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MEASURING ACCESSIBILITY LEVEL FOR AGRICULTURAL COMMODITIES MOVEMENT IN SOUTHERN ADAMAWA REGION, NIGERIA

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Abstract

The aim of this study was to Measure Accessibility Level for Agricultural Commodities Movement in Southern Adamawa Region, Nigeria. Study data were mainly obtained from survey questionnaire. Using multistage sampling, 384 respondents were selected from twelve sample markets to acquire the study data. Data were then analysed using simple descriptive statistics and graph analytic theory. The study found out that various transport modes were used in the flow of agricultural commodities in the region, out of which only 27% are convenient freight carriers while the remaining 73% were not specifically meant for freight movement, which were basically small in size usually with low carrying capacity. Another finding reveals that 57.28% out of the total road networks in the region were not surfaced and that 92.24% of the total road networks were in bad condition. The findings also revealed that the Ganye, Jada, Mayobelwa markets show high connectivity value while those located in the peripheral zones show low connectivity values. There is also an overall road network density of 34m/km^2 in the region and Beta index of 1.67 showing high degree of connectedness. Finally, the study recommended among other things the upgrade, rehabilitation and continuous maintenance of road networks, encourage public and private participation in the provision of transport services in the study area.

Keywords*:* Accessibility, Agriculture, Commodity Flow, Road Networks

1. Introduction

Transportation has been described as a major factor in all economic activities and as such, it provides market accessibility by linking producers and consumers. Accessibility refers to the ease to arrive to facilities, activities or goals, which could be appointed in general as opportunities. In addition, accessibility could be defined as "the intensity of the possibility of interaction" (Hansen,1959) and interchange (Engwicht, 1993). Accessibility refers to the ease of reaching goods, services, activities and destinations, which together are called opportunities. It can be defined as the potential for interaction and exchange (Engwicht 1993). Accessibility of road is one of the most important indicators of the degree and efficiency of transport system of an area. The concept of road accessibility is quite different from the concept of railway accessibility. Because, railway lines mainly connect important and major places of the country. On the other hand, roads connect any part of the country with another region irrespective of the importance of the places. Hence, for the

socio- economic development of an area, a high degree of road accessibility is much essential (Behera, 1993).

A place is considered to be more connected and accessible if it has more direct road connection with other places. The location in relation to other places therefore plays a remarkable role in determining the degree of connectivity and accessibility. While examining a transport network, a geographer is also interested in node linkage associations in terms of accessibility. The structure of a network, changes in response to the addition of new linkages or the improvement of exiting linkages are reflected as the changes in the nodal accessibility. The measurement of nodal accessibility is based on graph theory (Robinson and Bamford, 1978).

Agricultural commodities for instance, generated in the rural areas need to be taken to urban centres for further distribution, this can only be possible through transporting these commodities from those rural areas to other places. Here transportation provides the means by which these products are circulated. Nigeria as an agrarian nation has more than 70% of its rural populace depending on agriculture as source of livelihood (Adegboye, 2004). Southern Adamawa region, the study area for instance has a wide range of climate variation which allows it to produce varieties of livestock, food and cash crops, tubers etc. Unfortunately, the transportation system that is needed to evacuate surplus agricultural commodities to places of deficit is not adequate. As envisaged by Ikporukpo, (1990), most developing countries (Nigeria inclusive) suffers intensive poor road transport infrastructures and that most rural communities in Africa do face transport challenges which limit their ability to reduce their economic hardship. In view of above, this research tends to measure accessibility level for agricultural commodities movement in Southern Adamawa Region, Nigeria.

2.Materials and Methods

2.1 Study Area

Southern Adamawa region comprises four Local Government Areas namely; Ganye, Jada, Mayo Belwa, and Toungo. The study area located in the North Eastern part of Nigeria, lies between Latitude 7^{o} 2’ 49” and 9^{o} 11’ 3” of the equator and between Longitude 7^{o} 2’ 49” and 12^{o} 58’ 41” of the Greenwich meridian. It shares local boundary with Numan and Fufore LGAs in the Northern part of the state and shares a state boundary with Taraba State in the Southwest, it also shares an international boundary with Cameroon Republic along its eastern border (Figure 1 & 2). The study area covers a land area of about 12,130.32 km^2 with a total population of about 543,375 people (projected figure for 2019) (NPC, 2010). Majority of the people are farmers engaged in rain fed and irrigational agriculture as well as animal husbandry with the production of assorted grains, tubers and cash crops which include groundnut, maize, guinea corn, rice, yam, cassava etc. Major ethnic groups in the study area are Fulani, Chamba and Nyandang **(**Adebayo, Tukur & Zemba, 2020 and Fakuade, 2020).

There are twenty (20) functional markets in the study area which are mostly periodic in

nature and attract large number of people from within the state, neighboring states and Cameroun republic. Several agricultural commodities which include livestock, food and cash crops such as groundnut, maize, guinea corn, rice, beans, yam, and cassava among others are exchanged in these markets (Mubi, 2020).

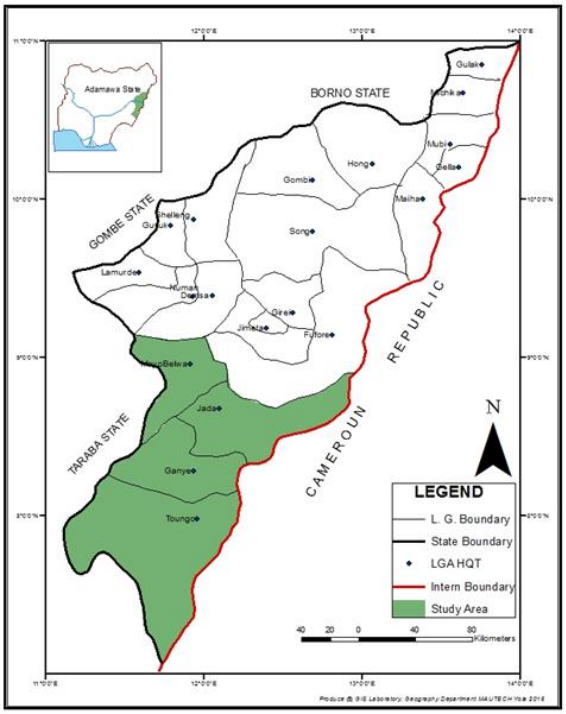

Figure 1: The Study Area
Source: Author's, (2021)

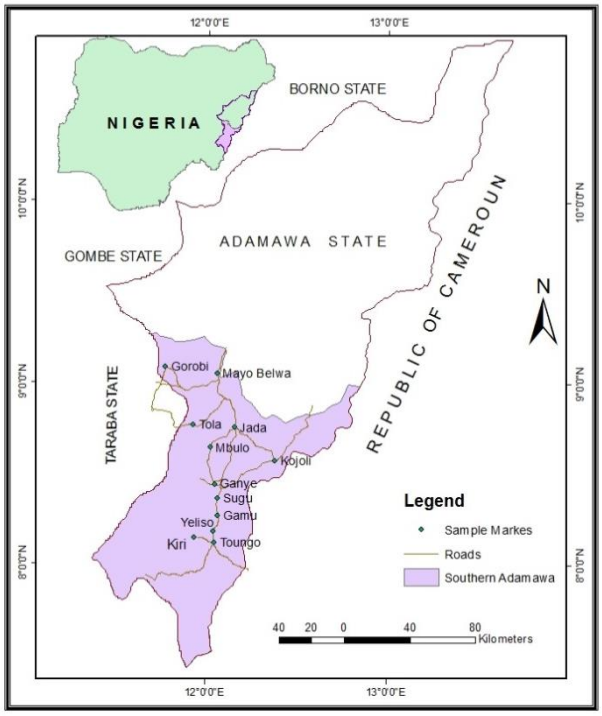

Figure 2: Sample Markets
Source: Author's, (2021)

3. Methods of data collection

The study used both primary and secondary data, the primary data were mainly obtained from survey questionnaire while the secondary were sourced from sourced from Adamawa State Ministry of Lands and survey and the Google Earth map; data on volume of agricultural yields were sourced from Adamawa State Ministries of Agriculture and Livestock while relevant population data was obtained from the National Population Commission (NPC), Adamawa State. Study Data were largely acquired through questionnaire survey designed to gather information from the targeted population which include handlers of the agricultural commodities and transport operators. Twelve (12) sample markets were selected, three (3) from each of the four (4) Local Government Areas that made up the study area (Figure 2). 384 questionnaires (adapted from James et al, 2001) were distributed at random to respondents on designated market days. Data were then analysed using simple frequencies and percentages presented in tables, charts.

4. Results and Discussion

4.1 Sex Composition of the Handlers of Agricultural Commodities

The sex composition of the people handling agricultural commodities flow in the region presented in Figure 3 show overall male (79%) dominance over female (21%). However, despite the overall male dominance; the flow of some certain commodities (particularly cowpea, rice and yam) exhibits a fair participation of both gender compositions. This is mainly due to the fact that the flow of such commodities is bounded by short distance travel, thereby warranting more female counterparts to participate, who on the other hand were traditionally saddled with the responsibility of household chores. Consistent with the findings was the suggestion made by Yemisi and Idisi, (2014) that women are inhibited from practicing activities outside home-making and their rights are denied by the social norms and customs of their societies. The gender characteristic of the people however plays a significant role in the functioning of regional commodity flow pattern.

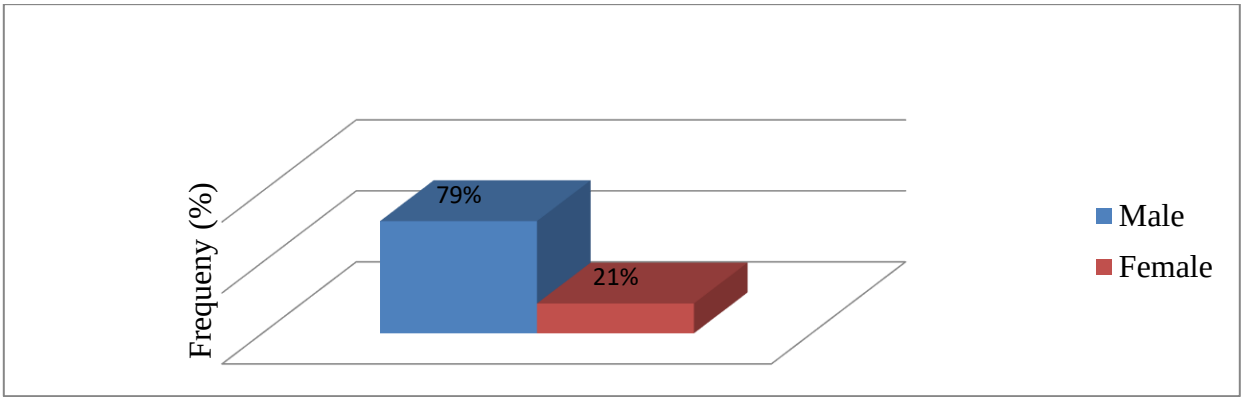

Figure 3: Sex Composition of the Handlers of Commodities
Source: Author's, (2021)

4.2 Age Composition of the Handlers of Agricultural Commodities

The age composition of the people handling agricultural commodities in the study area as clearly presented in Figure 4 shows that age range 41-50 years and 31-40 years dominates the commodity flow market signifying that flow of commodities in the Southern Adamawa region are handled by the active age group who are very vibrant and productive.

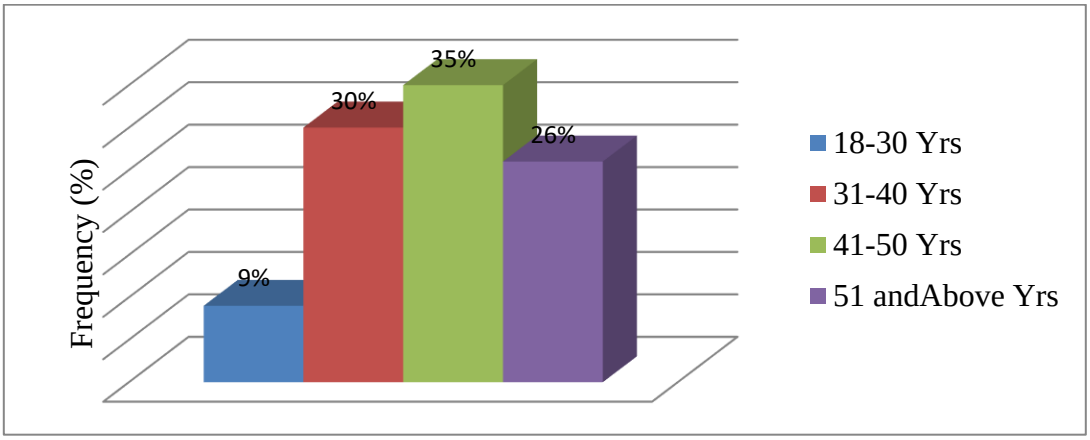

Figure 4: Age Composition of the Handlers of Commodities
Source: Author's, (2021)

4.3 Income Earning of the Handlers of Agricultural Commodities

Income earning of the respondents on monthly basis was presented in figure 5 using a four (4) income group based on the minimum national wage. Where those earning less than N35,000 were the Low-Income earners, N35,001-N70,000 Lower Middle-Income earners, N70,001-105,000 Upper Middle-Income earners, while those earning more than N105,001 are High-Income earners. The result shows that majority of the people that are engaged in the flow of agricultural commodities in the study area are high-income earners and this is strongly related to and influenced by the type commodity involved in the flow.

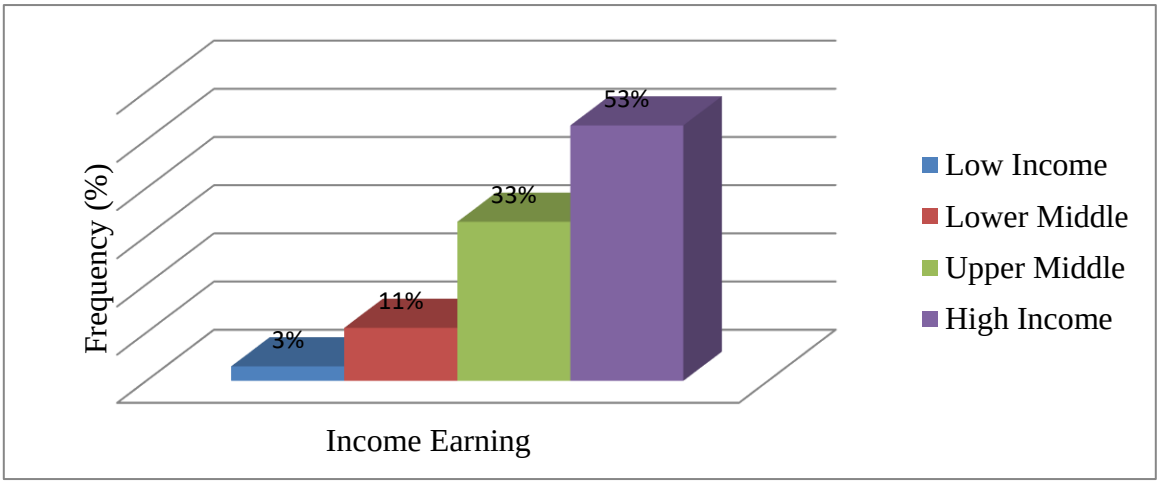

Figure 5: Income Earning of the Handlers of Commodities
Source: Author's, (2021)

5. Spatial Pattern of Agricultural Commodities Flow in Southern Adamawa Region

It is very important to understand where they are produced in the study area as well as their final destinations. Table 1 present percentage of agricultural commodities flow. It can be seen that majority of the cattle mainly comes from the major markets of Mayo-Belwa, Ganye, Toungo and Jada while a small proportion comes from markets in the neighboring Cameroun Republic (which are specifically referred to as "Internationals") most of which are further redistributed to other markets outside the study area. Unlike cattle, the remaining agricultural commodities mainly come from the subordinate markets. However, Gamu, Ganye, Toungo and Sugu markets serve as the major yam supply; a small proportion however comes from markets in neighboring states. This is an indication that most of the agricultural commodities are obtained within the region, only a small proportion comes from outside the study area. The above results is highly corroborated with the contributions of Adebayo, Tukur and Zemba (2020) and Tukur and Ardo (2020), that Southern Adamawa region due to favorable environmental factors support high agricultural yield and the production of such crops as yam and rice which require adequate climatic factors. Also in addition, the region falls under two out of the four pastoral (livestock) blocks in Adamawa State, namely Toungo and Jada/Mayo-Belwa pastoral blocks (Tukur & Ardo, 2020).

Table 1: Agricultural Commodities Flow in Southern Adamawa Region

Sample Markets	Percentage of Agricultural Commodity Flow													
	Cattle (%)		Cowpea (%)		G/Nut (%)		Maize (%)		Rice (%)		Sorghum (%)		Yam (%)	
	O	D	O	D	O	D	O	D	O	D	O	D	O	D
Gamu	7.47	-	-	-	12.5	-	15.79	-	10.41	-	6.89	-	25	-
Ganye	14.95	18.69	26.67	26.67	17.5	36.25	17.54	26.31	29.18	20.83	10.34	17.24	25	2.08
Sugu	8.41	-	6.67	-	10	2.5	7.01	-	10.41	-	3.44	-	12.5	-
Jada	10.28	17.75	-	20	7.5	12.5	5.26	17.54	16.67	8.33	10.34	13.79	2.08	20.83
Kojoli	5.60	-	-	-	5	-	8.77	-	4.17	-	6.89	-	2.08	-
Mbulo	5.60	-	-	-	16.25	-	12.28	-	2.08	-	13.79	-	2.08	2.08
Gorobi	1.86	-	-	-	2.5	-	1.75	-	2.08	-	3.44	-	-	2.08
M/Belwa	15.88	7.47	-	26.67	6.25	15	5.26	7.01	16.67	4.17	10.34	13.79	-	20.83
Tola	3.73	0.93	20	-	10	-	14.03	-	4.17	-	10.34	-	2.08	-
Kiri	2.80	-	-	-	1.25	-	8.77	-	2.08	2.08	3.44	-	2.08	-
Toungo	14.01	2.80	46.67	-	10	2.5	1.75	5.26	2.08	6.25	24.14	-	16.67	2.08
Yeliso	0.93	-	-	-	1.25	-	1.75	-	-	2.08	-	-	2.08	-
Region's Total	91.59	47.66	100	73.33	100	68.75	100	56.14	100	43.75	100	44.83	91.67	50
Outside Markets	8.41	52.34	-	26.67	-	31.25	-	43.86	-	56.24	-	55.17	8.33	50
Grand Total	100	100	100	100	100	100	100	100	100	100	100	100	100	100

Source: Author's, (2021)

6. Modal Share used in Agricultural Commodities Flow

The modal dependence is vital in the flow of agricultural commodities. Figure 6 shows that mode shares for commodities flow are mostly by pick-up Vans and Truck/Lorry, others include Bus, Taxi-car, Tricycle, Bicycle and by foot either as head portrait or wheel cart, implying that study area is heavily dependent on road transport system for the movement of its commodities which are mostly on commercial basis. However, despite this result, poor condition of the roads in the Study Area has made it very difficult and almost impossible for convenient freight carriers to access most of the markets and other remote areas in the region to the extent that people are forced to depend mostly on low carrying capacity and small in size such as cars, buses, tricycles motorcycles etc. due their flexibility are their ability to penetrate remote areas. Mode shares were also analyzed in terms of their convenience in transporting agricultural commodities where the International Road Transport Union (IRU, 2001) recognizes truck operators as the standard and most convenient for the mobility of goods by roads and hereby represents their interest. In contrast, only 29.57% of the agricultural commodities are conveyed by trucks (Figure 7).

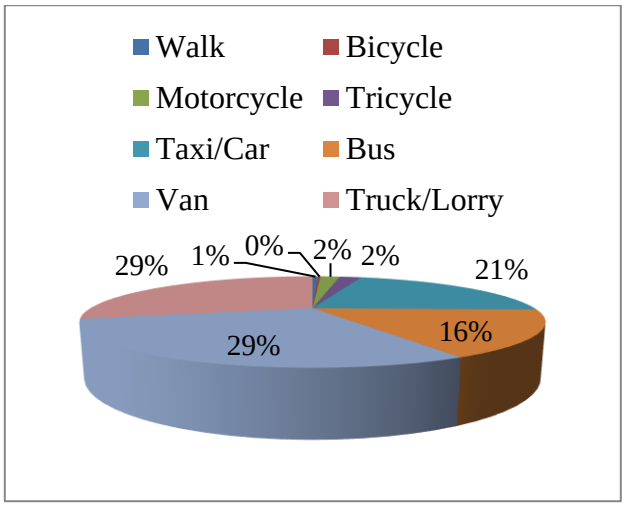

Figure 6: Mode Shares
Source: Author's, (2021)

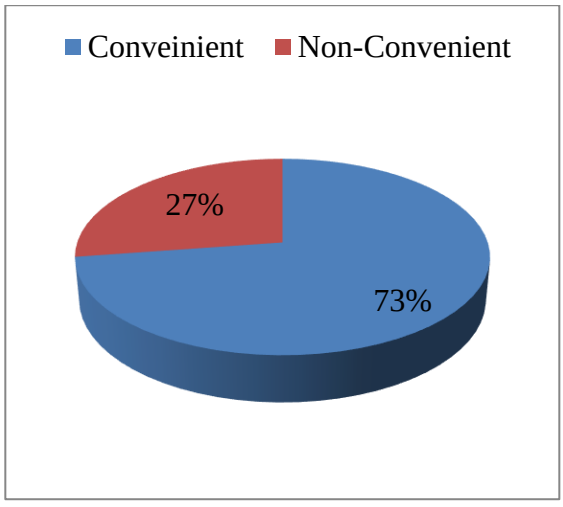

Figure 7: Modal Dependence
Source: Author's, (2021)

7. Nature of Road Networks in the Southern Adamawa Region

States of road networks in the Southern Adamawa region (Table 2) shows that total length of road networks stands at 412 Kilometers. Out of which 42.72% were tarred roads while 57.28% were un-tarred roads. Table 6 further analyzed the road conditions and the result reveals that only 7.76% out of the total (176 Km) tarred roads were in very good condition, 26.46% were fairly good and 65.78% were in very poor condition. The result also implies that majority of the road transport network in

the region that facilitates the movements of commodities is in a deplorable condition but are however accessible all year round. Road network density was further analyzed using the total land area of 12,130.32 Km^2 and the total network length of approximately 412 kilometers (i.e. the length of road per unit of geographical area) as envisaged by Odaga and Heneveld (1995) that "road network density is high when it is more than 120 meters per Km^2; medium when it is more than 30 meters and less than 120 meters per Km^2 and low when it is less than 30 meters per Km^2". Table 3 reveals that the overall network density region was 34m/km^2 which stand at moderate since it is not more than 30 meters per Km^2 (Odaga and Heneveld, 1995). The result revealed an overall index of 1.67, a value greater than 1, indicating a high degree of connectivity. However, lack of well-surfaced road network in the region has made accessibility more inefficient (Table 3).

Table 2: Nature and Condition of Road Network in the Study Area

Description of Road Condition	**Nature of Road Network (Kilometers)**			
	Paved	**Not paved**	**Total**	**Total %**
Very Good (Smooth Paved Surface)	32	-	32	7.76
Fairly Good (Road with Numerous Potholes)	109	-	109	26.46
Very Poor (Road Components eroded off)	35	236	271	65.78
Total	**176**	**236**	**412**	**100**
Total %	**42.76**	**57.28**	**100**	

Source: Author's, (2021)

Table 3: Analysis of Existing Road Networks in the Study Area

S/N	**Indicators**	**Formula**	**Index Score**	**Correlation with Connectivity**
1	Network Density	ND = L/S	34 m/Sq. Km	Lower density indicates less Development
2	Beta Index	$\beta = e/v$	1.67	Higher value indicates more connectivity

Source: Authors, (2021)

8. Conclusion

The study evaluates road transport accessibility in relation to agricultural commodities flow in southern Adamawa region, Nigeria. From the study, the following conclusion can be drawn; The study revealed that there is an overall male dominance over female, flow of commodities in the Southern Adamawa region are handled by the active age group who are very vibrant and productive. The result also reveals that majority of the people that are engaged in the flow of agricultural commodities in the study area are high income earners, and that most of the agricultural commodities are obtained within the region, only a small proportion comes from outside the study area. The

study also found out that various transport modes were used in the flow of agricultural commodities in the region, out of which only 27% are convenient freight carriers while the remaining 73% were not specifically meant for freight movement, and were basically small in size usually with low carrying capacity. Out of the total road networks in the region, 57.28% were not surfaced and that 92.24% were in bad condition. The markets which are located in the central part of the region show high connectivity value while on the other hand those located in the peripheral zones show low connectivity values. There is also an overall road network density of 34m/km^2 in the region and Beta index of 1.67 shows high degree connectivity.

9. Recommendations

The study therefore recommends that:

a) Due attention should be devoted more to the upgrading, rehabilitation and continuous maintenance of roads.
b) There is need for the prompt construction of new motor-able roads to link the peripherals and their central zones.
c) Combine effort should be made from both Government and the private sector to assist in the provision of appropriate and convenient freight carriers which have high carrying capacity for effective flow of commodities in the region.
d) Government should also encourage public and private participation in the provision of transport services. This could be accomplished by encouraging various bodies/unions that are involved in flow of commodities to form cooperatives through which they can be able to access loans to buy vehicles that are convenient for the flow of commodities.
e) For a sustainable road transport system in the region, there is need for the introduction of rail transport for it various advantages such as low cost of transport, high carrying capacity, lower influence by weather conditions, and lower energy consumption. This will help reduce the over burden on roads, reduce the involvement of smaller vehicles in the movement of commodities which have low carrying capacity.

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