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ASSESSMENT OF AGRARIAN HOUSEHOLDS ADAPTIVE CAPACITY TO DROUGHT IN GOMBE STATE, NIGERIA.

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Abstract

This study was carried out to assess the adaptive capacity of agrarian households to drought in Gombe State, Nigeria. Three rural communities were selected with a total of 100 sampled respondents mainly households' heads both male and female by probability sampling. Data collected was processed and analyzed using descriptive statistics. The findings revealed that out of the five livelihood resources namely; financially, physically, socially, human and natural resources, more than four-fifths (84%) of the respondents are less adaptive to drought financially, more than 70% (72) are less adaptive physically, less than four-fifths (77%) are less adaptive socially, close to 90% (89%) are less adaptive to their human resources and less than one-half (48%) are less adaptive with respect to natural resource. Therefore, there is need to understand the dynamics of people's livelihoods and how they are affected by drought, how they might respond with the resources they have and how the conditions can be reflected and built upon. It is recommended that ecosystem management and restoration activities should be encourage by protecting and enhancing natural services that support livelihoods for farmers to achieve their best with the resources at their disposal.

Key Words: Adaptive capacity, agrarian households, Drought, Gombe.

1. Introduction

Chambers (1989) notes that "vulnerable" and "vulnerability" are common terms in development, but their use is often vague, pointing out that often these terms simply serve as convenient substitutes for "poor" and "poverty". He attempts to distinguish poverty which he defined as 'deprivation, lack or want from vulnerability, described as defenselessness, insecurity and exposure to risk, shocks and stress (Chambers 1989). We believe the distinction between poverty and vulnerability highlighted by Chambers is an important one. Vulnerability is not poverty; vulnerability is shorthand for factors that drive people into poverty, keep them in poverty and block their exit routes from poverty.

The concept of vulnerability is valuable because it draws attention to the multiple dimensions of deprivation such as social exclusion and gender as well as to poverty dynamics and to established patterns of coping and resilience used by those directly affected. Understanding vulnerability should deepen our understanding of the climatic, social, generational, geographic, economic and political processes that generate poverty, particularly chronic poverty (Chambers 1994).

Like vulnerability, adaptive capacity is a concept that has multiple interpretations in the climate change literature. In general terms, adaptive capacity is defined in the

climate change literature as "the potential or ability of a system, region or community to adapt to the effects or impacts of climate change" (Smith 2001). The determinants of adaptive capacity include the range of available technological options for adaptation, the availability of resources and their distribution across the population; the structure of critical institutions and decision-making; human capital, including education and personal security; social capital, including property rights; the system's access to risk spreading processes; the ability of decision-makers to manage information and the public's perceived attributes to the source of stress.

Adaptive capacity has been used as a measure of whether technological climate change and adaptation can be successfully adopted or implemented. In the starting point interpretation, Adaptive capacity also refers to the present ability to cope with and respond to stressors and secure livelihoods. Adaptive capacity in the first case refers to future adaptations and vulnerability, while adaptive capacity in the second case pertains to present day vulnerability (Burton 2002).

The different understandings of adaptive capacity are directly related to understanding of adaptation, which can be generally defined as an "adjustment in ecological, social or economic systems in response to actual or expected climatic stimuli and their effects or impacts" (Smith 2001). Burton (2002) points out that even the term adaptation has multiple interpretations, representing "first generation" and "second generation" adaptation research. The first generation adaptation research is impacts – driven, the extent to which the gross impact of climate change can be reduced by adaptation (Burton 2002). This approach relies on future scenarios and directs attention towards future impacts of climate change rather than towards present vulnerability.

The second generation adaptation research, in contrast, considers adaptations in response to a wide variety of economic, social, political and environmental circumstances. The point of departure is the present, in terms of the distribution of vulnerability, existing adaptations to the climatic environment and the way that current policies and development practices serve to reduce vulnerability. Future climatic and socio-economic conditions are taken into account in assessing and prioritizing policy options, but only to set the context for future adaptations.

The aim of the study is to assess the adaptive capacity of agrarian households to drought for more efficient water sourcing and water use practices. Specifically, the study assessed agrarian household responses to five livelihood resources (finance, physical, social, human and natural) and categorized agrarian households on the basis of their adaptive capacity to drought.

2. MATERIALS AND METHOD

2.1 The Study Area

Gombe State is located between latitude 9^0 $30^{'}$ and 12^0 $30^{'}$N and longitudes 8^0 $45^{'}$ and 11^0 $45^{'}$E of the green wich meridian. It lies within the north-east region of Nigeria and occupies a total land area of about 20,265 sq.km. the state had by 2006 census population of 2,365,040 inhabitants. The state is prone to drought and experiences water scarcity. Farming and animal husbandry are the major economic activities. As in most rural areas in this region, lack of facilities such as piped water and electricity and the limited nature of government assistance, leave the people to the mercy of the environment (Dabi and Anderson, 1999). The study concentrates on three villages that are vulnerable to drought that is Deba, Dukku and Tula (fig. 1)

The agrarian households in Gombe State depend on the limited rainfall, surface and ground water sources for their domestic and

economic needs. This scanty water availability is typical for locations in the extensive sedimentary chad formation, which is recharged by seasonal surface flow, which is the main ground water source. The undulating terrain is covered mostly by Sudan Savannah type of vegetation basically parch grasses and scrub as well as scattered acacia and baobab tree species.

The household economy is a combination of subsistence and market activities with limited external linkages. Human activities are typical of most rural areas in North East region – rain – fed agriculture. Each household produces agricultural commodities, some of which are traded in the periodic local market (Dabi and Anderson, 1999).

Temperatures in Gombe State are generally high. Mean daily maximum temperatures range from 30.5^{0C} in July to August to 40.65^{0C} in March and April. The mean daily minimum ranges from 11.7^{0C} in December and January to 24.7^{0C} in April and May. Sunshine hours range from about 5 hours in July to 9 hours in November. The effects of these high temperatures are high evapotranspiration and this eventually brings about water shortages for arable cropping.

The relative humidity is also high throughout the year. Humidity ranges from about 12 percent in February to about 68 percent in August. The rainy seasons months are May to September, monthly rain ranges from 0.0 mm in December and January, though only traces of less than 0.1 mm in February and November to about 343mm in July (amman, O. and Peters, 2000).

Vegetation in Gombe State is predominantly wooded shrubland comprising *Anogegeisus/Combreum/Afformasia/Datariu m*. The Northern part of the State exhibits a mosaic shrubbed grassland and grassed shrubland with the preponderance of acacia. In the southern part of the State, the vegetation is shrubbed woodland with mostly *Afformasia and Datarium* (Mbaya et al, 2019).

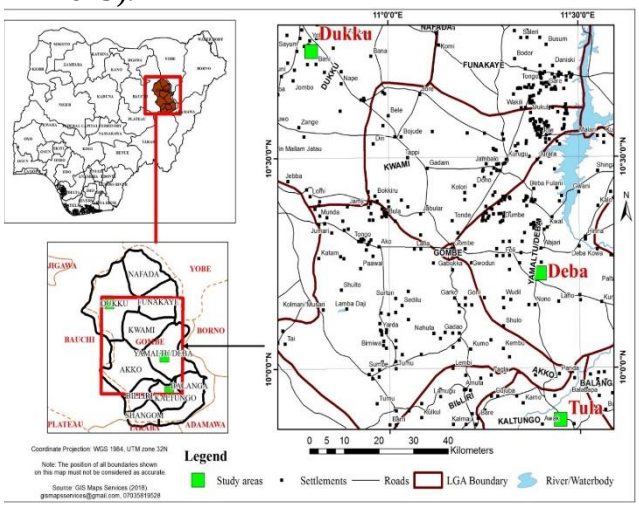

Fig. 1: Map of the Study Area
Source: GIS Lab. Gombe State University, 2019.

2.2 Materials and Methods

The data for this study were generated from the household heads themselves. The researcher relies solely on data that are collected directly from the agrarian household heads in the state, through observations and structured interview schedule. The data collection sheet consists of a combination of closed and open-ended questions related to aspects of drought, economic activities undertaken by households, problems encountered and coping measures.

The data gathering instrument was designed to collect as much as possible qualitative and quantitative data from the household heads in the study State. The data gathering instrument sought to find household heads' perception on drought, their beliefs, attitudes, participation in various adaptation programmes and their adaptive capacity.

A reconnaissance survey was conducted from 16th – 19th April, 2018. The purpose of the reconnaissance survey was for identifying villages that experienced drought in the previous ten years, meeting with the village heads and representatives of the community to inform them about the study and solicit for their help and cooperation as

well as holding informal interviews and consultations with household heads. During the reconnaissance survey, observations were made and poor agrarian communities were identified based on interactions with key informants in the communities in the state.

The major part of the data collection involved administration of instrument of data collection in three systematically selected villages in the state. The data collection sheet contains a combination of closed and open-ended questions related to aspects of drought, activities undertaken by households, problems they encountered, strategies they have adopted to cope with droughts and their adaptive capacity. Information generated by the instrument of data collection provides the basis for identifying vulnerable households, establishing how they are coping (adaptation measures) and revealing factors that influence their capacity to adapt to drought. Individual agrarian household heads constitute the unit of enumeration. Households where the heads of household were found physically present were approached and interviewed. The convenient sampling technique was employed as only the household heads that were physically present at the time of visit were included in the sample. A total of 100 data collection forms were administered by face to face interview to household heads in their homes (Table 1). Two field assistants were used in each village.

Data collected from the household heads were analyzed using qualitative and quantitative methods and descriptive statistics in the form of frequencies and percentages presented in tables.

2.3 Sampling technique and Sample size

The population of the study area was based on 2018 projected figures of 1991 National Population Census. The results of the 1991 census were used for the projection because the results of the 2006 census do not contain community level data. The projection of sampled localities' population was based on Gombe State population growth rate of 3.2% using the formula: $\mathbf{P_{t+n} = P_t e^{r*n}}$, Where, P_{t+n} = Future population (2018), P_t =Base year (1991), e= exponential, r =Growth rate (3.2%), n =Interval between future population and base year population (2018-1991=27years). This is shown in Table 1. To obtain the sample size for the study, Yamane (1967) method of sample size determination was employed. Based on this, 95% confidence level and error limit of 10% were adopted. Yamane (1967) formula is depicted as n= $\frac{N}{1+N(e^2)}$, where n=required sample, e^2=error limit (0.1in this case), N=Population size. Hence, a sample size of 100 was used for the study.

Table 1: Distribution of Respondents in the study Area

Local Government Area	Selected Villages	NPC 1991	2018 projection	Proportion of Questionnaire
Deba	Deba	12,629	29,844	19
Dukku	Dukku	39,691	91,433	58
Kaltungo	Tula	15,025	35,506	23
Total		**66,345**	**156,783**	**100**

3. RESULT AND DISCUSSIONS

3.1 Adaptive Capacity of Household

The following factors affect the adaptation of the coping strategies of Agrarian households:

i. The resource base for sustainable livelihoods.
ii. Government policy
iii. Availability of information and warning signals.

Households capacities for adopting coping strategies are determined by their resource base, made up of their endowments of five types of livelihood resources-financial, human, natural, social and physical. These household endowments are measured using households' income, level of education of household head, water availability for household use, community social network and distance to road or market. Using the survey data, values are established to classify the level of adaptation of households along

the dimensions of the five livelihood resources. Table 2 shows the number of households classified as highly adaptive, moderately adaptive and less adaptive with respect to the five resource types.

Table 2 is the summary of respondents' adaptive capacity for the five livelihood resources. From the table, it is evident that more than four-fifths (84 percent) of the respondents are less adaptive to drought farming practices which bring about poor yields and high risk crop losses and failure. Unable to invest in improvements to their farms or earn off farm labour income, poor A large proportion of households more than seventy percent (72%) were also less adaptive to physical resources. This is due to the absence of infrastructural facilities such as roads and markets, which affect accessibility to sources of inputs and markets for products; water supply and sanitation, which affects human health, well-being, and energy in the form of electricity, which affects food storage and food processing. About four-fifths (77%) of the respondents are less adaptive in terms of social resource or family and community networks. Drought will often impact adversely on most if not all members of a social network simultaneously, weakening the ability of the network to assist and support its members in periods of drought. This condition will inhibit self-help programs such as food sharing, labour assistance and remittances, which serve as safety nets that can reduce vulnerability. It will also deepen religious beliefs and prayers, which give hope and relief to households during and after droughts and financially. Most of the household respondents have very low incomes, financial savings and saleable assets. They lack opportunities for off-farm labour income and collateral necessary to access financial credit. This limits their ability to purchase farm inputs, equipment and other technology to improve agricultural production or adapt to climate variability and extremes. Consequently, most farmers are restricted to their old traditions of low input rural households are trapped in poverty, placing them at risk of hunger and other adverse impacts of drought (Leary *et al*. 2008).

increase the possibilities of conflicts between arable farmers and herdsmen over grazing land and watering points, especially during and immediately after droughts (Idoma *et al*., 2018). The same Table 2 reveals that close to ninety percent (89%) of the respondents are also less adaptive with respect to their endowment of human resource. This is attributed to the fact that most households have had no formal education, which may constrain access to and use of information about climate risks, risk management strategies and new technologies, which in turn may negatively affect the adoption of coping strategies. The Table also reveals that less than one-half (48%) are less adaptive with respect to natural resource, for example water availability. The most probable reason for this perception is because no major drought events, such as the 1973/74 and 1982/83 drought periods have been recorded recently (Dogo *et al*., 2015).

Table 3 presents the summary of the respondents' adaptive capacity.

Table 2: Adaptive Capacity of Households

Indices	Highly adaptive		Moderately adaptive		Less Adaptive	
	F	%	F	%	F	%
Total income per household (financial)	2	2	9	9	84	84
Distance to road (physical)	17	17	11	11	72	72
Community social network, (social)	4	4	12	12	77	77
Level of education (human)	4	4	6	6	89	89
Water availability, (natural)	24	24	28	28	48	48

Source: Fieldwork, 2018.

Table 3: Summary of Respondents Adaptive Capacity

Indices	Highly Adaptive	Moderately Adaptive	Less Adaptive
Level of education	4	6	89
Total Income per Household	2	9	84
Community network	4	12	77
Household Size	10	11	22
Water Availability	25	27	48
Distance of House from nearest motorable road	18	11	71
Physical Disabilities	5	2	2
Food Security	65	26	2
Media Exposure	23	14	63

Source: Fieldwork, 2018.

Important policy areas for adaptation therefore should include education, research and development, institutional change and political will, religious and traditional institutions, and provision of infrastructural facilities. In the area of education, government should provide formal and informal educational institutions in order to improve literacy levels. Education will enable households to be better/adequately informed and thus benefit from any strategy that may be introduced. Education will also enable households to access and utilize weather information. However, government must improve on information dissemination, provision of extension services and capacity building. Research and development are needed to better understand the risks to rural livelihoods from climate variability and change, as well as to develop and test risk management strategies and technologies. Important areas for research and development include climate change, water resources management, agricultural practice and development, land use and land use change, farm inputs, and harvest and post-harvest activities. These efforts will facilitate the monitoring of weather elements and the provision of warning signs as well as the development of good practice.

4. Conclusion and Recommendations

Based on their socio-economic characteristics, more than three-fifths of the respondents are less adaptive in their endowments of the following five types of livelihood resources: financial, physical, social, human and natural resources. Adaptive capacity of agrarian households in Gombe State, Nigeria is a function of their socio-economic characteristics. The study reveals that respondents are less adaptive financially, physically, socially, naturally and in human resource.

In conclusion, if reducing current vulnerabilities is the starting point of adaptation, then poverty reduction is essential for the process since poverty is both a condition and determinant of vulnerability. Yet poverty reduction requires an understanding of how local livelihoods are conducted and sustained, as the assets and capabilities that comprise peoples' livelihoods often shape poverty and the ability to reduce it. Moreover, by understanding the dynamics of poor peoples' livelihoods, we can begin to understand how they will be affected by climate change impacts, how they might respond with the resources they have, and how these conditions can be reflected and built upon for successful adaptation strategies.

Reference

Burton, I. and Van Aalst, M. (2004). *Look before you leap: A risk Management Approach for incorporating Climate Change Adaptation into World Bank Operations*, Washington, D.C.: World Bank.

Chambers, R. (1989). Editorial Introduction: Vulnerability, Coping and Policy. *IDS Bulletin* 21, 1-7

Chambers, R. (1994). The Origin and Practice of Participatory Rural Appraisal. *World Development, 22* (7), 953-69.

Dabi, D.D. and Anderson, W.P. (1999). Water use for Commodity Production in Katarko Village, Northern Nigeria, *Applied Geography,* 19, (1) 105-22.

Dogo et al (eds) (2015), *Studies in Climate Change Physical and Human Resources utilization and development in Nigeria*. M.O press and Publishers Limited, Kaduna, Nigeria.

Idoma et al (2018), *Pastoralists coping strategies to the effect of climate variation on animal production in*

Talata-Marafa Local Government Area of Zamfara State, Nigeria, Journal of Environmental and Social Sciences. Vol. 24 N0.2

Leary, N.; Adejuwon, J.; Barros, V.; Burton, I.; Kulkarni, J. and Lasco, R.(Eds) (2008). *Climate Change and Adaptation.* Earthscan, UK and USA.

Mamman, A.B.; Oyebanji, J.O. and Peters, S.W. (2000). *Nigeria-A People United, a Future Assured*. Volume 2 Survey of States, Millennium Edition.

Mbaya, L.A; Wannah, B.B; Dan, Y; Ahmed, B.Y (ed) (2019) *Gombe: People, Environment and Development*. Nonimod J. Ventures Jimeta-Yola, Adamawa State Nigeria.

Smith, B. (2001). *From Adaptation to Adaptative Capacity and Vulnerability Reduction*. University of Guelph, Ontario, Canada.

Yamane, Yaro (1967), *Statistics: An Introductory Analysis*, (2nded) New York. Harper and Row.