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DOES THEIR GEOGRAPHY MATTER? ASSESSING THE IMPACT OF GEOGRAPHICAL FACTORS ON DEVELOPMENT OF RURAL COMMUNITIES IN BENUE STATE, NIGERIA

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ABSTRACT: *The study assessed the impact of geographical factors on the development of rural communities in Benue state. Primary data (on living standard, employment, social inclusion, climate, location, resources, and environmental stability) were generated through mixed questionnaires administered to the respondents in a household survey. A random selection of nine (9) LGAs in the State was done, with three (3) LGAs selected from each of Benue North, Benue Central and Benue South. A sample of 820 was selected out of the population of 2,065,400. The logistic regression analysis was employed to examine the impact of geographical factors on economic development of rural households in Benue state with analysis done using the SPSS. Geographical factors, such as climate, location, resources and environmental stability, were found to have negative impacts on the standard of living, employment and social inclusion of households in rural communities of Benue state, thereby significantly impacting the economic development of such households in the state. It was recommended among others that, the ministries concerned with rural development should concentrate on linking the rural communities to the urban areas for the flow of goods, services and information.*

KEYWORDS: Climate, Location, Resources, Environmental stability, Rural development.

JEL Classification Code: O10, O18, P25,R00, R11

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INTRODUCTION

The geography of a people is a key, but almost neglected, factor in defining their level of development. The climate condition facing the people, their location, the resources available, and the environmental stability of where they live collectively or individually determine the development process and efforts of a people in both rural and urban areas. Geography plays an extremely important role in determining long-term performance due to the fact that economic activities of settlements are closely related to the natural environment. But the role of this important natural factor in shaping economic performance, especially in the less developed countries (LDCs), is often neglected by economists and other scholars/analysts. However, works like Bloom and Sachs (1998), Gallup, Sachs and Mellinger (1999), Krugman (1999), Henderson, Shalizi and Venables (2001), Rajović and Bulatović (2014), and Potosyan (2017) have shown a potent correlation between the geography and economic development of rural or urban area or a whole country.

Considering this impact of geography on development between an urban area and a rural area, Potosyan (2017) had observed that, whatever influence natural environment (i.e., geography) may have on the development of people, it is greater on rural settlements than on urban. This means that the development of rural communities is greatly tied to their geography than as is the case with the urban areas. This implies further that applying a development model that has neglected geographical factors to rural areas may likely not yield the same results as in the urban sector where such factors have less impact. It, therefore, requires that rural developmental efforts should factor in the geographical component for holistic approach and effective outcome.

As essential as rural development is to achieving the 2030 Agenda for Sustainable Development, rural development in Nigeria seems to be affected by the application of a not-so-fit development model which considers little or no role of the natural factors. This has left development in the rural sector to be far behind in comparison to that of the urban. A brief picture of this gulf between the sectors can be seen from the report of National Bureau of Statistics (NBS) and United Nations Children's Fund (UNICEF) (2018). According to the report, out of about 54 percent of households in Nigeria with access to electricity, 86.8 percent are in urban and 35.7 percent in rural; urban-rural mortality differential is also pronounced between sectors with infant mortality rate at 77 per 1,000 live births in the rural areas, while 53 per 1,000 live births in urban areas. Access to improved drinking water sources is also higher in urban areas (82.9 percent) than rural areas (54.6 percent) with the use of improved sanitation at 49.2 percent in the urban areas higher than 29.2 percent in rural areas. The difference spans through other aspects of human development indicators like education and child labour as recorded in the report.

Benue state, being one of the states in Nigeria with a high percentage of rural population, has remained one of the underdeveloped states despite a series of developmental efforts. The rural communities in the state face a similar situation as shown by the report above. However, there seems to be no deviation from the linear development approach where one model solves-it-all, not minding the inherent peculiarities that exist between the sectors. This is seen even in scholarly works which have looked more at socio-economic factors as determinants of rural development in Benue state, to the neglect of these geographical factors. Could this slow pace of rural development in the state, and perhaps the whole nation, be the consequence of considering the geographical determining factors inconsequential and

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ignoring them into the development process of these rural communities? The study, thus, sought to assess and bring to fore the impact of geographical factors on the development of rural communities in Benue state. Thus, redirecting policy action towards rural development.

LITERATURE REVIEW

Theoretical Framework

There is yet any theory expressly tying geography to rural development or any other form of development for that matter. However, since Adam Smith's The Wealth of Nations in 1776, economists have questioned the disparity in growth between different places. Smith, for instance, had sought to know why England became wealthier than continental Europe. By 1826, Johann Heinrich von Thünen popularized the *Location Theory* which sought to address questions of what economic activities are located where and why. Location theory (also referred to as microeconomic theory) generally assumes that based on acting in self-interest, economic firms choose locations that maximize their profits and individuals choose locations that maximize their utility. The attraction to a location was based on transportation costs, economic rents, different land uses and distance from the marketplace which vary from place to place. It focuses on the interaction of different cultural and natural geo-factors in a specific land.

There have been other scattered attempts at developing a geography-development theory. In 1991, Paul Krugman put forward a new location theory which is called *New Economic Geography*. He defined the New Economic Geography as the location theory of production, in similar light as the classicals had explained location theory. This gives an explanation to the mechanism of formation and evolution of the economic spatial structure. The New Economic Geography theory of Krugman is summed up as follows: a main idea, four propositions, four tools and three models. Krugman's New Economic Geography is based on the main idea that there exists multiple equilibrium states in the development of economic spatial structure. In order to analyze more clearly the process of formation and evolution of economic spatial structure, Krugman puts forward four propositions: one, transportation Costs play a key role in international trade and inter-regional trade; two, spatial agglomeration of interrelated economic activity could achieve cost-saving and benefit-increasing; three, the cost-saving and benefit-increasing from the economic spatial agglomeration could promote the further concentration of economic development; and four, early-development advantage could lead to the long-term accumulation of economic activity.

Linked to the development paradigm, Krugman's New Economic Geography could be summed up by saying that: geography provides a platform to organize economic activities of areas; all places are diverse in terms of development, costs, localization and resource base; and development spillovers are geographically influenced. As such, rural development critically hinges on the geographical setting of the rural areas, and by extension, which rural development processes among rural communities in Benue State is equally defined. And if so, neglecting these geographical forces in rural development would mean a partial treatment.

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Conceptual Framework

Rural development is a comprehensive term taken to mean the process of improving the quality of life and economic well-being of people living in rural areas, often relatively isolated and sparsely populated areas. It essentially focuses on action for the development of areas outside the mainstream urban economic system. Rural development has traditionally been centered on the exploitation of land-intensive natural resources such as agriculture and forestry. Changes brought about by globalization and increased urbanization are said to have, however, altered the character of rural areas which has created the need for rural communities to approach development from a wider perspective with more focus on a broad range of development goals rather than merely creating incentive for agricultural or resource-based businesses. Bringing in geographical dimension, Madu (2007) characterized rural development as the improvement of the spatial and socioeconomic environment of rural space, which leads to the enhancement of the rural individual's ability to care for and sustain his or her well-being.

Geography is simply viewed here as a natural setting comprising the climate, location, resources, and environmental stability of an area, in this case, a rural area. These aspects of geography importantly influence the socioeconomic life of people. They define health, resource base, productivity, production, links and accessibility to socioeconomic and political benefits of the people. For instance, Madu (2007) observed that the spatial variation in availability and access to rural infrastructure results in spatial disparities in living standards both within and between regions and localities. Another aspect is the linkage of agricultural productivity to geographical conditions, such as soil quality, water availability, temperature, growing season, and other factors that differ significantly between geographic regions. The cost of accessing remote rural areas also counts for their development as they are cut-off from many developmental gains and spill-overs from the urban centers. Other geographical factors that affect overall per capita income is the resources availability and stability of the environment (the absence of natural disasters like monsoons, floods, landslides, etc) of the area.

The relationship between these geographical factors and rural development is as schematized in Figure 1. The framework shows that geographical influence flows through the four cardinal factors of climate, location, resources and environmental stability. Climate exerts its impact via temperature, pressure, humidity, and winds. Favorable or unfavorable changes in these tell the line of development. The World Bank (2022) noted the deep connectivity of climate change with global patterns of inequality; in such a way that the most vulnerable people bear the brunt of climate change impacts, but contribute the least to the crisis. And as the impacts of climate change mount, millions of vulnerable people face disproportionate challenges in terms of extreme events, health impacts, food security, livelihood security, water security, and cultural identity. The impact of location comes in the form of remoteness, accessibility, and transport cost. These define the closeness of the rural area to the political powers, modern resources, backward/forward linkages needed for industrial development and contact with the outside-world for flow of ideas and other resources. Resources comprise natural, human, and technical, the availability of these and the ease of exploiting them. Environment stability tells how free a rural area is from occurrence of natural disasters and disease outbreaks. These define the first layer of impact of geography.

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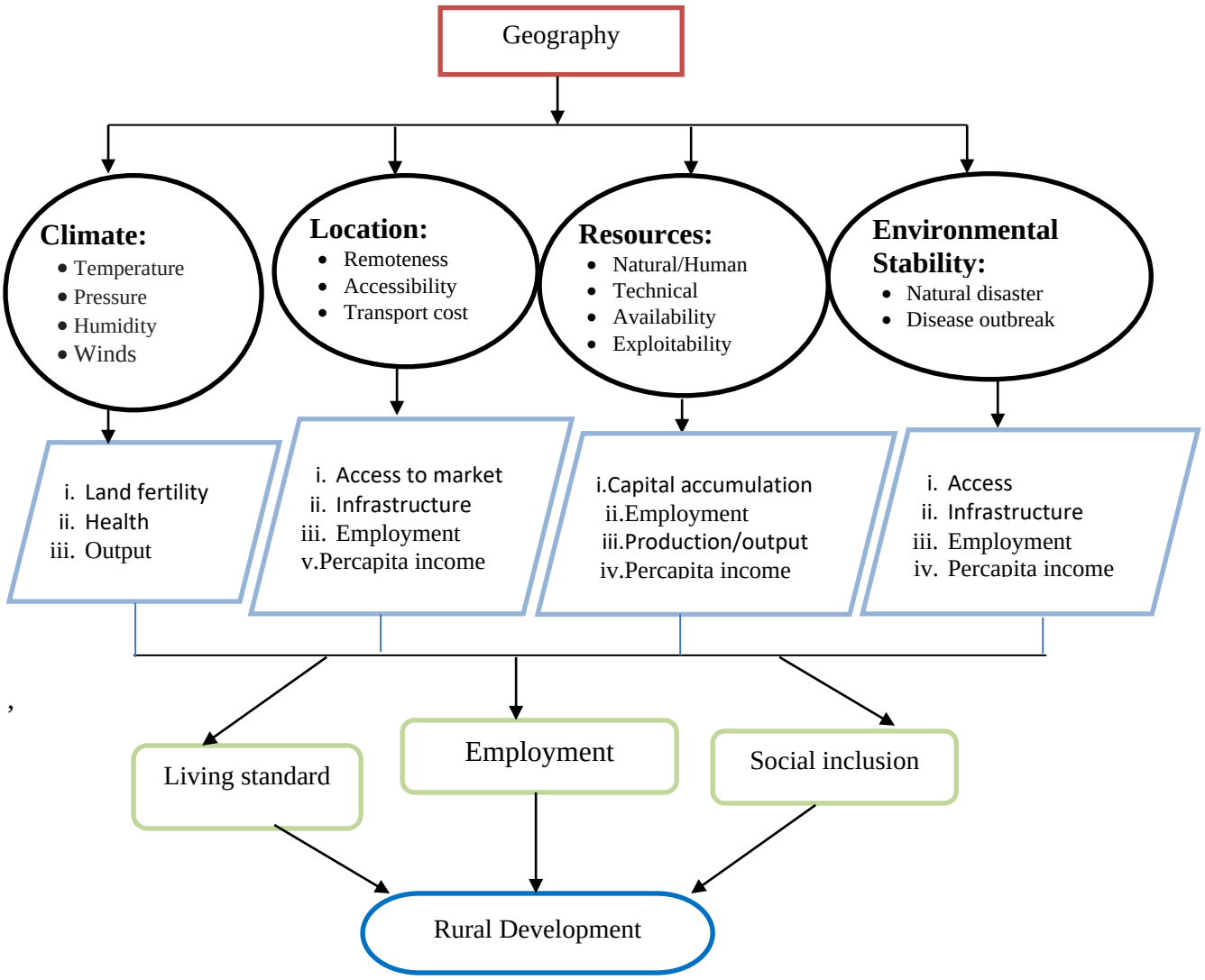

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Figure 1: The relation between environment and rural development.

Source: Author's design.

At the second layer, changes in the dimensions of the climate factor dictate the fertility of the soil, health of humans, animals and crops, and the output per-capita. Favorable changes in these dimensions would lead to good soil fertility, healthy labor, animals and crops, and boost in output; while unfavorable changes will lead to the opposite. The location, through its components, can determine access to market, infrastructural development and usage, employment (of all kinds of resources), and per capita income. Variations in resources create waves of impact which are noticeable in the level of capital formation/accumulation, resource employment, production/output levels, and income per head. Movements in environmental forces account for accessibility, infrastructural development and usage, employment (of all kinds of resources), and per capita income.

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At the third stage, these impacts flow to indicators of development of living standard, employment and living standard. With good health of humans, animals and crops, high output per-capita, access to market, infrastructural development and usage, and employment of all forms of resources, all things equal, living standard will rise, employment will rise and there will be increased social inclusion. The reverse will hold if the geography works in the negative. In whichever case, there will be a corresponding impact on rural development.

Empirical Review

Not really tied to rural development, there are some empirical literatures that show the correlation between geography and (economic) development. Among such is the work of Bloom and Sachs (1998) which studied the impact of climate, topography, and natural ecology on public health, nutrition, demographics, technological diffusion, international trade and other determinants of economic development in Africa. The paper also discussed the general problems of tropical development and the focus of Africa's problems in worldwide tropical perspectives and demographic trends in Africa. It used the standard cross-country growth equations with demographic and geographic variables and found relative roles of geography in economic development.

Gallup, Sachs and Mellinger (1999) in their study, addressed the complex relationship between geography and macroeconomic growth and investigated the ways in which geography may matter directly for growth, controlling for economic policies and institutions, as well as the effects of geography on policy choices and institutions. They found that location and climate have large effects on income levels and income growth, through their effects on transport costs, disease burdens, and agricultural productivity, among other channels. They further discovered that geography is a factor in the choice of economic policy itself. The study revealed that many of the geographical regions that were not conducive to modern economic growth had high population density and rapid population increase. This, they found, was especially true of populations that are located far from the coast, and thus face large transport costs for international trade, as well as populations in tropical regions of high disease burden. Furthermore, much of the population increase in the next thirty years is likely to take place in these geographically disadvantaged regions.

Coming from the perspective that economic development and underdevelopment is one aspect of the uneven spatial distribution of economic activity, Henderson, Shalizi and Venables (2001) undertook a review of existing literature on geography and development based on analytical issues like: why does economic activity cluster in centers of activity? How do new centers develop? And what are the consequences of remoteness from existing centers? They found and concluded that rigorous theoretical and empirical analysis are needed to increase understanding of the role of geography in development and to better design development policy.

The work of Rajović and Bulatović (2014) was based on the premise that rural population loss (RPL) is not only due to the laws of social and economic development but also the comprehensive action of natural, social, and economic factors. Taking 774 administrative villages in Laiyang County, which is in a hilly region, they comprehensively used spatial analysis and geographic detectors to explore the spatial characteristics and driving factors of RPL, which was significantly correlated with rural planning. The research demonstrated that

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the spatial characteristics influence RPL. They, therefore, advocated for integration of spatial characteristics in rural revitalization, and preparation of rural development planning.

Others like Huskey and Morehouse (1992), Madu (2007), Kumar (2011), Rajović and Bulatović (2012), Rajović and Bulatović (2013), Del Gatto and Mastinu (2015), Castells-Quintana, Lopez-Uribe and McDermott (2017), Del Gatto and Mastinu (2018), and Desmet, Nagy and Rossi-Hansberg (2018) have in their works portrayed the impact of geographical factors on economic development. However, none of these is situated in Nigeria, not to mention Benue state. Also, less emphasis is placed on the impact of geography on rural development. The time space also calls for an updated review. These thus create the geographical, case and time relevance of the study.

METHODOLOGY

Research Design

The research design was triangulated with the combination of survey and quasi-experimental research designs. Survey design presents an oriented methodology used to investigate population by selecting samples to analyze and discover occurrences. The essence was to generate primary data which will be used to analyze the impact of environmental impact assessment sustainable development in the study area. Quasi-experimental design, on the other hand, sought to examine the impact of the independent variables on the dependent variable in order to determine the variation in dependent variable as a result of changes in independent variables.

Data Used

The study depended on primary data which were generated through mixed questionnaires administered to the respondents in a survey. The primary data which is about variables of the study (living standard, employment, social inclusion, climate, location, resources, and environmental stability) were sourced from the household survey.

A random selection of nine (9) LGAs in the State was done with three (3) LGAs selected from each of Benue North (Zone A) (i.e., Konshisha, Ukum and Vandeikya), Benue Central (Zone B) (i.e.Buruku, Guma and Gwer-East), and Benue South (Zone C) (i.e., Agatu, Apaand Ohimini). The population of these LGAs (which is 2,065,400) thus form the study population. To ensure a representative sample, a multi-stage random sampling design was used in selecting the required sample for the study. At the first stage, a sample of nine (9) LGAs was purposely selected from the state taking three (3) most populated LGAs from each zone.

The sample size was determined using the sample size formula given by Naig, Winn, and Rusli (2006) as:

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$$n = \frac{Nz^2p(1-p)}{e^2(N-1)+z^2p(1-p)} * Deff \quad (1)$$

where:

N = Population of selected LGAs = 2,065,400

p = Expected value of the indicator = 50%

e = Margin of error = 5%

Deff = Design effect = 1.5

Z-score = 2.33 at standard of 99% confidence interval.

The determined sample of 814.17 was further adjusted by rounding-up to 820 as the higher the sample the closer it is to the population. The proportion of the sample to each LGA (121, 116, 126, 111, 104, 90, 62, 52, and 38 respectively) was determined using the Bourley's proportional allocation method, after which there was a random selection of ten (10) wards from each senatorial district. Only ten were chosen in keeping to the lean resources and for in-depth analysis. Based on their allotted sample sizes, 12, 12, 13, 11, 10, 9, 6, 5, and 4 households were randomly selected from the ten wards in Konshisha, Ukum, Vandeikya, Buruku, Guma, Gwer-East, Agatu, Apa, and Ohimini respectively. These households served as the Secondary Sampling Units (SSUs) from where the needed information was obtained.

3Model Specification

The interest of the study is to determine the impact of geographical factors on rural development. Thus, rural development is a function of geographical factors. Algebraically, this dependency relationship can be expressed as:

$$RD = f(GF) \quad (2)$$

where:

RD = Rural development

GF = Geographical factors

With geographical factors measured in terms of climate, location, resources, and environmental stability, equation (2) becomes:

$$RD = f(CL, LO, RE, ES) \quad (3)$$

where:

CL = Climate

LO = Location

RE = Resources

ES = Environmental Stability

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Also, measuring economic development in terms of living standard, employment, and social inclusion, equation (3) breaks down to:

$$LS = f(CL, LO, RE, ES) \quad (4)$$

$$Emp = f(CL, LO, RE, ES) \quad (5)$$

$$SI = f(CL, LO, RE, ES) \quad (6)$$

where:

LS = Living standard

Emp = Employment

SI = Social inclusion

Rural development is measured by the work as a categorical (or dichotomous) variable – a household is developed or not. That is:

$$RD = D_i = \{1: Present\ of\ RD\ 0: Absent\ of\ RD \quad (7)$$

The relationship between the variable becomes a binary in nature and can be expressed in a Binary Logistic Regression model, which in its simplest form can be stated thus:

$$P(Y) = P_i = 1/1 + e^{-(\beta_0 + \beta_i X_i + U_i)} \quad (8)$$

This can also be written as:

$$P_i\left[1 + e^{-(\beta_0 + \beta_i X_i + U_i)}\right] = 1 \quad (9)$$

Or

$$Log(P_i/1 - P_i) = \beta_0 + \beta_i X_i + U_i \qquad (i = 1, 2, 3, \ldots, n), \quad (10)$$

where $P(Y) = P_i$ is the probability of Y occurring, Y is the categorical variable which in this case is rural development, e is the base of natural logarithms, X_i is the predictor variables, and U_i the estimates of the error terms. The β_0 is the Y intercept and β_i the coefficients of the predictor variables. The ratio ($P_i/1- P_i$) is called the log odd or Logit, which acts as the dependent variable.

Therefore, the model to estimate the relationship between rural development and its determinants is of the form:

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$$Log(odds) = LS = \beta_0 + \beta_1 CL_i + \beta_2 LO_i + \beta_3 RE_i + \beta_4 ES_i + \varepsilon_i \quad (11)$$

$$Log(odds) = Emp = \beta_0 + \beta_1 CL_i + \beta_2 LO_i + \beta_3 RE_i + \beta_4 ES_i + \varepsilon_i \quad (12)$$

$$Log(odds) = SI = \beta_0 + \beta_1 CL_i + \beta_2 LO_i + \beta_3 RE_i + \beta_4 ES_i + \varepsilon_i \quad (13)$$

Given theoretical and empirical positions, rural development is an increasing function of its determining variable – geography. Therefore, from the logistic regression, a positive relationship is expected between rural development and its causative factors, such that the coefficients of the predictor variables will be positively signed (i.e., $\beta_i < 0$).

Data Analysis Technique

Analysis of data was done using both descriptive and inferential techniques. Descriptive techniques such as the simple frequency distribution and percentage were used to describe and examine the relationship between the geographical factors and rural development in Benue state. The responses were coded with the aid of the Statistical Package for Social Sciences (SPSS) and the questions scaled as follows:

Section B

a. Strongly Agree 4

b. Agree 3

c. Disagree 2

d. Strongly Disagree 1

The cut-off mean: $\underline{X} = \frac{fx}{n} = \frac{4+3+2+1}{4} = 2.50.$

Section C

a. Yes 3

b. No 2

c. Not sure 1

The cut-off mean: $\underline{X} = \frac{fx}{n} = \frac{3+2+1}{3} = 2.00.$

Any item in the instrument with a mean response of 2.50 and above for Section B was considered accepted while any item with a mean rating from 2.49 below for Section B was considered as rejection. In the case of Section C, though the computed expected response mean is 2.00, a response of 2.00 is a NO. As such, only a response mean of 2.50 to 3.00 was considered as indicating a positive affirmation; implying that any item with a mean rating

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from 2.49 below was considered as rejection. Inferential analysis adopted binary logistic regression analysis; with its components of Z-test and the likelihood ratio test.

RESULTS AND DISCUSSION

Data Presentation

A total of 820 (eight hundred and twenty) households were sampled from 9 (nine) Local Government Areas (LGAs). The data were collected on geographical factors (climate, location, resources, and environmental stability), rural development (living standard, employment, and social inclusion) and demographic characteristics of these selected households of Benue state.

Demographic Characteristics

The educational distribution indicates that, 429 (i.e., 52.3%) of the household heads attended only primary education level, 374 (corresponding to 45.6%) went up to the secondary level, and 17 (making 2.1%) had tertiary education (see Figure 2). On average, the households were deemed literate to provide adequate and valid information needed.

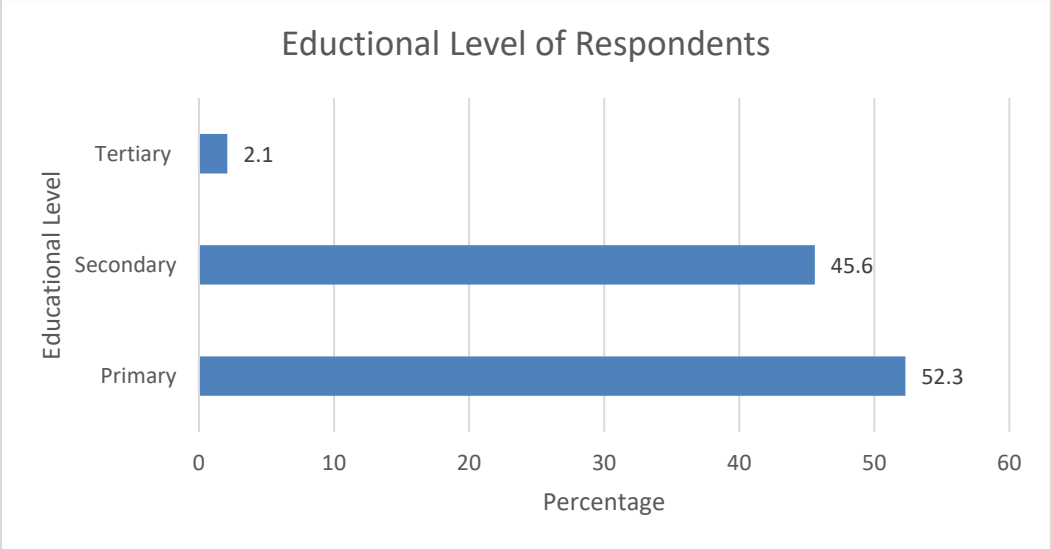

Figure 2: Educational distribution of surveyed rural households in Benue state.

Source: Field Survey of Rural Households in Benue State, 2021.

According to the data obtained, 562 out of 820 sampled households, which is 65.5%, are farmers, 103 (making 12.6%) are entrepreneurs, 119 (i.e., 14.5%) are employed, and 36 (corresponding to 4.4%) are engaged in other income activities like provision of crafts work (see Figure 3). This affirms that the rural Benue man is basically a farmer, engaged in various farming activities and at various scales but basically small scale.

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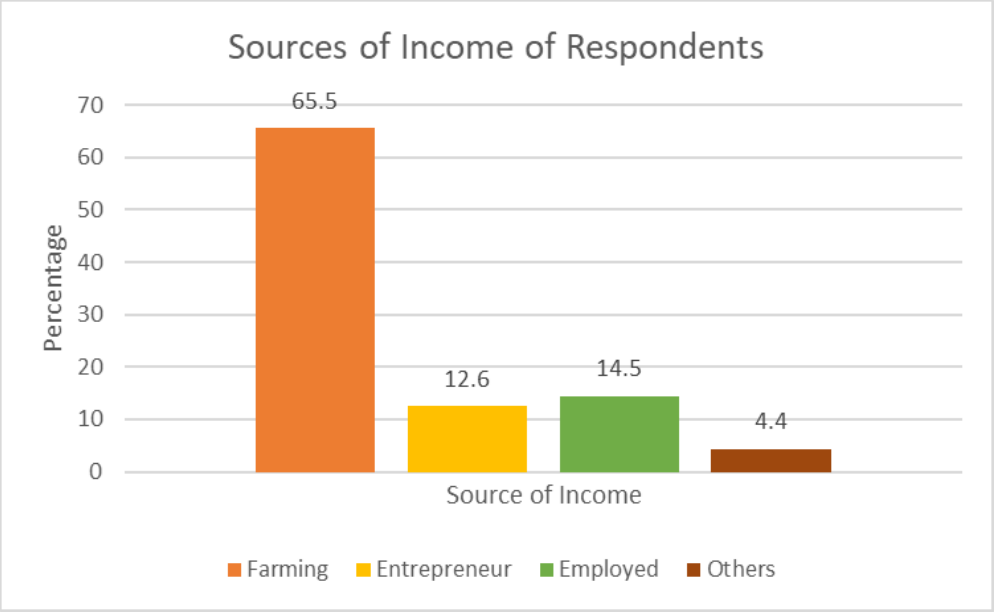

Figure 3: Distribution of surveyed rural household in Benue state by income sources.

Source: Field Survey of Rural Household in Benue State, 2021.

Considering the monthly income earned by the households from their various economic activities, the percentages as displayed in Figure 4, indicate that, 483, which corresponds to 58.9% of the 820 households, earn less than ₦10,000 per month, 224 (i.e., 27.3%) earn between ₦10,000 and ₦50,000 per month, 106 (i.e., 12.9%) earn between ₦50,001 and ₦100,000 per month, and only 7 (which is 00.9%) earn more than ₦100,000 per month. These sums were considered for the entire members of the household. Any household with income per month that is below the sum of ₦174,300.00 is deemed to be living below the poverty line. This was arrived at with the consideration of the standard family size of 7 (seven) members (i.e., husband, wife and 5 children), as in Table 1, and $2 (₦830) per day for a month (30 days average) (i.e., ₦192 X 6 X 30 = 34,560₦830 X 7 X 30 = ₦174300). This was then used as the household poverty line for the analysis of the study. From the above, only 7 of the 820 sampled households, who may be earning ₦174300 or more, can be said to be living above the poverty line.

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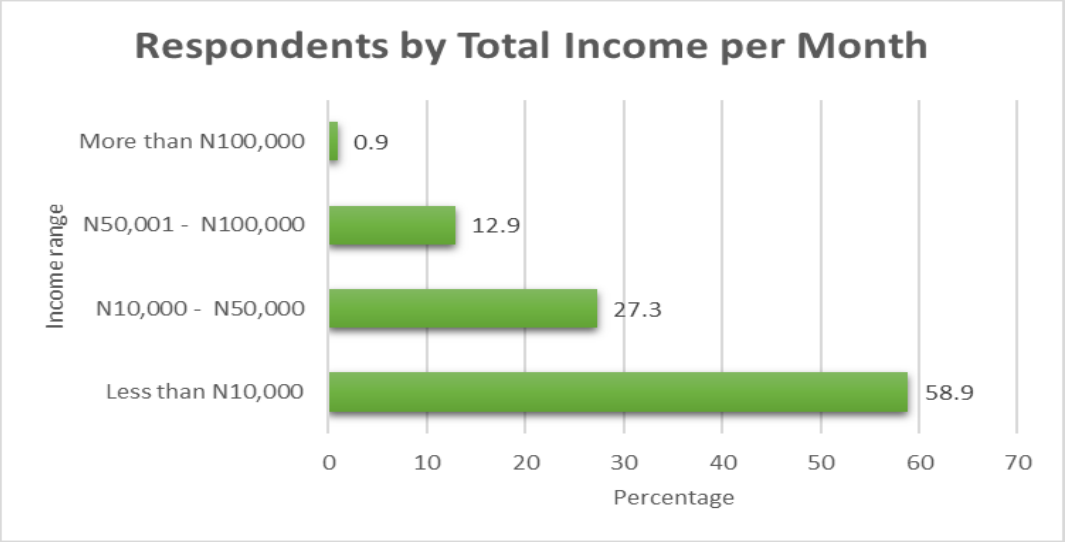

Figure 4: Distribution of surveyed rural households in Benue state by total income per month.

Source: Field Survey of Rural Households in Benue state, 2021.

The total size of the 820 households sampled is 5,327 members. The following distribution presents a breakdown of the rural household size by age and sex. From the breakdown in Table 1, 455 (i.e. about 10.4%) of the household members fall within the age limit of 0 to 5 years; out of which 251 (about 4.7%) are male and 304 (about 5.7%) are female. Those within the age limit of 6 to 14 were 1,343, making about 25.2% of the total size of the sampled households with the male making 719 (i.e. 13.5%) and female 624 (about 11.7%).

Table 1: Family Size by Age and Sex

Age	Male	Female	Total	Mean
0 to 5	251 (4.7)*	304 (5.7)	555 (10.4)	0.7
6 to 14	719 (13.5)	624 (11.7)	1343 (25.2)	1.6
15 to 49	1673 (31.4)	1162 (21.8)	2835 (53.2)	3.5
50+	303 (5.7)	291 (5.5)	594 (11.2)	0.7
Total	**2546 (57.5)**	**1881 (42.5)**	**5327 (100)**	**6.5**

*The values in the parentheses are percentages.

Source: Field Survey of Rural Households in Benue state, 2021.

The distribution also shows that those within 15 to 49 years old were 2,835, corresponding to 53.2%. This is the age limit with the highest number of household members. The group with 50 years and above had 594 members and constituted about 11.2% of the total household size. Inferred from these statistics is that, the rural communities in Benue state comprised more of the active population of less than 50 years. On the other hand, it could also mean that

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these communities of the state have relatively low life span with few members attaining ages above 50 years.

Equally determined from the distribution is that, each household has, on the average, approximately 7 (seven) members with about 1 member within the age limits of 0 to 5 years and 50 years above, about 2 members for within 6 to 14 years, and 4 members within the age limit of 15 to 49 years. The relatively low number of members per household can be attributed to combined factors of controlled birth and high death rate that reflect their low level of development.

Descriptive Analysis

Using a 4-point Likert-type scale (1-4) where 4 stand for strongly agree, 3 for agree, 2 for disagree, and 1 for strongly disagree, the respondents were asked to indicate the level of agreement with changes in geographical factors and the impact on their developmental indices.

Regarding the climate. and based on the standard cut-off mean of 2.50, the respondents agreed that: they do experience irregular rainfall; they suffer from higher temperatures/heat waves throughout the year, they are having more droughts than ever; they experience dry wind most of the time; changes in our climate have brought illnesses for them; their agricultural and business activities are affected by climate change; and they have witness low yield due to climate changes. Going by this, it can be said that the rural communities in Benue state suffer from geographical factors in terms of climate and this can have a negative impact on the development of these rural communities.

In terms of their location, the average responses, the respondents agreed that: they are far from the state capital and local government headquarters; it is very difficult accessing their community due to its hilly or swampy nature; they suffer high cost of transportation due to difficulty in accessing their communities; they do not have easy access to markets for their goods; they do not have industries in their community; they have difficulty in accessing the nearest hospital, school, etc.; and the locations of their community has affected their income generation. This implies that the rural communities in Benue state experience the impact of geographical factors in terms of location which is said to have influenced their development.

The average responses were also above the standard cut-off mean of 2.50, revealing respondents' agreement to dearth/exploitability of resources in terms of fertility of their lands; quantity of natural resources; the knowledge to exploit natural resources; enough hands to work the farm and business activities; having modern techniques/tools of farming; all year-round engagement of land/labor; impact of the nature of their lands together with their farming methods on their output and income. These responses are indicative that rural communities in Benue state equally suffer geographical factors in terms of resources inability and inadequate knowledge/techniques to exploit available resources. This too has affected their development.

Considering environmental stability of the rural communities, which are averagely above the standard cut-off mean of 2.50, the respondents affirm the presence of environmental instability in their communities with attendant impact on their economic wellbeing.

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In terms of the rural economic development variables, a 3-point Likert-type scale (1-3), where 3 stands for yes, 2 for no, and 1 for not sure, were used. The respondents were asked to indicate the level or state their position in the different aspects of their development. With average responses below the standard cut-off mean of 2.50, it indicates that the households have low living standards, are unemployed/underemployed, and socially excluded. Implied from these outcomes is that, the people of Benue state are facing poor economic wellbeing.

Analysis of Results

The estimation model (12) to (13) with the Binary Logistic Regression technique using the SPSS, was then performed to test impact of geographical factors (i.e., climate change, location, resources, and environmental stability) on economic development (measured in terms of living standard, employment, and social inclusion) of the rural households in Benue state. The summary of the results is as below.

Impact of geographical factors on living standard of rural households in Benue state

The result obtained from the measure of the impact of geographical factors on living standard in rural communities is as presented in Table 2.

Table 2: Binary Logistic Regression Result for Model (11)

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
LS							Lower	Upper
CL	1.556	.474	10.771	1	.001	.211	.083	.534
LO	1.771	.811	4.763	1	.029	.170	.035	.835
RE	1.118	.534	4.375	1	.036	.327	.115	.932
ES	-.137	.476	.083	1	.774	.872	.343	2.217
Constant	40.097	5482.561	.000	1	.994	2.594E+17		

Overall Percentage 95.7

-2 Log-Likelihood = 127.596 NagelkerkeR^2 = .733

Test	**Chi-square**	**Df**	**Sig.**
Hosmer-Lemeshow	8.006	8	.433
Omnibus	80.376	4	.000

Source: Computed from Survey Data (IBM SPSS Statistics 21)

Given the variables, the estimated logit model is:

$$Log(odds) = LS = 40.097 + 1.556CL_i + 1.771LO_i + 1.118RE_i - .137ES_i \qquad (11')$$

From the result, all predictors, other than ES, were correctly signed as expected. The positive coefficients (i.e. log odds) of CL, LO, and RE indicate that a unit increase in these forms of geographical factors will increase the odds (likelihood) of the rural households having improved living standards. Implying that, all things being equal, a one unit rise in these variables will bring about a corresponding positive impact of 1.556, 1.771, and 1.118

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respectively in the level of living standard among the rural households. On the contrary, it was determined from these ratios that a unit increase in the value of ES for a rural household will decrease the odds of the household having an improved living standard by -.137. However, the Wald tests showed that only CL, LO, and RE were statistically significant. This was corroborated by the 5% level of significance ($\rho < .05$). It means that only an improvement in climatic condition, location, and resources of the rural communities can have meaningful impact on the living standard of the rural households in Benue State or at least the sampled LGAs.

The fitness of model (i.e. Goodness-of-fit statistics) shows that the overall predicted percentage was given as 95.7%, meaning that 95.7% of rural households have been accurately classified as either having a good living standard or not on the basis of our 4 (four) variables model.

With the chi-square value of $\chi^2 = 8.006$, $\rho = .433$, Homer and Lemeshow test shows that the set of predictors can accurately predict the actual probabilities of a rural household experiencing low living standard. The -2 log likelihood value (-2LL = 127.596) also supported that the model significantly fit the data, thereby indicating a reduction in the number of unexplained information about living standard of the people. This was confirmed by the associated Omnibus validity test of model coefficients, which indicates that the four-predictor model provided a statistically significant improvement over the constant-only-model. The Nagelkerke Pseudo R^2, on the other hand, indicated that the model accounted for 73.3% of the total variance of living standard of the rural households; indicating further the explanatory ability of the model.

Impact of geographical factors on employment of rural households in Benue State

The result obtained from the measure of the impact of geographical factors on employment situations in rural communities is as presented in Table 3.

Table 3: Binary Logistic Regression Result for Model (12)

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I.for EXP(B)	
							Lower	Upper
Emp								
CL	1.398	.649	6.414	1	.021	.321	.074	.534
LO	1.231	.651	4.722	1	.039	.153	.035	.835
RE	1.835	.633	10.590	1	.004	.134	.015	.532
ES	.972	.481	2.353	1	.043	.522	.343	1.307
Constant	2.254	.761	2.960	1	.003	.957		

Overall Percentage 84.6

-2 Log-Likelihood = 144.612 NagelkerkeR^2 = .711

Test	**Chi-square**	**Df**	**Sig.**
Hosmer-Lemeshow	10.010	8	.514
Omnibus	79.615	3	.000

Source: Computed from Survey Data (IBM SPSS Statistics 21).

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Given the variables, the estimated logit model is:

$$Log(odds) = Ump = 2.254 + 1.398AP_i + 1.231WP_i + 1.8358LP_i + .972NP_i \quad (12')$$

The result indicates that all predictors were correct in terms of sign in as expected. The positive log odds of CL, LO, RE and ES shows that a unit improvement in these variables is capable of giving a rise in the level of employment by 1.398, 1.231, 1.835 and 0.972, respectively. On the other hand, a fall in these will bring about a corresponding fall in the level of employment among Benue rural people, *ceteris paribus*. The Wald tests indicate that only all factors were statistically significant. This was corroborated by the 5% level of significance ($\rho < .05$). Therefore, given the forms of geographical factors studied, the four predictors significantly predicted the level of employment in the rural communities of the state.

Tests for the fitness of the model were given as 84.6%, implying an 84.6% accurate classification of the rural households as either unemployed or employed on the basis of our 4 (four) variables model. The Homer and Lemeshow test that assessed whether the predicted probabilities match the observed probabilities at $\rho > .05$ came out with the chi-square value of $\chi^2 = 10.010$, $\rho = .514$. It was concluded that the set of predictors can accurately predict the actual probabilities of a member of a rural household being unemployed. The -2 log likelihood value (-2LL = 127.596) also reinforced the claim of the significant fit of the model to the data, thereby indicating a reduction in the number of unexplained information about employment level of the rural people in the State. The related Omnibus validity test of model coefficients equally established it. The result ($\chi^2 = 79.615$, $\rho = .001$) indicated that the four-predictor model provided a statistically significant improvement over the constant-only-model. The Nagelkerke Pseudo R^2, on the other hand, indicated that the model accounted for 71.1% of the total variance of employment level of the households; indicating further the explanatory ability of the model.

Impact of geographical factors on social inclusion of rural households in Benue State

Table 4 displays the result obtained from the measure of the impact of geographical factors on social inclusion.

Table 4: Binary Logistic Regression Result for Model (13)

	B	S.E.	Wald	df	Sig.	Exp(B)	95% C.I. for EXP(B)	
SI							Lower	Upper
CL	-1.805	.435	4.140	1	.000	.871	.951	2.659
LO	1.403	.367	3.282	1	.045	2.199	.683	6.353
RE	1.157	.417	4.375	1	.036	.327	.115	.932
ES	1.131	.4 76	3.083	1	.014	.872	.343	2.217
Constant	-17.682	3925.401	.000	1	.994	.000		

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Overall Percentage 94.8

-2 Log-Likelihood = 103.187 NagelkerkeR^2 = .939

Test	Chi-square	Df	Sig.
Hosmer-Lemeshow	9.791	8	. 901
Omnibus	22.267	3	.000

Source: Computed from Survey Data (IBM SPSS Statistics 21).

The estimated logit model (3.15) is:

$$Log(odds) = LE = -17.682 - 2.063AP_i + .788WP_i - 1.157LP_i - 1.131NP_i \quad (13')$$

Other than CL with a negative sign, all variables were correctly signed as *a priori* expected. With LO, RE, and ES having positive coefficients means that, a positive increase of these variables will result in a decline in social inclusion. That is, a positive unit change in these forms of geographical factors will increase the odds of a Benue state rural person being socially inclusive by 1.403, 1.157, and 1.131, respectively. On the other hand, and far from any reality, it was determined from these odds that a positive improvement in the value of CL for a rural household will reduce the chances of the members of the household being socially inclusive. In terms of the Wald tests, all factors were statistically significant as was corroborated by the 5% level of significance ($\rho < .05$). Therefore, it could be inferred that, all the forms of geographical factors studied can significantly predict social inclusion among household members in Benue state. It implies that improvement in locational conditions, and resources availability/usage, can have a meaningful impact on the social inclusion of the rural communities in Benue state.

The overall predicted percentage estimated to be 95.7% means the classification of rural households as either socially inclusive or socially exclusive on the basis of our 4 (four) variables in the model was 95.7% accurate. The Homer and Lemeshow of χ^2= 9.791, ρ= .901 means that the set of predictors can accurately predict the actual probabilities of a household member being socially inclusive. This is backed by -2 log likelihood value (-2LL = 103.187) that the model significantly fit the data, thereby indicating a reduction in the number of unexplained information about social inclusion of the rural communities. The connected Omnibus validity test of model coefficients indicates (χ^2= 22.267, ρ= .000) that the four-predictor model provided a statistically significant improvement over the constant-only-model. And the Nagelkerke Pseudo R^2, on the other hand, indicated that the model accounted for 69.5% of the total variance of social inclusiveness of the rural households; indicating further the explanatory ability of the model.

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DISCUSSION OF FINDINGS

Given the survey and the empirical results obtained, it was found that geographical factors have significant impact on the economic development of rural households in Benue state. This impact of geographical factors was through changes in their climate factors, location, resources, and environmental stability. This finding corroborates that of Bloom and Sachs (1998), Gallup, Sachs and Mellinger (1999), Henderson, Shalizi and Venables (2001), and Rossi-Hansberg (2018), who found that geographical factors determine the level of economic development of an area. The finding also agrees with others like Madu (2007), Kumar (2011), Rajović and Bulatović (2012), Rajović and Bulatović (2013), Del Gatto and Mastinu (2015), Castells-Quintana, Lopez-Uribe and McDermott (2017), and Del Gatto and Mastinu (2018), Desmet, Nagy, and Rossi-Hansberg (2018), who have maintained that geographical factors are capable of impeding development of an area.

The research specifically found that:

i. Geographical factors of climate, location, and resources have significantly exerted a serious negative impact on the living standard of households in rural communities of Benue state. The negative climate changes, remoteness of the communities, and the limitedness and inappropriate exploiting skills of their resources have affected their living standard in ways, such as lack of source of income, lack of access to and use of electricity/pipe borne water, lack of access to 3 square meal a day, inadequate clothings, lack of access to modern health care facility, lack of quality education, and adequate housing for family members. This is chiefly caused by climate changes with consequences on their agricultural yields and other business activities, and their health. Also, their location imposed on them high costs of transportation, lack of easy access to markets/other infrastructure thus affecting their income. Resources and environmental stability had a mild impact on their development.

ii. Likewise, the unfavorable geography of the rural Benue communities has heightened the rate of employment of the rural households. Due to their challenging geography, many members of rural households lack requisite skills to gain employment outside farming, lack employment opportunities, and have a single source of income that is seasonal and can hardly provide meaningful income to cater for the family needs for a month. In this regard, resource base/utilization, location, and climate change impacted more; while environment stability impacted less.

iii. Also, by their disadvantageous geography in terms of remoteness of the communities from the urban centers, the limitedness and inappropriate skills to exploit their resources, and instability of their environment, the households from these rural communities are socially excluded as they are not often informed about government policies/programmes; cannot feel government efforts to link their communities with the urban sector, do vote in elections, lack the sense of participation in government of their state, have low quality schools/hospitals/markets as compared to those in urban centers, and have no industry in the community. This was influenced greatly by location, resource base/usage, environmental stability and less by climate change.

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CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Undertaking a study to examine the impact of geographical factors on economic development of rural communities in Benue state became imperative due to neglect of these factors with their attendant impact on the economic wellbeing of the people, mostly those in rural areas. The results obtained led to the conclusion that the geographical factors have a negative impact on the economic wellbeing of the average rural households in Benue state.

Conclusively, the development of rural communities in Benue state is negatively affected by the combined geographical factors of climate, location, resources, and environmental stability. These have a negative impact on the economic development of the rural communities through lowering living standards and heightened employment levels, and social exclusion.

Recommendations

Flowing from the analyses and discussions above, the following recommendations were then made to help in the formulation, implementation and evaluation of government policies geared toward control of geographical factors as they have impact on rural development in Benue state. Also, to guide those who may want to undertake further or related studies in the area of geographical factors and economic development. The following recommendations were thus proffered:

i. First and foremost, the ministries concerned with rural development should concentrate on linking the rural communities to the urban areas for the flow of goods, services and information. This can be done by provision of good road networks to ease transportation costs. The private sector should also be encouraged to intervene in rural development by the government through tax incentives, subsidies, etc.

ii. The government of Benue state, the federal government and the pro-poor organisations should factor these geographical factors in efforts towards boosting rural economic activities in the state, so as to increase income of the average Benue rural man. This can be done through support schemes, such as creating markets for their products, aiding farmers with farm inputs, and provision of loan schemes to boost output, among others.

iii. The government and other agencies should find a way of helping the rural people in correctly predicting, averting, and managing the impact from the geographical factors.

iv. The government should make efforts towards properly and widely carrying the rural communities along in its policy formulation/implementation. This should be done through effective communication and intensify efforts towards provision of other basic infrastructure like good water supply and electricity to the communities, recreational centers, etc. These, if provided in their right proportions will enhance the sense of belonging of the rural people.

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