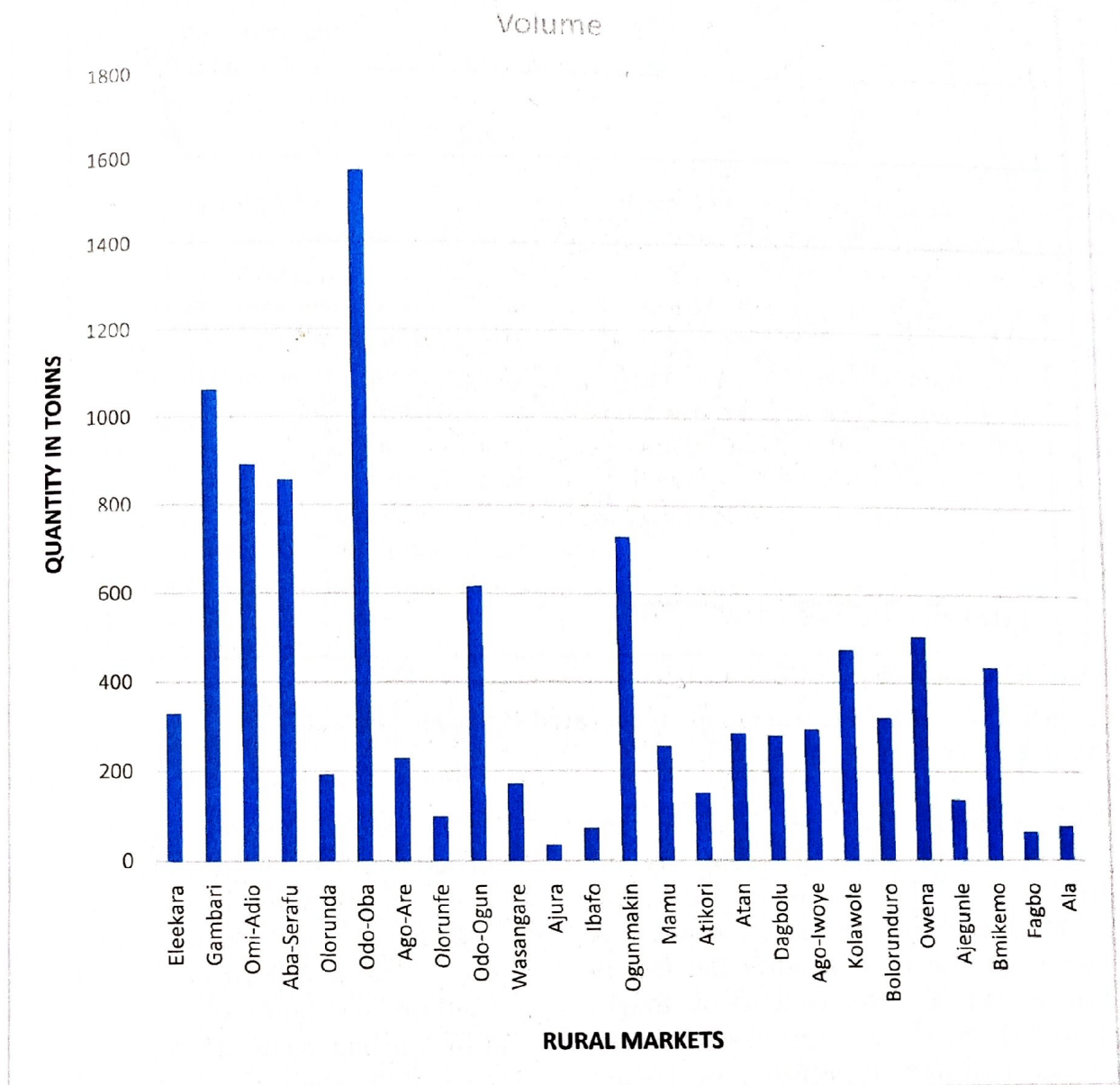


Figure 3 Volume (In Tons) of Goods Generated by Different Sampled Rural Markets
 Source: Field Work April, 2105.

Figures 3 and 4 are bar charts and map respectively showing the estimated volume of goods generated by different markets. The figure reveals that Odo-oba generated the highest volume of 1565 tons of goods, which constitutes 15.5%. The next highest volume of 1061 tons representing 10.5% is recorded for Gambari this is followed by Omi-Adio with 892 tons of goods representing 8.8% of the total volume in the study area. The least volume of 35 tons is generated by Ajura, the amount constitute only 0.3% of the total volume. In addition, figure 6.1

shows the pattern of goods volume generated by the sampled markets. The results as outlined in Figure 1 and 2 indicate the variation that exists in the types and volume of freight by different market centres.

The above variation is due to so many factors. These may include spatial variation in the type and volume of agricultural output produced within market localities, the size of catchment area, the level of market accessibility, the distance of the nearest of alternative market and the periodicity of market.

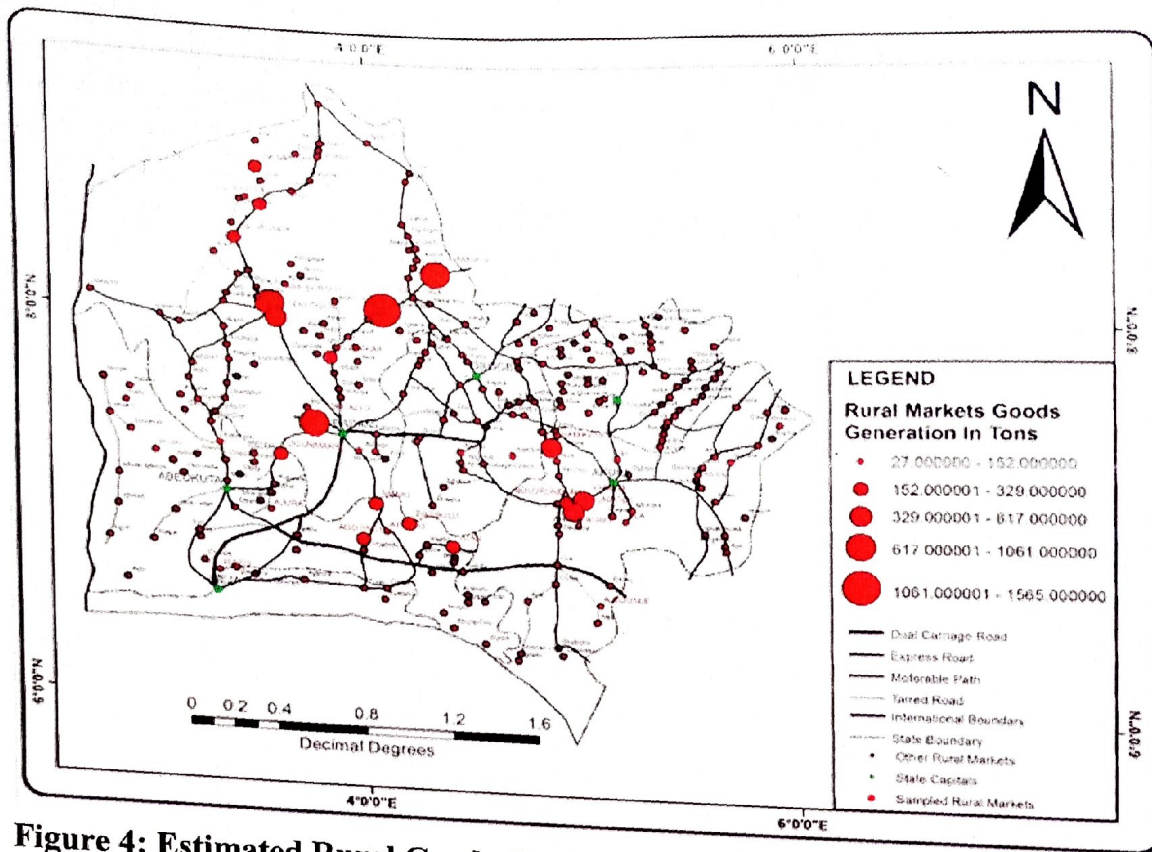


Figure 4: Estimated Rural Goods Generated By Each Market
 Source: Field Survey April 2015.

The variation in the volume and composition of goods generated by the rural markets also symbolizes the degree of importance of the market centres. A useful exercise is to identify the factors that account for the volume of freight generated by these markets. Various factors have been identified by scholars, for example, Onakomaiya (1970) observed that ecological differences, uneven distribution of resources, the degree of regional urbanisation, cultural factor, the existence of food surplus and deficit areas within and between regions, the extent of industrialization and degree of urbanisation are major factors that affect the volume and types of interregional goods flow in Nigeria. Estra (1992) at national and international levels, identified Gross Domestic Product (GDP) and geographical area of a country as major factors that influence the volume and types of goods generated. However, in this study the above factors are not applicable as the geographical scale of analysis is different.

In the case of Onakomaiya, his study was undertaken at interregional level while Estra's work was undertaken at national and international levels, this study is carried out at a local level of analysis. In addition, the times of studies were also different and elements considered during each of the studies were also different. In addition, the tools of analyses adopted in each of these studies were also different.

Determinants of Rural Goods Generation

In modelling freight generation by rural markets, there are certain factors that determine the pattern and the volume of goods generated by each rural market in the study area. In other words, it implies that certain factors help to explain the volume and pattern of freight generation by rural markets. In this study five variables are identified as predictors of the volume of traffic generated by rural market centres, these are;

- AA = Accessibility
- SC = Sale catchment
- DM = Distance to the nearest alternative market
- MP = Market Periodicity
- VT = Volume of Vehicular traffic

(a) Accessibility (AA)

Accessibility is a measure of the reachability of a node from some other nodes. It can be measured in different ways. In this study we have adopted the associated number method. The choice of this measure may be justified by Richardson and Young's (1981) observation that the degree of topological accessibility of transport route is a measure of accessibility, which can affect the rate at which goods and people move from place to place.

(b) Sales Catchment Area (SC)

The sales catchments area refers to the geographical area in which goods are imported to a rural market centre for sale. As Christaller (1933) postulated in his Central Place Theory, a higher order central place or market centre will have a higher order (bigger) complementary region than a lower order place. In other words, the bigger is the complementary region, the bigger is the central place or market centre. It is therefore believed that the size of the import hinterland of a rural market centre may affect the volume of goods generated by each rural market. The sales catchment area is measured by the number of origin states where goods sold in the sampled rural market centres came from. In other words, this variable is measured by the number of states that that exports its goods to the rural market centre under study.

(c) Distance to Nearest Alternative Market (DM)

The inclusion of this variable is based on the argument of Ullman (1973) that the presence of intervening opportunity between two complementary areas may

affect the rate of spatial interactions between the two complementary areas. The closer the intervening opportunity the higher is the possibility of diversion of traffic to the intervening centre. Therefore, the closer is the alternative market centre, the more likely is the diversion of traffic to the nearest alternative market centre. This is measured in kilometres.

(d) Market Periodicity (MP)

This refers to the frequency with which a particular rural market is open for marketing activity. It is believed that, the more open a market the lower is the volume of activity it can attract in each day of operation, because very little time is available for goods consolidation. The market periodicity is measured in days.

(e) Traffic Volume (VT)

The traffic volume is the number of vehicular traffic generated by individual markets. The assumption here is that, the volume of vehicles generated by a market centre is directly related to the volume of good such market centre generates. Eastman (1980) in his study of freight generation in U.K has found a relationship between the volume of goods available in a market and the volume vehicles plying the market. This variable is measured by the number of vehicles generated and attracted by each market.

(f) Volume of Goods Generated (RGG)

This is the amount of goods that are transported or imported into the market from other places on the market days. This is measured in tons.

Rural Goods Generation Model

A model of rural goods generation is formulated as:

$$RGG = f(AA, SC, DM, MP, VT) \text{---eqn. (1)}$$

Where RGG is the response variable (i.e dependent variable) denoting volume of rural goods generated by each rural market centre and AA, SC, DM, MP, and VT represent the independent variables.

The aprior expectation of the above are as follows

$$\frac{\partial RGG}{\partial AA} > 0 \quad \frac{\partial RGG}{\partial SC} > 0 \quad \frac{\partial RGG}{\partial VT} > 0$$

While

$$\frac{\partial RGG}{\partial DM} < 0 \quad \frac{\partial RGG}{\partial MP} < 0$$

The above aprior expectations are well documented in Richardson and Young (1981) and Eastman (1980). The evaluation statistics of note in this estimation are 't' value, 'f' and 'R²'. The log form of equation (1) was examined to see if it would perform better than the raw data this was not however found to be so. The model was subject to regression analysis using SPSS statistical package to run the analysis. The result of the regression summary is provided in Table 2.

Empirical Estimate

Table 2: Results of Regression Analysis of Goods Generation

VARIABLES	DEPENDENT VARIABLE = RGG
Constant	-278.4
AA	3.48
SC	178.9
DM	-12.5
MP	35.6
VT	.048
R ²	0.59
R ² Adjusted	0.48
'F'	5.50
N	25

't' values are in parenthesis, *significant at 1% level, ** significant at 5% level

The result in Table 2 presents the summary of the regression results. The table shows that only two variables are very significant in modelling rural goods generation in the study area. These are Sale Catchment Area (SC) and Volume of Vehicular Traffic (VT). The Sale Catchment Area (SC) is significant at 1% level, while (VT) that is, volume of vehicular traffic generated by each rural market is significant at 5% level. Apart

from their significance, they also conform to aprior expectations. Although, the rest variables were found to be insignificant, only AA, and DM conform to aprior expectations, while MP did not conform to aprior expectations. DM shows an inverse relationship with the dependent variable (RGG). This implies that the longer the distance of alternative market the higher is the volume of goods that will be generated, while the shorter the distance

the lower the volume of goods. Other variables are positively related to the dependent variable.

In terms of their contribution to the explanation of the variation in the rural goods generated by rural markets, the model accounts for a total of 48% explanation, which is quite good for cross sectional based studies of this nature. The above findings show that only two variables out of five used for analysis can be considered good for planning rural goods generation in South Western Nigeria.

Research Implications and Recommendations

The study has further confirmed the crucial role of rural markets in rural goods generation and distribution. Since the size of market catchment area is discovered as one of determinants of goods generation by rural markets, it is therefore necessary to improve the level of accessibility and mobility to the rural markets from their catchment areas in order to enhance rural economy. Having established a strong relationship between vehicular flow and quantity of goods generated by rural markets, there is need for improvement in the flow of vehicular traffic to rural markets through provision of good roads in order to enhance efficient and effective flow of rural goods in the study area. Therefore, the government should assist the rural communities in building more rural markets centres to meet the marketing need of the rural populace. The establishment of more rural market centres will no doubt bring market centres closer to the people thereby increase rural market accessibility.

Most goods generated in rural markets are predominantly agricultural products; there is the need to provide appropriate facilities

for loading and off-loading of agricultural goods. Goods preservative facilities and specialized vehicles are needed to help in preserving the agricultural products from spoiling and maintain their freshness until they reach the final consumers.

As revealed in this study, the structure and volume of goods generated by the rural markets dictate their sizes and spatial area of influence. This can be a basis for the reorganisation of markets for improved efficiency. Therefore the concept of load centre can be introduced in the planning of market for regional development in Nigeria. Based on the classes of rural markets discovered in the study, some specific rural market centres can be designated as "load centres" where modern freight operational facilities are provided. This will serve as a major rural interchange point for goods distribution among rural and urban centres in the country. The rural market load centres will serve as collection points for rural goods moved from other smaller rural market centres for interregional goods transportation.

Conclusion

The search for determinants of rural goods generation in the study area is inconclusive as only two determinants namely (sales catchment areas of rural markets and the vehicular traffic volume produced by each market) out of five variables used for the analysis in this study could be considered good enough to estimate or forecast the volume of rural goods generated by rural markets in the study area. A further research is therefore required to fully understand other factors like population, agricultural output, patronage level and transport availability among others that may determine the volume of goods generated by rural markets.

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