The Geography of Rural Markets in Cross River North Senatorial District, Nigeria

Ochiche, C. Abua; Ajom, S. K. and Echigbe, I. E.
Dept of Geography and Environmental Science
University of Calabar, Nigeria
abuaochiche@yahoo.com 08162841299

Abstract

The geography of rural markets in modern time has not been adequately harnessed to ensure rural market viability for a robust rural economy especially in developing countries. This study is meant to identify and explain the order in the temporal and spatial distribution of rural periodic markets in Cross North Senatorial District of Nigeria with the motive of identifying which order enhance market viability. Market location data and functions were obtained through physical observation and measurement using GPS, questionnaires and focus group discussion. Market location information were inputted into GIS software applications where maps were produced while the pattern of distribution of rural markets were tested using nearest neighbor statistics and ANOVA. From the result obtained, markets in the region exhibit significant clustering spatially but show tendency toward uniformity in their temporal distribution; the physical spacing of markets whose meetings are separated by different length of time vary significantly hence as the temporal separation of markets increases, distances between rural markets tend to collapse. Inefficient location of some rural markets were identified. Ten market cycles and four classes of rural markets of different functions were found. The study recommends a spatial re-organization of rural markets to enhance their viability.

Keywords: Spatio-Temporal Distribution of Markets, Periodic Markets, Rural Economy, Cross River North Senatorial District

Introduction

The market and market place system represent universal characteristics of an economic space and structure in developing nations. Market is any arrangement where buyers and sellers interact for the purpose of exchange. Market place is a particular approved location where buyers and sellers meet at regular intervals for the purpose of exchange (Hill, 1966 and Good, 1971). These market places which may be rural or urban, daily or periodic are prominent economic features in Nigeria and other parts of the world. They have provided the setting for trading and marketing and hence play a vital role in the economic life of the country. A network of market places serves as nodal points for the collection and distribution of a wide range of local and regional goods and services and hence, provide a linking force between the rural population and the regional, national and international economic structure" (Allison, 1975).

The explanation of the pattern of distribution of rural markets has always been at the heart of a regional development planner who has interest in planning for the development of the rural

economy. The pre-occupation of this study is mainly to identify and give details of the hierarchy in which certain elements are positioned in space (Haggett, Cliff & Frey, 1977 and Ebong & Animashaun, 2009). The spatial distribution of rural market centres that serve as central places depicts the operation of a market system and the channel of change in space economy. The description and explanation of the order that exist in space, time and function remain central in any attempt to understand the way rural markets are spaced in any region. The allocation of scarce development resources for regional development is determined by the pattern of distribution of central places and their complementary regions.

Cross River North Senatorial District has seventy markets spread across the region for the purpose of providing a platform for the exchange of both imported and local commodities. The unique feature of rural markets in the area is their periodicity and location pattern, showing temporal and spatial form of rural markets. These markets do not only have a spatial location but operate on time schedule governed by a traditional calendar whose origin is known by the local people and is yet to be brought into limelight for public scrutiny. The region operates a market periodicity regime yet to be discovered with each market day activity followed by market-less days of inactivity. On such market day, the host community receives a large number of buyers and sellers who travel to the local market to buy and sell commodities from different ecological zones. On a single market day, so many marketing activities of different intensities take place in different locations in the same region. The tempo of these marketing activities also varies with time of the day. On the other hand, lack of comprehensive data on the locational attribute and periodicity of rural markets in Cross River North Senatorial district is also a paradox worthy of scientific investigation to enhance proper rural market planning in the area.

Rural markets centres also compete with one another for space and patronage to survive as each centre need a threshold demand or population for its continual existence. It is expected that rural markets should showcase certain distinct order, both in spatial and temporal distribution. Markets in Cross River North also perform different functions, therefore the need to structure its pattern of distribution.

The spatial and temporal characteristics of rural markets have been separately studied elsewhere and some useful results obtained (Fagerlund & Smith, 1970; Wood, 1972; Eni, 1981; Wabungu, 1995; Madu, 2001and Udosen & Adams, 2009). With some allowances for the uneven distribution of population, it has been observed that rural markets tend to exhibit uniform distribution pattern, hence, reflecting the operation of a process of spatial repulsion and ensures that no section of the dispersed rural population is distant from a market place. Fagerlund & Smith (1970) and other scholars have provided two hypotheses that enable one examine the optimality of spatial pattern of rural periodic markets. These hypotheses state that; (a) the physical spacing of markets whose meetings is separated by different lengths of time should display a certain degree of order. (b) Markets on the same day should exhibit uniform spatial pattern.

In spite of the fact that several studies have been carried out on the locational pattern of rural markets globally and Nigeria, such research work includes that of Reinhard (1984); Udosen & Adams (2009) whose work was on "A spatial-temporal synchronization of periodic markets, and Eni (1981) conducted a similar study in Obuba South Development Council Area of Cross River State, Nigeria are no doubt huge contribution to literature. After skimming through all the existing literatures, none have addressed the spatio-temporal distribution pattern of periodic markets in Cross River North Senatorial District. Further, during the review of literature, it was discovered that there is also inadequate knowledge on the origin of market and spatio-temporal

distribution of rural periodic markets. Therefore, the need to fill in this gap, with this study is very timely.

From the foregoing therefore, it could be deduced that there is challenge in customers accessing transfer of goods and services from any market without knowing the spatial and temporal distribution of rural markets, empirics of Northern Senatorial District of Cross River State, Nigeria. Therefore, this study aims to answer certain profoundly critical questions such as; is there any order in the distribution of rural markets in space, time and function in the study area? If there is, what is the nature of the order? How does this order conform to, or differ from any known order in a similar or different environment? How does this order affect market viability? What type of goods and services are offered for sale in Cross River Northern Senatorial District markets? This work is expected to complement other works done on rural development planning in Cross River State and Nigeria such as those of Ochiche and Adie (2017), Ochiche, Okpara and Isu (2020), Ochiche, Isu and Okpara (2020), Ochiche, Bonoh and Bege (2020), Efiong, Digha and Ochiche (2016), Eja, Ochiche and Onabe (2014), Eneji et al (2015) and Ntamu et al (2017).

Aim and objectives of the study

The major aim of this is to investigate the spatio-temporal distribution pattern of rural periodic markets in Cross River North Senatorial District, Nigeria. Specifically, the objectives of the study are to;

1. investigate the order that exists in the spatial and temporal distribution of periodic markets in Cross River North Senatorial District.
2. identify the categories of goods and services offered for sale in the study area
3. attempt a classification of rural markets based on their functions
4. suggest strategy for proper market planning in the rural area.

Research hypotheses

The following serve as hypotheses for this study:

1. the spatial distribution of all rural periodic markets in Cross River North is random
2. Markets meeting on the same day of the week are randomly distributed.
3. The physical spacing of markets whose meetings are separated by different lengths of time does not vary significantly.

Literature review

Review of related literature on the geography of rural periodic markets has been extensively done by eminent scholars in the field of rural market studies such as Eni (1981), Udosen and Adams (2009),Omole et al (2012) and Omole, Yusuf and Baki (2014). The review has centred on the definition, typology, spatio-temporal locational pattern and other relevant features of peridic markets.

In terms of definition, attempts have variously been made to define a market-place. Following the United Kingdom Royal Commission on Market Rights and Tolls (1891), Hill (1966), defined a market-place as an authorized concourse of buyers and sellers of commodities meeting at a place more or less strictly limited or defined, at an appointed time. It is not only a place for the interchange of commodities (Jarret 1977), but also locations with social, economic, cultural and other referents where prices offered and paid by each is affected by the decisions of other (Belshaw 1965, quoted by Berry 1967). Other writers such as Mckim (1972), Hodder and Lee (1974) and Sada and McNuttty (1974) have given similar definitions of market place.

Periodic markets therefore, are place where buyers and sellers converge on a given location each day, or every second, third or nth day (Fagerlund and Smith 1970; Hill 1966; Hodder 1961); or, specific gathering places where attendance is heavy for one day in the market week, falling off

precipitously, frequently to zero on other days (Eighmy 1972). Hence, they are markets that do not open every day, but opening periodically less often than daily at fixed times (Hill 1966).

Reasons for this periodic nature of rural markets are available in the literature. Some often advanced reasons include; poorly developed transport networks (Jackson 1971; Hodder and Lee 1982), traditional calendar (Fagerlund and Smith 1970; Good 1973), the calendar being primarily economic (Hill 1966); perishable goods (Fagerlund and Smith 1970, Gana 1978); low population density (Hodder 1961, 1965; Hodder and Ukwu 1969, Hodder and Lee 1982; Good 1972), and poorly utilized resource bases (Norton et al, 1975).

Spatio-temporal distribution of periodic markets

Spatio-temporal distribution of markets refers to the arrangement of markets in space and time. Mulimani (2006) in his study noted that distribution is a process involving a large diversity of complex interrelated variables of physical, economic and social characteristics. Location and distribution pattern are the most useful factors for geographers, because they involve in the physical space and arrangements. While Hugar (2000) held that the locational factors not only influence the growth of market sites, but that it also acts and react on the various processes and stages of development of the market. According to Hudson (1969), a locational pattern may arise from either a contagious process or a repulsive process. A contagious process leads to the clustering together of units to produce an agglomerated order of market distribution. A repulsive process or competitive process is one which when given appropriate topographic and population distribution in an area will result in a uniform or maximally spaced order of distribution.

Several studies have shown that rural periodic markets in rural space exhibit an even order of distribution since they are directly engaged in spatial and temporal competition. The nearest Neighbour analysis which was originally invented by two English botanists- Clerk and Evans in 1954 to analyse the pattern of distribution of plant species has been applied in the analysis of spatial distribution of periodic markets in many areas. The nearest neighbor model is represented by the formula below;

$$Rn = \frac{d_o}{d_e} = \frac{2. \sum_{i=1}^{N} dsi}{\sqrt{N.A}}$$

Where N = number of market places

Do = observed mean nearest neighbor distance

De = expected mean nearest neighbor distance if points are placed randomly.

Dsi = spatial distance of a market place to its nearest neighbor

A = area of the study region.

Rn values range from 0 to 2.15 with a value of 1.0 indicating random spatial distribution (Animashaun & Eze, 2006). A number of works worthy of review has been done in the field of spatio-temporal distribution of rural periodic markets.

Ochiche, Ajake and Okpiliya (2013) conducted a study on the spatio-temporal distribution of rural markets in Bekwarra Local Government Area of Cross River State. The primary data for the study was generated through administration of structured interview, field observation and measurement. Nearest neighbour statistics was adopted to test the spatial distribution of markets in the area, while the student t-test was used to test the variation between mean distances of same-day and adjacent day markets. The result returned from the analysis revealed that markets in the area are distributed randomly and same day market was discovered to be more widely spaced than adjacent day market. The study findings also revealed that local, state and national markets, were the three classes of markets dominant in the study vicinity. Thus, spatial re-organization of market centers for effective and open market system was the recommendation of the study.

Omotoye-Omisore,(2016) conducted a study on spatial location of local markets in Ife North. The study aimed to show the unique capability of Geographic Information System (GIS) in assessing and mapping local market distribution. Data from both primary and secondary sources were used for the study. Handheld GPS was used to collect coordinate points of the existing markets and interview was conducted with market women. Meanwhile secondary data was gotten from administrative maps and satellite images of the area of study, it was geo-referenced and digitized. The output from the analysis revealed that the distribution of markets in the region tends toward dispersal with poor road network hindering the transportation of goods and services from remote villages to semi-urban areas. Against these findings, it was recommended that new markets be sited as proposed by the study.

Madu (2001) carried out a study on periodic markets and rural development in Nsukka region, South-Eastern Nigeria and one of his objectives was to map out the spatial and temporal pattern of distribution of these markets. Using 35 markets which he selected from a total of 88 markets in the region using simple random sampling, he was able to discover that markets in the region clustered around the central plateau at an average spacing of 4.5km. Variation in temporal distribution of markets among the four days of the native week was observed. Same-day markets were more widely spaced than other markets of longer temporal separations.

Smith (1971), in his study, held that a four-day market in Western Nigeria has shown that the spatial patterns of markets operating on each of the four days were significantly different from random and were approaching uniformity. The same market structure were also found in old Kasina Emirate (Hill and Smith 1972), Ghana (Fagerland and Smith 1970) and Kenya (Wood, 1975).

Concerning rural market temporal distribution pattern, it was discovered that same-day markets are more widely spaced that adjacent-day markets (Fagerland and Smith 1970, Smith 1972, and Ukwu 1969). This hypothesis has been investigated in several parts of Africa by measuring distances separating same-day markets and adjacent day markets as well as other categories of temporal separations. The means of these measurements were then tested for significant difference using the students't test and ANOVA statistics.

Rural periodic markets are held at regular intervals at market places. It may be sited at close proximity to the bush, junction of path ways, in hamlets and villages on the road sides or in the towns and cities. In Yoruba land, periodic markets show little correlation with distribution and hierarchy of settlements (Hodder, 1968).

Classification of rural markets as central places

Classification of rural markets based on their functions as central places is normally approached through the analysis of specific information concerning the types of goods and service available, and the size and nature of the area served by the markets. Observations and interviews (either oral or through the use of questionnaire) are used to analyse and classify markets based on the number of functions. Using observation and interview techniques, Skinner (1964) identified five hierarchical markets in rural China. They are Regional markets, Central markets, Intermediate markets, Standard markets and Minor markets. One of the objectives of the present study is to examine the presence of a hierarchy of market in Cross River North Senatorial District. This calls for their classification. Most of the earlier attempts at the empirical identification of the hierarchy of centers have been criticized because of the way in which functions have been rated. To assume that all central functions are of equal significance does not appear realistic. Thus, it appears unreasonable to award the same score to the sale of bicycle in the market and the sale of hardware in another but similar market. In their analysis of towns in Ghana, Grove and Hiszar (1965) tried

to avoid the issue of subjectivity by awarding different scores to different functions as they deemed fit based on their importance. Total scores for each town are computed and towns were then ranked. This method is still open to the criticism of arbitrary weighing system. Abiodun (1967) in her study in South Western Nigeria, however devised a more sophisticated statistical technique in working out the rank of central places having defied the method employed by Grove and Hiszar. Despite this, her initial weighing of functions on which the ranking of central places depended was faulty also. Instead of 1, 2, or 3 as awarded by Grove and Hiszar, she gave weight of 1, 5, 10, etc. to functions as she deemed fit. This is by no means less arbitrary than the weighing of Grove Hiszar. It could be observed that the above methods lacked objectivity since they gave pre-established ranking to function which undoubtedly affected subsequent ranking. However, Anawana (1971) tried to avoid the arbitrary elements of previous weighing method. His methods seek to relate inversely the weight of each function to the number of centers, which posses that function. In other words, scores of functions are more significant in determining central importance than ubiquitous ones. The assumption stems from the central place theory, -"higher order functions are by definition those which are few and far between so that people travel longer distances for them (Anawana, 1971). This method is represented by the formula. $W=a(1-x/n)$ Where W = the weight of the function a = the maximum weight allowed for the set of function x = the number of centres having the function under consideration n = the total number of centres under consideration To get the centers total centrality, Grove and Hiszar (1966) summed up the scores of all the variables. In order to group the 258 centres into hierarchies, they draw up what they referred to as "Crucial Curve". This is a sort of graphical representation of the relationship between the number of centres and the degree and level of their centrality. From this curve, all the centres that tend to cluster together are grouped together into one class. At the end, they had five classes. Abiodun (1967) disagreed with this method of crucial curve arguing that it was liable to subjectivity. She therefore proceeded to use "----highly sophisticated statistical technique" (Omotosho 1971) in her grouping. Abiodun aimed at calculating the functional magnitude of the service centres. Functional magnitude is the measure of importance of market places in terms of all central functions under consideration. Like Grove and Hiszar's crucial curve, Abiodun proceeded to graph functional magnitude against curves. From this, she adopted the same method of reading used by Grove and Hiszar and she aimed at five distinct classes. Similarly, Madu (2001), using the idea of functional magnitude identified four levels of hierarchies of rural markets at the Nsukka region of south eastern Nigeria. He determined the functional magnitude of the markets by working out the centrality coefficients or values of each markets using Singh (1979) model as follows; $C=ti \div T \times 100$ Where C is the centrality coefficient, ti is the number of stalls or persons selling an item or providing a service in a market and T is the total number of stalls or person selling or providing a particular item or service in all the markets. For this study, the same idea of functional magnitude as used by Abiodun and Madu would be adopted. This is because the technique is considered more encompassing; i.e makes the use of different variables under consideration.

Research Outputs and Outcomes (Provide the expected outputs and outcomes of the project)

Conceptual framework

The central place theory

This research work is rooted in the ideas and concepts embedded in the Central Place Theory, which was expounded by Walter Christaller in 1933 (Hagget,1979). The theory states that, the number, sizes and patterns of spatial distribution of central places can be explained by the

operations of the forces of demand and supply which is influenced by the extent to which these centres provide goods and services to their surrounding areas (Christaller 1966).

Christaller emphasized centralization as a principle of order. "The crystallization of mass around a nucleus is organic as well as in-organic in nature, an elementary form of ordering of things which belong together-a centralistic order. This order is not only a human mode of thinking, existing in the human world of imagination and developed because people demand it, it in fact exists out of the inherent pattern of matter (Christaller, 1966). The theory brought a holistic perspective and reliable technique to aid the study of spatial structure in a social system. The main contribution of the theory is the systematic attempt to designate certain attributes of the spatial structure of a large highly populated area.

According to the theory, if settlements (central places with markets inclusive) exist for the purpose of supplying goods and services to the surrounding region, then there should be an order in the distribution of these central places. This ranges from higher to lower order central places. Higher order central places are fewer in number but perform higher order functions than lower order central places. To Christaller, the ideal shape of a market area is that of a hexagon and the pattern of distribution of central places at each level can follow any of marketing, transportation and administration principles. Marketing principle follows a rule of three (3), transportation follows a rule of four (4) while administration principle follows a rule of seven (7),

Economic location theory of August Losch

August Losch (1906 – 1945), a German economist propounded the theory of economic location in his work titled "The Spatial Organisation of the Economy" published in 1940 but later translated into English in 1954 as the Economics of location. The theory came as a reaction against the central placed theory of Walter Christaller.

The idea embedded in this theory is that the optimal location of economic activities is a function of market demand occurring in places where net profit is the highest. Net profit is the difference between sales income and production cost. Due to this tendency, economic activities (markets inclusive) will tend to locate in those sectors of a trade area circle that are well served with transport and other socio-economic infrastructures. Losch used the term "Economic Landscape" to explain this sectoral arrangement of central places and economic activities.

The theory assumes a uniform population distribution with constant taste, absence of spatial variation in the distribution of factors of production and no locational interdependence between firms including an Isotropic terrain. With this set of assumptions, Losch went ahead to demonstrate that the ideal shape of a market area for a particular firm is that of a hexagon. This allow for the greatest amount of packing in to an area with minimum transport cost. Losch agreed with Christaller on his hexagonal arrangement of market area but questioned his hierarchy of central places with its rigid system that determines the specific number of such centres at each level. To him, the distribution of central places need not always follow Christaller`s K- factor rule because some central places tends to cluster in those areas that are well served with transport and other socio-economic facilities. By this, Losch has succeeded in developing a theory that incorporate all relevant factors required to explain the main features of spatial distribution, hence bringing in reality and flexibility to Christaller`s pattern of distribution of central places. While Christaller approach may be seen purely as an explanation of the service element in spatial structure, the Losch model could be cast as an explanation of the space economy (Ebong & Animashaun, 2009).

Markets as central places

The term "central place" is used to describe a settlement providing single or several services for the population residing outside it. Such services may be rudimentary but essential, for example general stores, or sophisticated and specialized, services, for example, University.

The main function of a market town is to provide goods and services for a surrounding market area. Such towns are located centrally within their market areas, and hence they can be called 'central places'.

The greater the number of goods and services provided the higher is the order of central place. Lower order places offer convenience goods that are purchased frequently within small market areas and have the range of lower order convenience goods, which is the maximum distance consumers, are willing to travel. Higher order places are fewer in number and are more widely spaced than lower order places providing goods with greater ranges.

Market periodicity regime

Available literature on rural markets reveals variations in market periodicities. Different ethnic nations have different periodic regimes or market calendar/weeks. In Nigeria, different market calendars have been noted. Hodder and Ukwu (1969) identified 2-day 4-day and 8-day periodicities in Yoruba- land and 4-days, 8-day and 21-day 'periodicity in Ibo land. Hill and Smith (1972) observed a seven-day market week in almost all parts of Northern Nigeria. A 2-day periodic market has one market-less day, 4-day market has three, 5-day market has four and so on.

Market ring

Another relevant characteristic of rural markets in the literature used to describe the order that exists in their distribution is "the linkage of these markets into a ring or cycle that reflects the rotation of market days among a set of market places. A market ring is an integrated sequence of markets that follows a particular temporal regime. A good example of such market ring is the Akinyele market ring in Oyo state" (Hodder 1961). There are eight markets in the ring, seven of which take place on successive days so that there is one market free day after which the cycle begins.

Method of study

Cross River North Senatorial District- the study area consists of the five (5) Local Government areas that constitute Cross River North Senatorial District. These are Ogoja, Obudu, Yala, Obanliku and Bekwarra. This geo-political zone is found at the extreme north of Cross River State within Latitudes $6^0 14^'$ and $7^0 10^'$ north of the Equator and Longitudes $8^0 20^'$ and $9^0 26^'$ East of the Greenwich Meridian. The zone is a part of the greater upper Cross River region often described by orthodox historians as "Fragments of the Earlier World", "Splinter Zone" and "Human Clusters" (Erim, 1990). Cross River North has a land mass of 4,466 square kilometres or 20.8% of the land mass of Cross River State (21,481 square kilometers) (Cross River State Land Survey Department, 2006).

There are 2,982, 988 Cross Riverians in the 2006 National population census result. Out of this number, 759,718 or 26.3 percent are from the Cross River North senatorial district. Population density then would have been 168 persons per square kilometer. At the moment the population of the region is projected at 1001345 using a growth rate of 2.8 percent. Cross River North senatorial district is a heterogeneous region encompassing several tribes speaking different dialets or languages with linguistic affinity. These are Yala, Yache, Igede, Ukelle, Nkim/Nkum, Ekajuk, Mbube, Bekwarra, Afrike, Bendi, Igwo, Becheve, Utanga, Sankwala, Alege, and Utugwang. A local government area can contain two, three or more languages and tribes.

The predominant economic activities in the area fall under primary economic category of which farming is the dominant. Farming here involves the cultivation of crops such as rice, yam, cassava, groundnut, cocoa, vegetables, maize, banana, plantain and numerous processed farm products. Other primary economic activities in the region are fishing, palm wine tapping, mining of sand/gravel, lumbering, salt mining, fruits gathering and hunting of wildlife. Common in all the clans of the study area is a market system. A total of 70 markets were identified in the region operating on a five-day market regime.

FIG 1: Cross North Senatorial District

Types of data needed for this study include number of rural markets in the study area and their location, Intermarket distances, nearest neighbor coefficient, number of markets held in each day in the area, length of market week and types of market commodities.

Sources of data include both Primary and secondary sources. Primary sources provided the researcher with first hand personal data and included the numerous market sites in the study area and villages in the study area. Secondary sources are documented record of work done by other persons that are relevant to the work. These include academic journals, books, maps, magazines, market related documents in local and state government offices. Market site and situation provide a major source of data needed for this study and this include the actual site of the

markets, market location coordinates, elevation and size, intermarket distances, market facilities, internal organization of marketing activities.

All the markets in the study area were studied and the persons interviewed were purposely selected among the market administrators including village heads and prominent elders in the community visited.

Method of data collection include observation and measurement, physical observation and recording of market features such as market commodities, facilities, site and internal organization of marketing activities was done on all market visited. Geographic positioning system (GPS) was used to determine the location coordinates (lat. and long.), elevation and size of market sites. Intermarket distances were worked out using maps with GIS platform. Distances were measured as the crowflies or straight line.

Data generated from the field were presented and analyzed using both descriptive and quantitative statistics. The descriptive statistics include ratio, percentages, tables, chart, maps and other graphical illustration and representation. The spatial and temporal attribute data of all market locations in the study area collected from the field work were inputted into the GIS environment. Specifically, the ArcGIS software was used to create maps showing the spatial-temporal distribution of markets, the market days, market cycles as well as the market ranks based on the functionality of the markets. The symbology tool was used to classify the markets, grouping markets that hold on the same day and representing them with unique symbols. Also, the markets were also ranked according to their levels of importance from the biggest market in the study area to the smallest. The market ranking attribute data was used for the analysis and the unique values category symbology tool was used. Further, to create market cycles or rings, the data on the movement or rotation of market days as observed or deduced from the field survey guided in the analysis. Having identified the market locations and days, the polyline tool was used to digitize the market cycles or rings from the day-1 markets to the day-5 markets in a systematic manner such that markets in close proximity form ring-like shapes.

Data were also subjected to univariate, bivariate and multivariate analyses to establish the relationship between and among the variables investigated. The quantitative techniques adopted to test the hypotheses of this work are:

i. Nearest neighbor statistics (Rn) for determining the spatial distribution of markets.
ii. One-way ANOVA for testing variations in intermarkets distances of four temporal market separations.
iii. Market Centrality coefficient or indices used to determine the functional magnitude of each market using Sigh (1979) and Madu (2001) formula;

$$C = ti \div T \times 100 \dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots\dots (7)$$

Where C is the centrality coefficient, *ti* is the number of persons selling an item or providing a service in a market and T is the total number of person selling or providing a particular items or services in all the markets.

Data Presentation and Analysis
Spatial distribution of rural markets in Cross River North Senatorial district

The spatial distribution and characteristics of rural market in Cross River North is presented and analyzed in this subsection. Market location information such as markets location coordinates, elevation, and site, size of market area and periodicity regime were analysed. The elevation of market sites in the study area ranges from 34m above sea level in Abakpa (Ogoja) to 426m in

Amana (Obanliku). The market terrain therefore lies in an undulating land that slopes from Obudu plateau to Ogoja plain.

The coordinates also lie between latitudes $6^0 21'33.9"$N at Ntrigom (Yala) and $6^0 51'55.1"$N in Gabu (Yala) and longitudes $8^0 25'15.7"$E in Wanokom (Yala) and $9^0 26'53.3"$E in Amana (Obanliku). The common sites where markets are located include roadsides, road junctions, village centers, towns, and bushes.

Areas covered by these markets ranges from $100m^2$ in Oboso to $128,888m^2$ in Okuku markets. All the markets operate a five-day periodicity regime with different market day nomenclatures reflecting dialectical differences in the area. These nomenclatures of market days according to the different dialects or clans are Bekwarra (Ugidi, Achanya, Udama, Ugbada and Uchaga), Obudu/Obanliku (Ogidi, Azul, Lifedian, Lifembe and Katube), Mbube (Muanenkum, Ayantuel, Lekuan, Okuno and Nguel), Nkim/Nkum (Itunkim, Ayanto, Akpine, Ogbada and Itukpa), Ukelle (Igelle, Egana, Ekwok, Lifin and Ebi), Yala (Ogidi, Ikor, Ina, Ogbada and Akpakpa), Yache (Ogidi, Ogerije, Udama, Ogbada and Akpakpa) and Igede (Ihiigley, Ihiihio, Ihiobla, Ihiejua and Ihiokwo).

Figure 2 shows the spatial distribution of these market obtained from plotting of the market location coordinates taken during field work. A careful observation of the map reveals that the spatial distribution of rural markets confirms tendency toward clustering as the distribution follows the pattern of distribution of settlements and population as well as along major transport routes.
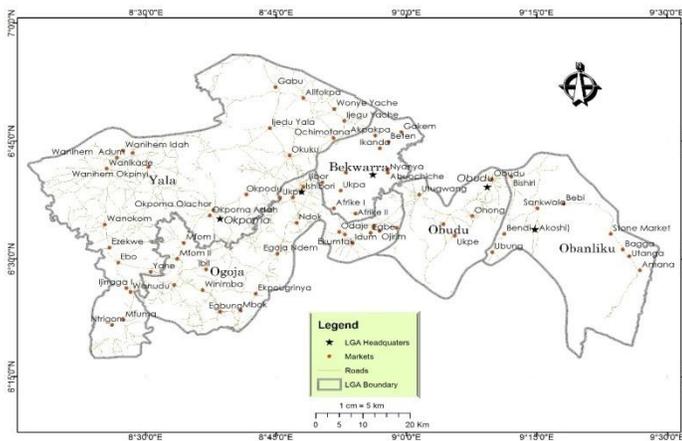

FIG. 2:   **Spatial distribution of rural markets in Cross River North Senatorial district**

Temporal distribution of rural markets in Cross River North Senatorial district

Tables 1and 2 show the temporal distribution of rural markets in Cross River North in terms of the frequency of market holding in each day of the week. From the tables, it can be observed that rural markets are almost evenly distributed among the five days of the week in Cross River North. The first day (Ugidi), has sixteen markets which is the highest. The second day (Achanya) has the lowest (12). This leaves a range of 4 markets which is not so widely distributed. A spatio-temporal distribution of these markets is shown in Figure 3 below. From Figure 3 it can be observed that some markets that meet on the same day are located close to each other. This encourages spatial and temporal competition for patronage between these markets. Physical observation of these markets facing competition reveals that some of them are at the point of closing or running out of business because they are unable to compete fovourably with the dominant ones. Example of these competitive market locations are Abuochiche and Ibiaragidi

markets, Ezekwe and Ebo markets, Ibil and Winimba markets, Utugwang and Nyanya markets, Ishibori and Abakpa markets.

TABLE 1
Distribution of rural periodic markets in Cross River North among market days

L.G.A.	Local Tribe	Local Market Day and Market Settlements				
Bekwarra	Bekwarra/Afrike	Ugidi 1.Abuochiche 2. Gakem 3. Ibiaragidi 4. Afrike I	Achanya 1. Afrike II 2. Ikanda	Udama 1. Ukpah 2. Akpakpa 3. Nyanya	Ugbada 1. Abuagbor	Uchaga 1. Beten
Obudu	Igwo	Ogidi 1. Ohong -	Azul 1. Ukpe	Lifedian -	Lifembe 1. Alege	Katube 1. Obudu
	Utugwang	Ugidi -	Achanya -	Udama 1. Utugwang	Ugbada -	Uchaga -
Obanliku	Sankwala/Becheve	Ogidi 1. Utanga 2. Bishiri	Azul 1. Bebi	Lifedian 1.Stone mkt 2.Bagga mkt	Lifembe 1. Sankwala 2. Bendi	Katube 1. Amana
Yala	Ukelle	Igelle 1. Izekwe 2.Wanihem Idah	Egana 1. Mfuma 2.Wanihem Lemoda wanibiolor	Ekwok 1.Wanokom 2. Wanudu 3.Wanihem Okpinya	Lifin 1. Wanikade 2. Ijirraga I	Ebi 1. Ntrigom 2.Wanihem Adum
	Yala/Yache/Igede	Ogidi/Ihiigley 1. Alifokpa 2. Ebo	Ikor/Ogerije/Ihiihio 1.Okpoma Olachor 2. Ochimofana	Ina/Udama/Ihiobla 1. Yahe 2. Gabu	Ogbada/Ihiejua 1. ijegu Yache 2. ijegu Yala 3.Okpoma Adah 4. Okpodo	Akpakpa/Ihiokwo 1. Okuku 2.Wonye Yache
Ogoja	Mbube	Muanenkum 1. Ojirim	Ayantuel 1. Ekumtak	Lekuan 1. Odaje 2. Ogberia	Okuno 1. Aragbang	Nguel 1. Egbe 2. Idum
	Nkim/Nkum	Itunkim	Ayanto 1. Ishibori 2. Abakpa/Ogboja	Akpine 1. Ukpe	Ogbada 1. Ndok	Itukpa
	Ekajuk	Nkim 1.EgojaNdem 2. Winimba 3. Ibil 4.Agburumbede	Egbo 1. Bansara	Ebe 1. Ekpougrinya	Ndak 1. Mfom II 2. Mbok I	Ekpa 1. Egbung 2. Mfom I 3. Ewang 4. Ebanembin

TABLE 2
Temporal distribution of rural markets in Cross River North Senatorial district

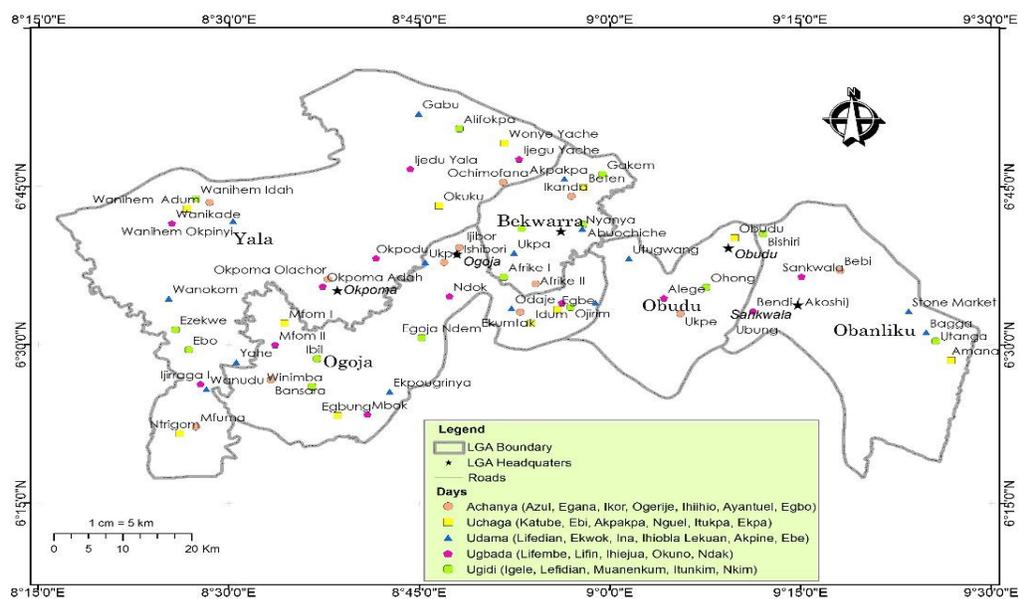| LGA\Market Day	Ugidi	Achanya	Udama	Ugbada	Uchaga	Total
Bekwarra	4	2	3	1	1	11
Obanliku	2	1	2	2	1	8
Obudu	1	1	1	1	1	5
Ogoja	5	4	4	4	6	23
Yala	4	4	5	6	4	23
Total	16	12	15	14	13	70
%	22.9	17.1	21.4	20.0	18.6	100

FIG. 3: Spatio-temporal distribution of rural markets in Cross River North Senatorial District

Market ring system

Market ring system or cycle reflects the rotation of market meetings among a set of market settlements following a particular temporal regime or periodicity. Such cycle of rotation of market meeting was observed in the study area. Twelve of such cycles of market meeting or rings were identified. Each cycle shows the pattern of market shift and has a number of markets constituting the cycle. In Yala LGA, three cycles were identified namely the North Ukelle Ring (Wanokom, Wankade, Wanihem Adun, Wanihem Okpinyi, Wanihem, Wanibiolor and Wanihem Idah); South Ukelle Ring (Ijrraga, Wanudu, Mfuma, Ntrigom and Ezekwe); Yala Yache Ring (Okuku, Ijegu Yache, Alifokpa, Okpoma Olachor and Ochimofana). In Bekwarra there are two rings – Northern Ring (Gakem, Beten, Akpakpa and Ikanda) and Southern Ring (Abuochiche, Afrike I, Afrike II, Ukpah and Nyanya); Ogoja LGA has four Rings namely Ekajuk Ring (Egbung, Bansara, Winimba, Ekpougrinya, Mfom II); Nkim Ring (Ishibori, Ibil, Egoja Ndem, Agburunbede and Ndok); Mbube West Ring (Odaje, Ekumtak, Egbe and Aragbang) and Mbube East Ring (Idum, Ogberia and Ojirim). Obudu has only one Ring consisting of five markets namely Obudu, Ohong, Ukpe, Alege and Utugwang. Obanlika has two cycles-Obanlika West (Sankwala, Bishiri, Bendi and Bebi) and Obanlika East (Utanga, Amana, Stone market, and Bagga markets) (see fig 4). These cycles are mostly adopted by itinerant traders in moving their lots from one market to another on a daily basis. Market ring system operates at the village group level.
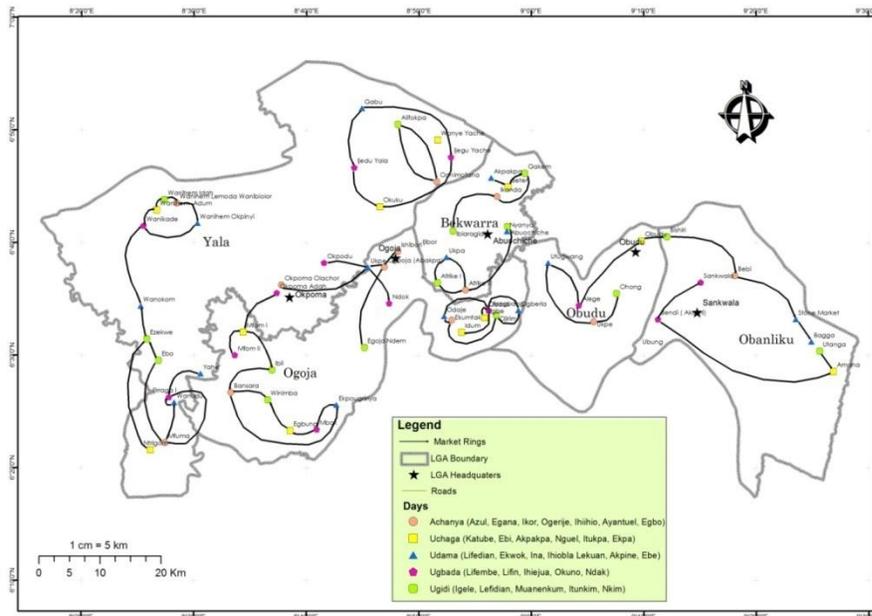
FIG. 4: Rural market cycle or ring system in Cross River North

Intermarket distances

Table 3 below displays mean intermarket nearest neighbor distances as the scrowflies for different temporal separations in the different traditional units of the study area. From Table 3, markets meeting on the same day are more widely spaced than other markets of different temporal separation. Same-day markets have a mean intermarket distance of 11.97km. One day earlier or later has 6.37km, two days earlier or later has 6.91km and three days earlier or later has mean distance of 7.77km. It follows that as the number of temporal separation increases, distance between markets tends to collapse. This is probably to avoid unnecessary competition for patronage or a clash in market catchment area. The average spatial distance separating markets irrespective of time factor was worked out as 5.28km. That is the nearest distance to a nearby market is 5.28km.

TABLE 3
Mean intermarket nearest neighbour distances of different temporal separations (in km)

S/N	Clan	Same-day	One day earlier or later	Two days earlier or later	Three days earlier or later
1	Bekwarra	12.67	6.44	6.00	3.00
2	Afrike	5.00	5.00	6.50	8.00
3	Becheve	5.00	5.00	5.00	6.00
4	Sankwala	14.33	12.00	9.00	5.00
5	Obudu	28.00	8.50	10.00	10.50
6	Utugwang	8.00	7.00	8.00	8.00
7	Nkim/Nkum	7.66	6.00	5.00	9.00
8	Mbube	8.00	4.33	7.50	7.50
9	Ekajuk	12.33	6.25	6.00	10.00
10	Ukelle	22.33	5.60	6.00	10.00
11	Yala	9.00	4.00	7.00	9.00
	Mean	11.97	6.37	6.91	7.77

Types of goods and services offered for sale in the study area

The breadth and depth of commodities supplied to the markets in Cross River North is shown in Table 4. From Table 4, tuber and tuber products rank highest on individual commodity classification with 22.8% frequency. This is followed by vegetable, fruits and spices 19.0%, services 16.3%, manufactured goods 10.8%, pulse and legumes 9.0%, fish and domestic animals each 5.3% and 5.0% respectively, edible oil 3.8%, local craft 3.4%, cereal 2.5% and bush meat 2.1%. The major commodity supplied to the markets in Cross River North is therefore tubers and their products of which yams, Cassava and gari constitute the major composition.

TABLE 4
The breadth and depth of commodities supplied to the markets in Cross River North

S/N	Type of commodity	Number of Sellers	%	Varieties/Composition
1	Vegetables/fruits /spices	9443	19.0	Banana, bush mangoes, Okro, garden egg, pepper, shear butter, locust bean seeds, onions, tomatoes, green vegetables, pineapple, ginger, oranges, plantain, grape, pawpaw, mangoes, cashew, palm kernel and native pear.
2	Cereals	1259	2.5	Guinea corn, millet, maize and rice
3	Tubers and products	11333	22.8	Yams, cassava, cassava flour, garri and sweet potatoes
4	Pulses/Legumes	4483	9.0	Beans, cowpea, pigeon beans, ground nuts, beniseed and melon

5	Fish	2640	5.3	Tilapia, crayfish, mud fish (mangala), iced fish and liver fish
6	Bush meat	1051	2.1	Rabbits, Antelopes, Bush Pigs, Monkeys, Birds, Rabbits, Alligator, Snakes, Grass Gutters.
7	Domestic animals/fowls	2472	5.0	Dogs, Goats, Sheep, Cows, Pigs and Fowls
8	Edible oil	1865	3.8	Palm Oil, Ground Nut Oil, palm kernel and shea butter oil
9	Local Craft Products	1681	3.4	Earthen pots, hoe, local soap, local mats, morter and pistle, wooden chair, garri siever, hand fan, leather/rubber products
10	Manufactured Goods	5371	10.8	Bicycle parts, beer, glasses, spoon, beverages, touch light, batteries, sugar, umbrella, hand bags, kerosene, mattress, old cloths, new cloths, cooking utensils, tooth paste, and foot wears
11	Services	8127	16.3	Cooked food, bus services, motorcycle and bicycle repairs, barbing, hairdressing, tailoring and shoe repairs
	Total	49725	100	

Source: Author's Fieldwork (2016)

Functional distribution of rural markets

Functional magnitude and hierarchy of markets in Cross River North were also analysed. Functional indices of rural markets in Cross River North were analysed. These indices show the level of centrality of these markets in terms of the number of goods and services they offer as a function to those patronizing them. The indices represent the functional magnitude of each market in terms of it centrality coefficient or value worked out using Singh (1979) and Madu (2001), model. Analysis of these centrality values reveals five hierarchical categories or levels of centrality of rural markets in Cross River North. This was based on the tendency of clustering of the centrality coefficient. The distribution and hierarchy of these markets in terms of their functions are displayed in Fig. 5 below. In the figure, there is only one major regional market (Okuku) at the top of the hierarchy. This is followed by four markets (Abuochiche, Utugwang, Bishiri and Sankwala) occupying the second position, nineteen occupy third position while the fourth and fifth groups of markets in the hierarchy have 12 and 32 markets respectively. The distribution pattern seems to follow the traffic principle of Walter Christaller's Central Place theory.
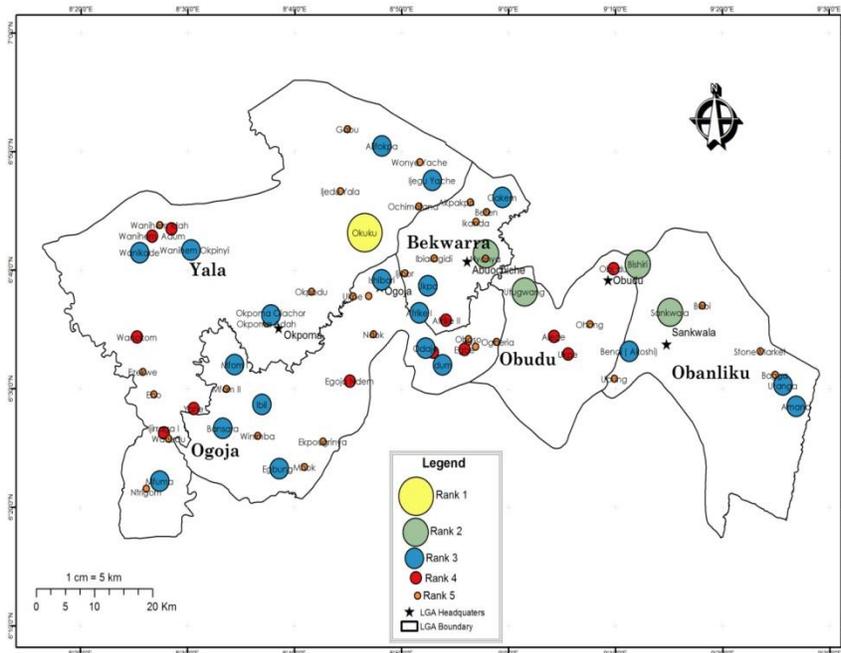
FIG. 5: Classification of markets by market function

Test of hypotheses
Hypothesis 1
Ho: the spatial distribution of all periodic markets in Cross River North is random
Ho: the spatial distribution of all periodic markets in Cross River North is not random

The Average Nearest Neighbor (ANN) statistical tool of ArcMap GIS software was used to test the spatial pattern of distribution of rural markets in Cross River North Senatorial District. The point data of all the market locations in Northern Cross River was used for the analysis. A total of 70 points were considered, which was a suitable number for the ANN analysis. The output of the ANN analysis shown in Figure 6 depicts an index (ANN ratio) of less than 1 (0.834), thus, the pattern exhibits clustering. Also, with a p-value of 0.008420 (< -1.96 or > +1.96) and a z-score of -2.635 at a 0.05 confidence level, there is less than 1 percent likelihood that this clustered pattern could be the result of random chance (ESRI, 2013). Based on the derived ANN ratio and p-value, there is enough evidence to accept the fact that the spatial distribution of markets in Northern Cross River State exhibits statistical significant clustering.
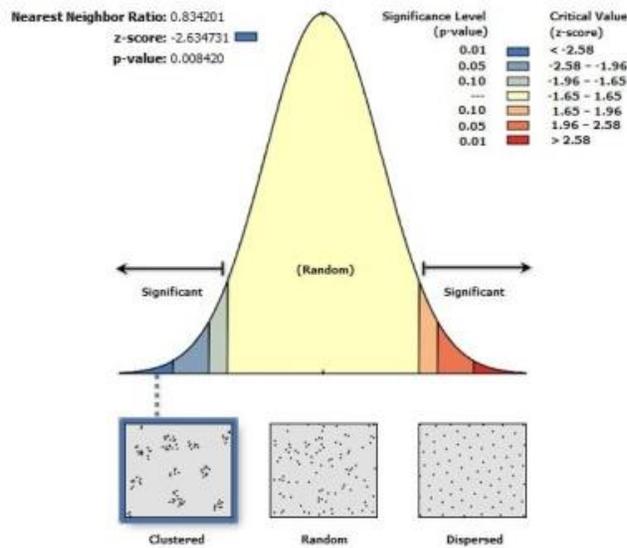
Figure 6: ANN analysis output

Hypothesis 2

H_0:   Markets meeting on the same day of the week are randomly distributed.

H_1:   Markets meeting on the same day of the week are not randomly distributed.

        The nearest neighbor values worked out for each of the five days of the week are presented in Table 5. From the table, all the Rn values for each of the five days are all greater than 1.0- the critical value for random distribution. It can therefore be concluded here that the pattern of distribution of markets in each day of the week tends toward uniformity.

TABLE 5

Nearest neighbour (Rn) values of market distribution in Cross River North

Day of the Week	Ugidi	Achanya	Udama	Ugbada	Uchaga
Number of Markets	16	12	15	14	13
Mean Intermarket Distance (km)	11.25	12.42	10.40	12.93	16.15
Area of Study (km^2)	4527	4527	4527	4527	4527
Rn Value	1.34	1.28	1.20	1.44	1.73
Pattern of Distribution	Uniform	Uniform	Uniform	Uniform	Uniform

        Source: Author's Field Report (2016)

Hypothesis 3

H_o The physical spacings of Markets whose meeting are separated by different lengths of time do not vary significantly.

H_1 The physical spacing of Markets whose meetings are separated by different lengths of time varies significantly.

The results from the analysis of data in Table 3 indicate that the physical spacing of markets whose meetings are separated by different lengths of time vary significantly, $F (3, 40) = 4.77$, $p < 0.05$. This means that the physical spacing of markets whose meetings follow different temporal separation categories varies. Temporal separation categories vary from same-day, one day earlier or later, two days earlier or later to three days earlier or later. The mean distances decreases from same-day (M = 11.97km) to one day earlier or later (M = 6.37km) and increase again in two days earlier or later (M = 6.91km) with further increases in three days earlier or later (M = 7.82km). Hence the null hypothesis was rejected. Although the fraction is significant, it does not indicate were the difference lies among the 4 intermarket distances. To establish this, the Schaffer's post hoc test was conducted. The results show that the spacing of same-day markets is different from one day earlier or later but not with two days earlier or later and three days earlier or later. Similarly, one day earlier or later markets are only different from same-day but not with the other two. Two days earlier or later markets and three days earlier or later do not differ with significant with other markets. However, same-day markets and two days earlier or later are different at exactly 0.05 significant level. It therefore concluded that the cause of the significant difference in the f-ratio lies with same-day markets.

Discussion of findings
The study has revealed that the pattern of distribution of same-day markets in Cross River North is uniform but spatially, all the markets in the area tends to cluster around route ways and settlements where there are population clusters. The study also showed that the markets in the area operate a 5-day Calendar as each market holds once every five days. This periodicity regime is similar to that observed in Tiv and Idoma tribes of Benue State by Smith (1970) but differs from what was obtainable in Obubra South by Eni (1981).

In the course of this study, the researcher subjected the three (3) hypotheses stated in for this work to test and analysis using different statistical techniques. After the presentation and analysis of data and the test of the stated hypothesis, the following findings which will be discussed below, emerged.

Hypothesis one reveals that the spatial distribution of periodic markets in Cross River North Senatorial District tends toward clustering around settlements and route ways. This tends to agrees with August Losch theory of an economic landscape. The theory suggested that the optimal location of economic activities is a function of market demand occurring in places where net profit is the highest and as a result economic activities (markets inclusive) will tend to locate in those sectors of a trade area circle that are well served with transport and other socio-economic infrastructures. Losch used the term "Economic Landscape" to explain this sectoral arrangement of central places and economic activities.

The test of hypothesis two reveals that markets meeting on the same day of the week are not randomly distributed but shows tendencies toward uniform distribution. This goes in consonance with the observation of Smith (1971) in Western Nigeria; Hill and Smith (1972) in former Katsina Emirate; Fagerlund and Smith (1970) in Ghana; and Wood (1975) in Kenya. According to Fagerlund and Smith (1970) the physical spacing of markets whose meetings are separated by different lengths of time should display certain degree of order. Markets on the same day should exhibit uniform spatial pattern.

In hypothesis three, it was discovered that the physical spacing of markets whose meetings are separated by different lengths of time varies significantly. It has been indicated that significantly, less physical spacing separate markets where meetings are adjacent days than those

markets that meet on the same day. The test conducted on the difference in the physical spacing of markets of four temporal separation category also reveals significant difference among the inter market distances. The four category of temporal separation are same day markets, one day earlier or later (adjacent markets), two days earlier or later and three days earlier or later markets. Although there was significant difference for all the four temporal separations yet much of the difference in the F-ratio was accounted for by the same day market as revealed by Schaffer's post hoc test. The result of the test confirms the idea of a spatio-temporal distribution of rural markets or spatial and temporal repulsion concept which has produced the temporal-locational spacing or spatio-temporal synchronization hypothesis which state that proximity in space implies separation in time (Fagerhand and Smith 1970). The result of this hypothesis lends credence to the observation and findings of scholars such as Fagerhand and Smith (1970) in Ghana, Udosen and Adams (2009) in the hinterlands of Akwa Ibom, Wabungu (1995) in Kenya, Wood (1972) in Ankole district of Western Uganda, Ukwu (1969) in Iboland and Hill & Smith (1972) in the four Emirates of Northern Nigeria.

The study findings further revealed that the major commodity supplied to the markets in Cross River North is mostly tubers and their products which includes but not limited to yams, cassava, water yam and garri as the major composition. These agricultural produce are purchased from the market by traders who in turn export them to major regional markets in Nigeria such as Maiduguri, Kano, Jos, Makurdi, Lagos, Port Harcourt, Calabar, Uyo, Enugu, Aba and Abuja.

The analysis of centrality values of each rural market in the area showed five hierarchies of rural market centers ranging from the highest to the lowest order. The distribution pattern seems to follow the traffic principle of Walter Christaller's central place theory.

Recommendations

In the light of the result derive from the research, the following recommendations are made to help improve and sustain the periodic rural marketing in the area;

1) The rural market in the area should be synchronized so that spatial and temporal competitions will rather be complementary. In doing so, the local market day calendar should be prioritized. Although it may seem difficult considering the pervasive cultural practices associated with rural market in the study area.
2) Opening and maintaining more rural markets is required to enhance more opportunity for periodic trading and profit making.
3) The plannings and reorganization of rural markets should incorporate provision of storage grain reserves, market stores, warehouses and modern refrigerating equipments such as cold store should be developed for rural market use.
4) To enhance the viability of these markets, there is urgent need for general improvement in the infrastructural development of rural areas in Cross River State. Motorable roads that can be used all year round, should be constructed by the government to enhance accessibility of the rural markets in the area. This will aid in easy distribution and conveyance of good, mostly perishable products to the market.

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