Analysis of Environmental Factors Affecting Rural Livelihood Diversification among Rural Dwellers in Adamawa State, Nigeria

***Donye, A. O., ***Ani, A. O., **P. M. Bzugu and **Nuhu, H. S.**

*Department of Agricultural Economics and Extension, Adamawa State, Mubi, Nigeria
**Department of Agricultural Extension Services, University of Maiduguri, Nigeria
***Department of Agricultural Extension, Federal University of Technology, Owerri, Nigeria

Corresponding author's email addresses: andrewdonye@yahoo.com
Corresponding author's Phone Numbers: +2348037848063; +2348050885484

Abstract

This study analyzed the environmental factors affecting rural livelihood diversification in Adamawa State, Nigeria. The data used for the analysis were generated from 360 respondents, using multi-stage random sampling procedure. The analytical tools used were descriptive (frequencies and percentages) and inferential statistics (Tobit regression). The descriptive statistics were used in categorizing the respondents on the basis of their socio-economic characteristics. Tobit regression was employed to determine the environmental factors affecting livelihood diversification. The major findings were that: the frequency of natural disasters (X_1) and season of the year (X_5) were positive and significant for livelihood diversification at 5% level of significance. The number of natural resources (X_3) available in an environment was positive and significant for livelihood diversification at 1% level of significance. The distance between state headquarters, local government headquarters and major towns (X_2) and where a respondent lives was found to be not significant. Similarly, distance between markets (X_4) and where a respondent lives was also found to be not significant for livelihood diversification. It was concluded that the number of natural disasters that occur and the number of natural resources available in the study area are strong factors that affect livelihood diversification. It was recommended, among others, that the prevailing environmental factors in a given area should be considered at the planning stages for any rural development or empowerment projects meant for livelihood diversification. Livelihood diversification opportunities should be made available and possible during dry season periods in the study area.

Key Words: Analysis, Environmental Factors, Rural Livelihood, Diversification, Nigeria.

INTRODUCTION

Empirical studies have revealed that, apart from agriculture, rural dwellers need to expand and diversify their livelihood activities. For example, Matthews-Njoku *et al.* (2007) have indicated that rural dwellers are engaged in multiple livelihood activities such as trading (e.g. marketing or adding value to commodities), small-scale business enterprises (e.g. carpentry, radio and bicycle repairs) and processing of agricultural produce as well as arts and crafts (e.g. weaving mats and basket making). These activities are intended to supplement earnings from agriculture. The multiplicity of these livelihood activities in which individuals and households are engaged are influenced by some factors which operate at both internal and external environments of rural households (Kinsella *et al*., 2000; Bateman and Ray, 1994).

The changing socio-economic, political, environmental and climatic atmosphere in Nigeria and other developing countries across the globe has continued to aggravate the living conditions of most households and individuals, especially those living in rural areas (Oluwatayo, 2009). The accompanying increase in poverty levels among rural people has led residents of these economies to devise a number of livelihood strategies geared towards cushioning the possible negative effects of these natural changes. Meanwhile, there has been an increased recognition among researchers that Africans diversify their livelihood strategies into on-farm (crop, livestock and fisheries) and off-farm as well as market and non-market activities. This is to mitigate potential risks inherent in unpredictable agro-climatic and politico-economic circumstances (Ellis, 1998; 2000; Bryceson, 2000).

A livelihood is defined as the activities, the assets, and the access that jointly determine the living gained by an individual or a household (Ellis, 1999). Livelihood diversification on the other hand is the attempt made by individuals and or households to find new ways to raise income and reduce environmental risks (Hussein and Nelson, 1998).

Statement of the Problem

It is commonly known that majority of Nigeria's rural dwellers earn their living mainly from agriculture and agriculture-related activities. They do this with any diversification to include non-farm and/or off-farm activities. The nation's Federal, State and Local Governments have been making concerted efforts in this regard to enhance the living standards of the rural people by empowering them to diversify their livelihood activities. In order to achieve this, many intervention projects, economic empowerment projects and poverty eradication projects were

implemented in the country, with the main goal that aimed at improving the living standard of the rural dwellers. Many of these projects envisaged achieving this goal through the creation of various livelihood options and portfolios that could enable and facilitate the efforts of the beneficiaries of such projects to diversify their livelihoods.

In spite of the fact that similar opportunities and assistance were given to beneficiaries of such projects, the extent of their livelihood diversification and the accompanying percentage increase in income were reported from empirical studies as being greatly different from one beneficiary to another (Nkonya *et al.,* 2009). These differences could be partly due to the external environmental factors which impede or facilitate the beneficiaries' livelihood diversification efforts. The presence/occurrence or otherwise of some of these factors might facilitate livelihood diversification opportunities, while the presence/occurrence or otherwise of some of them do remarkably limit or, in some cases, inhibit the rural people's ability to diversify their livelihoods. This assertion is based on the fact the environmental factors existing around the beneficiaries may not be the same at all times in different places for different beneficiaries due largely to geographical and climatic changes across their habitations. This, therefore, implies that the differences in such environmental factors, among other factors, could be responsible for some of the differences that exist in the rural people's extent of livelihood diversification. In view of this, it is imperative to say that the knowledge of the environmental factors that positively or negatively affect the rural people's ability to diversify their livelihoods is an important tool for agricultural and agricultural extension experts as well as other rural area development experts. Therefore, this study was conducted to analyze the environmental factors affecting rural livelihood diversification in the study area.

Objectives of the Study

The main objective of the study was to analyze the environmental factors affecting rural livelihood diversification in Adamawa State, Nigeria. The specific objectives were to:

i. identify the socio-economic characteristics of the respondents;
ii. determine the environmental factors affecting rural livelihood diversification among the respondents.

Scope and Limitations of the Study

The study involved only the rural dwellers in Adamawa State who benefited from the National Fadama Development Project II (NFDP II) activities. It also covered only four of the

ten (10) Local Government Areas where the World Bank conducted an impact assessment and evaluation of the NFDP II. Though the results of the study showed that the least educated respondents had attained primary school education, there was a remarkable difficulty in communicating with them, because many of them could not read, speak or understand the English language properly. Therefore, the services of interpreters were employed in some cases during the interview schedule. This had also posed some difficulties in explaining and understanding some terms that were used between the interviewers, interpreters and respondents.

METHODOLOGY

The Study Area

Adamawa State of Nigeria is located in the northeast part of the country. The state is divided into four Agricultural Development Programme Zones, namely, Mubi, Gombi, Mayo-Belwa and Guyuk. This division is just for the purpose of administrative convenience. The state lies between latitudes 7^0 28' and 10^0 55' North and longitude 11^0 30' East and 13^0 45' East of the Greenwich Meridian. The capital, Yola, lies on latitude 9^0 14'' North and longitude 12^0 28' East. The state has a total land area of 42,159 km^2. The National Population Commission reported that the state has a population of 3,168,101 in the year 2006.

Subsistence agriculture is the main source of livelihoods for the majority of the rural households in the state. The people of the state are made up of many ethnic groups who live in segmented communities speaking different languages and dialects. However, English language is the official language in the country. The state has a tropical climate that is marked by the dry and rainy seasons. The rainy season commences in April and ends late October. The average rainfall for the state is 79cm in the northern parts and 197cm in the southern parts, especially around Ganye Local Government Area. The wettest months are August and September. The dry season starts in November and ends in April. This is the period when the dust-laden north-easterly trade winds from the Sahara Desert have a marked effect on the climate of the state. The period is usually cold and dry. Temperature varies from place to place with an average temperature of 15.2 ^{0}C. There are two notable vegetation zones within the state, namely, the sub-Sudan zone and the Northern Guinea Savannah zone. The sub-Sudan zone is marked by short grasses and short trees commonly found in the northern parts of the state. However, to the south, the vegetation is thick with very tall grasses and very tall trees.

Sources of Data and Methods of Data Collection

Both primary and secondary data were collected for the study. The primary data were obtained from the respondents by means of interview schedule, using a structured questionnaire. Some secondary information was obtained from the records in the office of the NFDP II and others from the office of the Adamawa State Agricultural Development Programme (AADP). Information was also obtained from journals and the Internet. The AADP extension agents were trained and their services were employed during the process of data collection.

Test of the Validity and Reliability of the Research Questionnaire

A pilot research was conducted in Mubi-South Local Government Area, which was not among the local government areas where this research was conducted. This was done in order to ascertain the validity and reliability of the questionnaire by examining whether it was able to account for the information needed for the study or not. The pilot-test was also carried out to discover if there was any problem of ambiguity in the research instrument. After the pilot-test, few questions were removed and others restructured. Thus, the questionnaire was judged capable to measure what it was expected to measure for the study. A test-retest was also employed to verify the reliability of the research questionnaire. In order to achieve this, sample questionnaires were administered using interview schedule at two (2) weeks interval between the first and second. Thereafter, the Pearson's Correlation was run in order to determine the r value. The r value was found to be 0.851. According to Cramines and Zeller (1979) a research instrument is considered to be reliable if its R value is equal to or greater than 0.5. Therefore, the questionnaire was considered reliable and hence, used for the study.

Sampling Procedure and Sample Size

Four (4) Local Government Areas namely, Ganye, Mubi-North, Gombi and Lamurde, were purposely selected for this study because they were among the ten where beneficiary assessment and impact evaluation of the National Fadama Development Project II had been carried out by the World Bank. Each of the four Local Government Areas represents one of the four Adamawa State Agricultural Development Programme zones. They also represent an even distribution across the state. Multi-stage simple random sampling was employed for the selection of the wards, villages and respondents that were involved in the study. In the first stage, 5 out of the existing 10 wards from each of the four local government areas were selected, giving a total of twenty 20 wards. In the second stage, 3 villages were selected from each of the selected

wards. This gave a total of sixty 60 villages. In the final stage, 6 respondents were selected from the list of the rural people who benefited from the National Fadama Development Project II in each of the selected villages. This gave a total of 360 respondents to whom questionnaires were administered.

The total number of beneficiaries from the four local government areas considered for the study was 9,163. In order to ensure appropriate representation for each local government area, respondents were selected based on the percentage that each of them contributes to the grand total (i.e. 9163). Thus, Ganye has 995 (10.86%) out of 9,163, Gombi has 3,137 (34.24%) out of 9,163, Lamurde has 4305 (46.98%) out of 9,163 and Mubi-North has 726 (7.92%) out of 9,163 (see Table 3.1). Considering the enormity of the entire number (9,163) of beneficiaries, 360 respondents were decided to be used for this study. The number of respondents sampled from each local government area to constitute a total of 360 was therefore, determined based on their percentages of the total number (9,163) of beneficiaries as indicated above. Based on this, 39 respondents were randomly selected from Ganye, 123 from Gombi, 169 from Lamurde and 29 from Mubi-North Local Government Areas.

Table 1: Sample Size from the Selected Local Government Areas

LGA	Total No.	% of 9163	Sample (% of 360)
Ganye	995	10.86	39
Gombi	3137	34.24	123
Lamurde	4305	46.98	169
Mubi-North	726	7.92	29
Total	**9,163**	**100**	**360**

Source: Field Survey, 2014

Analytical Techniques

Data were analyzed using both descriptive and inferential statistics. The descriptive statistics (percentages and frequencies) were used to analyze objectives i. Tobit Regression was employed to address objective ii. The implicit form of the Tobit Regression model is expressed as follows:

$Y = f(\beta_1 X_i + e)$.

The explicit form of it is also expressed as follows:

$Y_i = \beta_0 + \beta_1 X_{1+} \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + \beta_5 X_5 + e$

Where:

Y = Livelihood Diversification Index (LDI): This takes values from 0.0 – 1.0

The explanatory or independent variables also considered in the study were as follows:

X_1 = Natural disaster (number of occurrence of natural disasters)

X_2 = Distance to towns (kilometres)

X_3 = Natural resources (number of resources available)

X_4 = Distance to markets (kilometres)

X_5 = Season of the year (Dry season = 1; Rainy season = 2)

β_0 = Constant term

β_1- β_5 = Regression parameters or coefficients

e = Error term

i = 1, 2, 3....., n (number of independent variables).

RESULTS AND DISCUSSION

Socio-economic Characteristics of the Respondents

In most social science researches, the socio-economic characteristics of the respondents are some of the indispensable variables usually considered for analyses. This is because socio-economic variables do not just account for the social and economic differences between the respondents, but they also play very important roles in determining the scope and quality the respondents' social and economic activities. The following discussion is on the results of the analysis of the socio-economic characteristics of the respondents.

Sex of the Respondents

The distribution of the respondents as presented in Table 2 shows that, out of the 360 respondents considered in the study, majority (66.4%) were males and 33.6% were females. These percentages indicated that the number of male respondents that participated in the study was almost two times the number of female respondents. The possible reason why fewer women were involved in livelihood diversification could be partially due to the imposition of customary laws on women and the enforcement of culture, tradition and societal norms in the area where the study was conducted. For instance, taking into cognizance the conditions determining the right to land ownership, access to credit and education, women are usually less privileged vis-à-vis their male counterparts in the rural areas.

Table 2: Distribution of the Respondents Based on their Socio-economic Characteristics

Socio-economic variable	Frequency	Percentage (%)
Sex		
Male	239	66.4
Female	121	33.6
Age		
Less than 20	6	1.7
20-30	52	14.4
31-40	137	38.1
41-50	124	34.4
51-60	33	9.2
Above 60	8	2.2
Income		
20,000-100,000	137	38.1
101,000-200,000	124	34.4
201,000-300,000	78	21.7
301,000-400,000	15	4.2
Above 400,000	6	1.7
Educational Characteristics		
Primary school	28	7.8
Secondary school	188	52.2
Tertiary education	144	40
Marital status		
Single	55	15.3
Married	276	76.7
Divorced	15	4.2
Widowed	14	3.9
Household size		
Less 3	83	23.1
3-6	189	52.5
7-10	78	21.7
Above 10	10	2.8
Years of farming experience		
Less 10	108	30
10-20	177	49.2
21-30	54	15
Above 30	21	5.8

Source: Field Survey, 2014

Age of the Respondents

Table 2 also shows the distribution of the respondents on the basis of their age. The table shows that the age classes of 31- 40 and 41-50 constituted 38.1% and 34.4% of the respondents respectively. Putting these together, the respondents in the two age range categories have

constituted the majority (72.5%). Therefore, the fact that the largest number of the respondents was found to be within these active age classes suggests that they were up and doing in order to make their living standards better through the strategy of diversifying their livelihoods A similar result was obtained in a study carried out by Lawal *et al.* (2010). The findings reported that an average Fadama farming household head is still young (44 years), active and productive. Similarly, the result of this study also agrees with that of Adeolu and Taiwo (2004), who reported that the average age (50 years) of the farmer participants in the NFDP II of Southern Guinea Savannah in Nigeria appears more than that obtained during the baseline survey of about 40 years.

Level of Education of the Respondents

Table 2 depicts that more than half (52.2%) of the respondents have obtained a minimum of secondary school education. The rest of them, constituting 40%, have attained one tertiary educational level or the other, including diplomas, undergraduate degrees and postgraduate degrees. The fact that the majority of the respondents possess at least a secondary school educational qualification, this suggests that there is a high likelihood of them accessing as well as utilizing useful information on livelihood diversification activities.

Marital Status of the Respondents

Table 2 also shows the distribution of the respondents based on their marital status. The distribution indicates that 15.3% of them are single and the majority (76.7%) of them were married. The divorced and widowed accounted for 4.2% and 3.9% respectively. The reason that could be adduced to the high percentage of the married category is that they have the responsibility of feeding and providing for the needs of their family members as is the case in Africa.

Household Size of the Respondents

The distribution of the respondents as shown on Table 2 indicated that the respondents with household members of less than 3 persons were 23.1%. Those within the range of 3-6 persons were 52.5% and the households with 7-10 members constituted 21.7%, whereas those with more than 10 persons made up 2.8%. The possible reasons why the respondents with larger household sizes were involved in the activities of the NFDP II could be attributed to the pressures of household needs (food, clothing, shelter, medical care) and other day-to-day

requirements). This is an opportunity that the NFDP II had provided to them and they utilized it properly by diversifying into various livelihoods in varying extent.

Years of Experience

Table 2 still presents the distribution of the respondents based on their years of experience in their various livelihood activities. The distribution shows that almost half (49.2%) of them were within the range of 10-20 years of experience. The result suggests that, by reason of the many years of experience, they must have acquired a lot of knowledge on how development projects like NFDP II can improve their social and economic problems. Similarly, those respondents within the ranges of 21-30 years (15%) and those above 30 years (5.8%) of experience have had many years of encounter in their struggle for means of living and must have known that diversifying their livelihoods is a good practice. They are therefore, probably, well informed about the possible benefits they can obtain when cultivate the culture of livelihood diversification as presented by development projects such as the NFDPII etc. The NFDP II beneficiaries that have less than 10 years of experience who constituted the second highest category percentage (30%) could be those that were being gingered by their ambition to live better lives, in spite of the fact that their years of experience were relatively low.

Results of Tobit Regression between Livelihood Diversification and Environmental Factors

Table 3 shows the results of the Tobit Regression analysis. The results indicated that the number of occurrence of natural disasters was positive and statistically significant at 5% level of significance. This means that as the number of natural disasters increases, the respondent also becomes more diversified. This implies that the more the occurrence of natural disasters the more the extent to which the respondents diversify their livelihoods. The wisdom in this is that if one livelihood is destroyed by a particular disaster, the respondents could still have other livelihood activities to rely upon for a living. This fact is based on the assertion that not all livelihood activities are likely to be affected by the same disaster(s) at the same time. The result concurred with that of Nasa *et al*. (2010), who also found that natural disasters were positive and significant for livelihood diversification.

The number of natural resources available in a community or the environment surrounding the respondents' dwelling places was found to be significant at 1% level of significance. This means that an increase in the number of natural resources in the area of study also brings an increase in livelihood diversification among the respondents. The possible reason

for this is that the more the availability of natural resources in a given area the more diversified the people. For example, where there is a river, water can be used for the irrigation of crops during the dry season. Sand from the river can also be used in building cement blocks for sale, building houses, etc. Similarly, the availability of rocks, forests and mineral resources can provide opportunities for livelihood diversification because gravel can be sold; timber and wood works can generate income to the rural people; etc. The result of the study carried out by Nasa *et al*. (2010) on factors influencing livelihood diversification among rural farmers in Kaduna State is in consonance with the result of this study. Their finding indicated that the number of natural resources present in their study area was found to be positive and significant for livelihood diversification.

Table 3: Results of Tobit Regression Analysis

Variables	Coefficient	Standard Error	t
No. of natural disasters	.056522	.0276744	2.04**
Distance to town	-.0260533	.0153280	-1.70
Season of the year	.270411	.0966440	2.80**
No. of natural resources	.1226635	.0118200	10.38***
Distance to markets	.026964	.0196323	1.37
-Cons	.1973527	.0125975	15.67***

** Significant at 5% level of significance
*** Significant at1% level of significance

The Tobit regression results indicated that the distance of the respondents' dwelling places from their state capital, local government headquarters and major towns was not significant. Similarly, the distance between them and their market places was found to be not significant. However, the period (dry or rainy season) of the year was positive and significant at 5% level of significance. This means that, during the dry season, there is a higher likelihood of more livelihood diversification among the respondents. On the other hand, they diversify less during the rainy season. This result is supported by the findings of Nasa *et al*. (2010), who also reported that the season of the year was found to be positive and significant for livelihood diversification in the study they carried out in Kaduna State, Nigeria.

Due to inadequate or, in some cases, lack of infrastructure such as good roads and bridges, market shops, stores and shades, business activities and movements by rural people during the rainy season become difficult and sometimes impossible. This, therefore, has a

negative effect on livelihood diversification among them and does account for the reason why they are less diversified during the rainy reason. Another possible reason why the dry season period has a positive and significant influence on livelihood diversification in the area of study is that the largest amount of their capital is being usually invested in agricultural activities during the rainy season, rendering them unable to diversify into other off-farm and non-farm livelihood activities during the dry season.

CONCLUSION

The occurrence of natural disasters and the availability of natural resources in the study area were strong factors that influenced livelihood diversification among the respondents. The environmental factors are responsible for the differences in the extent of rural livelihood diversification among the respondents in the study area. Livelihood diversification has contributed meaningfully to the betterment of the living standard of rural dwellers. The dry season period is more favourable for livelihood diversification in the study area when compared to the rainy season period. Provision of infrastructure can facilitate livelihood diversification across the dry and rainy seasons and will hence, improve the living standard of the rural dwellers.

RECOMMENDATIONS

Based on the findings of the study, the following recommendations were made:

i. Since the number of occurrence of natural disasters was found to affect rural livelihood diversification, the Federal and State Governments should create enabling environments and conditions for livelihood diversification by supporting new livelihood diversification opportunities in the rural areas in the event of natural disaster occurrence.

ii. Rural communities should be urbanized in order to facilitate the efforts of rural dwellers towards livelihood diversification. This can be done, partly, by constructing good roads that can allow easy transportation for on-farm, non-farm and off-farm income-earning activities throughout the rainy season as well as dry season.

iii. Government should formulate policies that can preserve and protect the natural resources, which are important potentials entrepreneurial activities from being destroyed by avoidable natural disasters.

REFERENCES

Adeolu, B. A. and Taiwo, A. (2004). The Impact of National Fadama Facility in Alleviating Rural Poverty and Enhancing Agricultural Development in South-Western Nigeria. *Journal of Social Science*. 9(3): 157-161.

Bateman, D. and Ray, C. (1994). Farm Pluriactivity and rural Policy: Some Evidence from Wales, *Journal of Rural Studies* 10(1): 1-13. Published by Pergamon.

Bryceson, D. (2000). Rural Africa at the Crossroads: Livelihood Practices and Policies, ODI Natural Resource Perspectives, No. 52. http://www.odi.org.uk/nrp/52.html.

Cramines, E. G. and Zeller, R. A. (1979). Reliability and Validity Assessment. Sage Publishers, Biverly Hill/London. Pp. 227-260.

Ellis, F. (1998). Household Strategies and Rural Livelihood Diversification. *Journal of Development Studies.* Vol. 35 No. 1 pp. 1-38.

Ellis, F. (1999). Rural Livelihood Diversity in Developing Countries: Evidence and Policy Implications. Natural Resource Perspectives Number 40, ODI. http://www.odi.org.uk/40.html.

Ellis, F. (2000). Rural Livelihoods and Diversity in Developing Countries. Oxford University Press. In Dorward, A., Anderson, S., Clark, S., Keane, B. and Moguel, J. Asset Function and Livelihood Strategies: A Framework for Pro-Poor Analysis, Policy and Practice. ADU Working Paper 01/01.

Hussein, K. and Nelson, J. (1998). Sustainable Livelihoods and Livelihood Diversification. IDS Working Paper, 69. Available at: www.padniger.net.Documents%20and%20Reports/.../sustlivelihood.pdf

Kinsella, J., Wilson, S., Jang, F. and Renting, H. (2000). Pluriactivity as a Livelihood Strategy. In: Matthews-Njoku, E. C.,. and Adesope, C. O. N. (2007). Livelihood Diversity Strategies of Rural Women in Imo State, Nigeria. *The Nigerian Journal of Agricultural Extension* (10): 117-123.

Nasa, D. H., Atala, T. K., Akpoko, J. G., Kudi, T. M. and Sani, H. (2010). Analysis of Factors Influencing Livelihood Diversification among Rural Farmers in Giwa Local Government Area of Kaduna State, Nigeria. *International Journal of Science and Nature.* Vol. 1 (2), 161-165.

Lawal, A. F., Omotesho, O. A. and Adewumi, M. O. (2010). Land Use Pattern and Sustainability of Food Crop Production in the Fadama of Southern Guinea Savannah of Nigeria. *African Journal of Agricultural Research* Vol. 5(3) pp. 178-187. Available at: www.academicjournals.org/AJAR.

Nkonya, E., Philip, D., Mogues, T., Pendar, J., Yahaya, M. K., Adebowale, G., Arokoyo, T. and Kato, E. (2008). Impacts of a Pro-Poor Community-Driven Development Project in Nigeria. *International Food Policy Research Institute*. www.ageconsearch.umn.edu/bitstream/42344/2/ifpridp00756.pdf.

Oluwatayo, I. B. (2009). Poverty and Income Diversification among Households in Rural Nigeria: A Gender Analysis of Livelihood Patterns. Conference Paper No. 41. Available at: www.iese.ac.mz/lib/publication/II.../CP41_2009_Oluwatayo.pdf.