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ASSESSMENT OF THE INFLUENCE OF CLIMATE CHANGE ON FARMERS/PASTORALISTS' CONFLICT IN BENUE STATE, NIGERIA

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Abstract

Resource-driven conflicts amongst arable crop farmers and cattle herdsmen have become common incidences in various parts of Nigeria. This study assessed the influence of climate change on conflicts between famers and herdsmen in Benue state, Nigeria. Data for this study were derived from the administration of a semi structured questionnaire and Focus Group Discussions (FGDs). Purposeful sampling method was used to select six communities, while 235 farmers and 72 pastoralists were chosen as sample size for the survey based on Krejcie and Morgan's formula. Descriptive (percentages, arithmetic mean) and inferential statistics (regression analysis) were adopted to analyze the data for the study. Results from the findings indicate that farmers and herders in Benue state were within active years of economic and productive age (35 to 44 years). Approximately, three-quarter of both farmers and pastoralists of the study villages perceived there is high variability in rainfall pattern and increase in temperature. The major cause of conflicts as perceived by farmers was destruction of crops by cattle ($\bar{x} = 3.30\ R1$) while the pastoralists perceived land tenure system as the main cause of farmers/pastoralists conflict ($\bar{x} = 2.58\ R1$) in the study area. The major impacts of the conflict on farmers/pastoralists activities were shift in livelihood (Mean RII= 0.83, R1) and increase in animal mortality and crop loss (Mean RII= 0.77, R3). The regression analysis on the relationship between the probabilities of engagement of farmers and pastoralists in conflict indicates that inadequate access to pasture, poor access to drinking water and pasture depletion were found to be statistically significant ($p < 0.01$). Conflict between famers and herders could be forestalled if Government could clearly formulate policies and implementation framework that would enhance climate change information forecasting and dissemination, adaptive capacity and ranch management in the study area.

Keywords: Assessment, Climate change, Conflict, Farmers, Influence, Pastoralists.

1. Introduction

The conflicts between farmers and pastoralists have remained the most preponderant resource-use conflict in Nigeria (Ajuwon, 2004; Fasona and Omojola, 2005). The necessity to provide food of crop and animal origin, as well as raw materials for industry and export in order to meet ever-growing demands, has

led to intensification of land use (Nyong and Fiki, 2005). It is increasingly becoming clear in recent times that population pressures on natural resources is severely degrading Nigeria's environment. Poor adaptation to changing environmental conditions, rural banditry and cattle rustling among others are consequently, inducing reactions such as communal crises and population displacement/mobility in search of more agriculturally viable lands, most importantly among Benue rural farming population. (Leme, 2017).

Conflicts between farmers and pastoralists in recent times have increased in intensity and frequency. Thomas Homer-Dixon, has identified resource scarcity and competition as the primary (though not the only) cause of the conflict between farmers and pastoralists (Homer-Dixon, 1999; Blench, 1984). This type of scarcity is essentially a decline in the availability and access to natural resources. It is usually brought about by climatic and environmental factors such as climate change manifesting as acute drought, environmental degradation, fresh water depletion, desertification, erosion, extreme heat and loss of wetland, among others.

Several studies (Odoh and Chilaka, 2012; Sunday, 2013; Sanfo, et al. 2015; Denis, 2016 and Idoma, 2016) have examined the linkage between climate change and resource conflicts. Having gone through these studies, it is obvious that most of the studies were purely descriptive and lack rigorous statistical analysis. In addition, they have not comprehensively shown the correlation between conflicts and climate change. It is important to note that climate change can threaten natural resources and can ensue violent conflict. These therefore has created a gap in knowledge, which this research proffered solution.

The aim of this research is to assess the influence of climate change on farmers/pastoralists conflicts in Benue State. Specifically, the study examined the demographic and socio-economic characteristics of farmers and pastoralists in the study area, the pattern of climatic elements between 1980 and 2018, the causes of conflicts between 2009 and 2018 and the effects of conflicts on the livelihood of farmers/pastoralists.

The choice of the study area is premised on the high population of farmers and pastoralists coupled with histories of rampant clashes between pastoralists and farmers (Umar, 2010).). The findings and recommendations of the study is of immeasurable assistance and support to both the farmers, pastoralists and all stakeholders in understanding how to respond to the lingering conflict(s) between farmers and pastoralists in the study area and the nation at large.

2. Materials and Methods

2.1 Study area

Benue State is located in the middle belt of Nigeria between latitude 6°29'N and 8°7'North of the equator and longitude 7°44'E and 9°55'East of the Greenwich meridian, with an estimated area of 30,955 km^2. (Fig. 1) Benue state is bounded by Nasarawa state to the North, Taraba State to the East, Cross-Rivers state to the Southeast, Enugu to Southwest, and Kogi to the West. The south Eastern part of the State also shares boundary with the Republic of Cameroun (See Figure 1). It is also bordered on the North by 280km stretch of River Benue and is traversed by 202km of River Katsina-Ala in the inland (Abaa, 2004). Benue state has twenty-three (23) Local Government Areas.

Benue State has a tropical sub humid climate, with two distinct seasons, namely the wet/rainy season and the dry/summer

season. The wet season; which lasts for seven months, starts from April and ends in October. The annual rainfall total ranges from 1,200mm 1,500mm. Temperatures are generally very high during the day, particularly in March and April. Along the river valleys, these high temperatures plus high relative humidity produces inclement/debilitating weather conditions. Makurdi, the State capital, for example, records average maximum and minimum daily temperatures of 35ºC and 21ºC in rainy season and 37ºC and 16ºC in dry season respectively (Ityo, 2010; Ujoh, 2014).

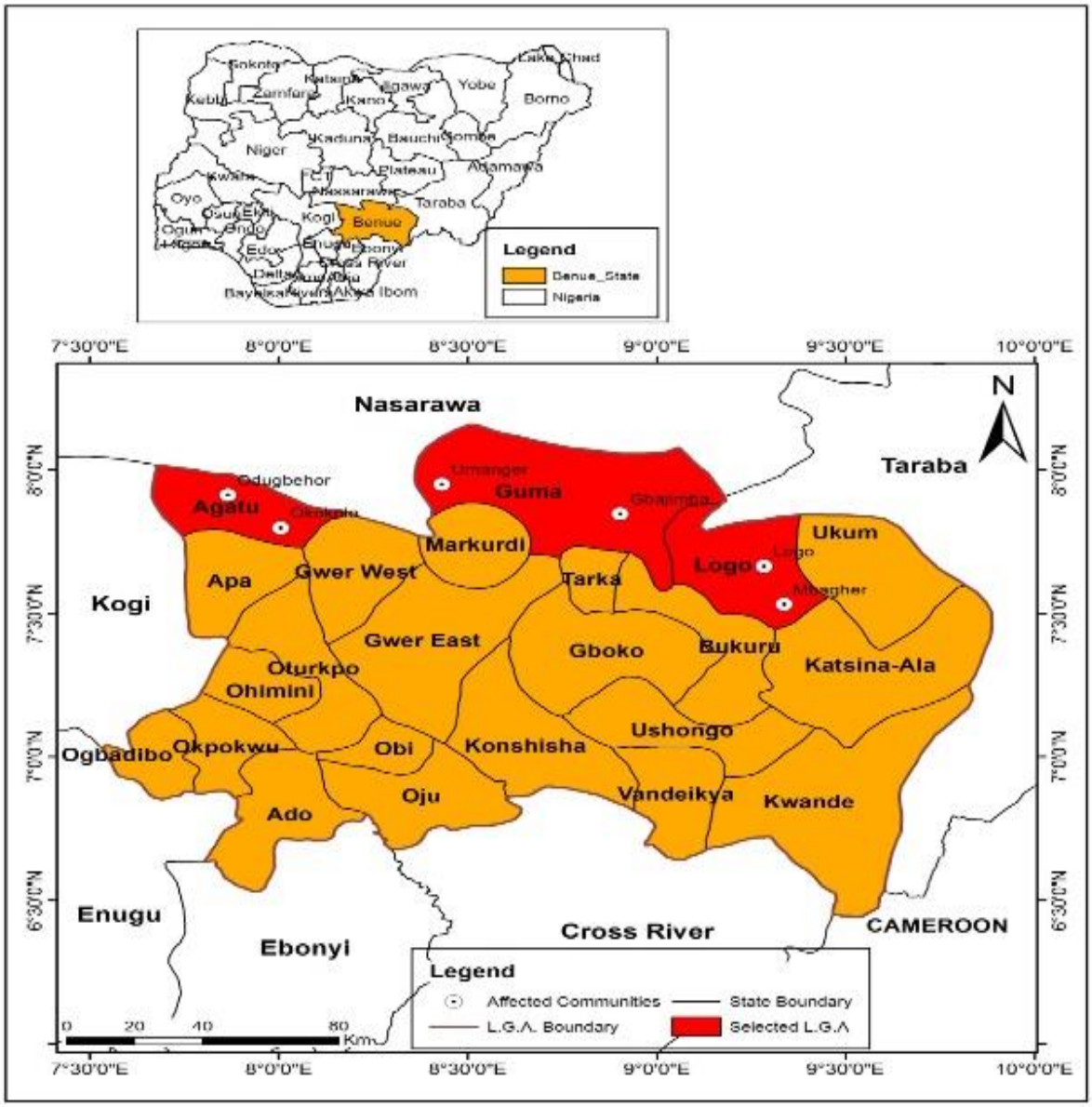

Figure 1: Map of Benue State showing the Study Area
Source: Adopted from Administrative Map of Benue State

Table 1: Copies of Questionnaire administered to farmers and pastoralists in the Study Area

S/N	LGA	Communities	Farmers	Pastoralists	Copies of Questionnaire
1.	Logo	Logo	64	28	92
		Mbagher	33	16	49
2	Guma	Umanger	26	11	37
		Gbajimba	45	13	58
3	Agatu	Odugbaho	73	20	92
		Okokolo	24	4	28
Total	**3**	**6**	**265**	**92**	**357**

Source: Fieldwork, 2019.

2.2 Methods

2.2.1 Sample size and sampling technique

Purposive sampling technique was used to select three Local Governments most affected by the last crises. These were Logo, Guma and Agatu Local Government (Idoma et al, 2018). Similarly, six most affected communities were chosen i.e. two from each local government area (Table 1). Krejice and Morgan (1970) sample size table was used to sample 357 respondents (267 farmers and 92 pastoralists) at 95confidence level and 5% sampling error margin. Snowball sampling technique (a sampled respondent directs the researcher to the next respondents) was used to select respondents in each of the affected communities. This method was used due to the nature of the pastoralists who do not stay together in a place.

The collated data for the study was analyzed with the aid of descriptive statistics such as arithmetic mean, percentages and counts as well as inferential statistics for instance regression analysis.

3. Results and Discussion

3.1 Socio-economic characteristics

The socio-economic and demographic characteristics of the farmers/pastoralists' in terms of their age and sex distribution, occupation and income status is depicted in Table 2. Regarding sex, results show that majority 70% and 85% of the farmers and pastoralists respectively are males. This shows that both farming and pastoral activities are male dominated in the study area. This agrees with the finding of Adelakun, Adurogbangba, and Akinbile, (2015) which revealed that males are more involved in both farming and pastoral activities. This is probably due to the nature of farming and pastoral work, which requires much physical exertion of energy.

Table 2: Distribution of Famers and Pastoralists based on Sex and Age structure, Occupation and Income status.

(N=235/72(Farmers/Pastoralists)

Categories	Farmers		Pastoralists	
	No.	%	No.	%
Sex				
Male	165	70	61	85
Female	70	30	11	15
Age				
< 15	21	8.9	9	12.5
15-24	32	13.6	7	9.7
25-34	45	19.1	19	26.4
35-44	61	26.0	25	34.7
45-54	32	13.6	5	6.9
55-64	26	11.1	4	5.6
Above 64	18	7.7	3	4.2
Occupation				
Arable farming	141	60.0	12	16.7
Animal farming	35	14.9	51	70.8
Trading	31	13.2	4	5.6
Civil servants	23	9.8	2	2.8
Artisan	5	2.1	3	4.2
Income Level				
<50,000	36	15.3	2	2.8
51,000-100,000	45	19.1	3	4.2
101,000-150,000	81	34.5	43	59.7
151,000-200,000	53	22.6	15	20.8
Above 200,000	20	8.5	9	12.5

Source: Fieldwork, 2019.

With respect to age distribution of the respondents, Table 2 indicates that majority (26% and 34%) of the farmers and pastoralists respectively were within the age bracket of 35 to 44 years. Respondents aged over 44 years represented one-third of the study population. This implies that farmers-herders in Benue were within active years of economic and productive age.

Furthermore, it suggests that a greater proportion of the respondents have stayed in the area for more than 40 years, have interacted with many people and have witnessed conflicts in the study area over the years. Kehinde, (2001), validates this investigation in his study of the factors influencing conflict between crop producers and pastoralists in Kabba-Bunu local government area of Kogi State.

Information was obtained from the respondents on their major occupations (Table 2). Results show that 60% of the farmers engaged in arable cropping, while 71% of the pastoralists were involved in animal husbandry. The preceding investigation is indicative of the fact that most of the communities are agrarian. The predominance of arable farming activities in the study area is orchestrated by the availability of large areas of fadama land resources suitable for growing of crops (Terwase, Gyuse, and Abawua, 2011). Table 2 further disclosed that crop producers and pastoralists are undergoing livelihood diversification. Pastoralists are increasingly involved in farming and non-farm activities, whereas the crop producers combine livestock production and farming as an insurance against failure. Homewood, (2008) validated the forgoing assertion that pastoralists almost always combine livestock focused occupations with complimentary livelihood activities such as farming, fishing, hunting and gathering, processing natural resources for sale, artisanal work, wage labour and investment in non-pastoral trade and businesses.

3.2 Farmers' and Pastoralists' Perception of the Pattern of Climatic Elements

Farmers and Pastoralists perceptions on different events of climate change

particulaly variabilities in rainfall and temperature patterns in the study area are climatic variables that influence farming and pastoral activities the most in the study area. In both farming and livestock production, the amount of rainfall is important and is an indicator of long term changes in the climate system. However, of more importance to the rural producers is the pattern of the rainfall. If the rain falls in the right amount and then it ceases for a long period before the next rain, the long dry spell can be devastating to rural livelihood activities. If however the rain falls in small amount but at the expected time and spread over the period of planting, it is a good season for farmers. From the results in Table 3, farmers and pastoralists of the study villages are clearly aware of presented in Table 3 . It is important to note that temperature and rainfall are the two climatic variability. They perceived that overall changes have occurred in rainfall and temperatures patterns. Approximately, three-quarter of both farmers and pastoralists of the study villages perceived there is high variability in rainfall pattern and increase in temperature. The preceding claim is validated by Rosenzweig, Tubiello and Goldberg, (2002), Mertz, Mbow and Reenberg, (2009) and Fosu-Mensah, Vlek, and Manschadi, (2010) who also reported that 91% of interviewees perceived a long term variability in temperature and rainfal as well as increase in temparature.

Table 3: Pattern of Climatic Elements Perceived by Farmers and Pastoralists (n=265/92)

Variables	Farmers				Pastoralists			
	Yes		No		Yes		No	
	F	%	F	%	F	%	F	%
Are you aware of changes in climatic conditions?	215	81	50	19	88	96	4	4
Is rainfall in the area adequate?	25	9	240	91	7	8	85	92
Is there any difference in rainfall in the last 30 years	210	79	55	21	81	88	11	12
Do you experience a decrease in rainfall?	201	76	64	24	72	78	20	22
Is there any difference in temperature in the last 30 years?	233	88	32	12	83	90	9	10
Do you experience an increase in temperature?	233	88	32	12	89	97	3	3
Do you have problem of floods?	243	92	22	8	56	61	36	39
Do you experience soil erosion?	198	75	67	25	49	53	43	47

Source: Fieldwork, 2019.

2.1 Comparison of Farmers' and Pastoralists' Perception of Climate Variability with Meteorological Records.

To verify farmers' and pastoralists' perceptions regarding the precipitation trend and temperature varaiability in the study area, available historical annual mean rainfall and temperature data from 1980 to 2018 were obtained from NMetS Makurdi. The results indicated high variability rather than a clear decreasing trend in precipitation (Figure 2A and 2B). The total annual rainfall for Makurdi meteorological stations for the period 1980 to 2018 has an increasing trend (y = 8.5392x + 1039.7). For instance, in Makurdi, over the 35 years period, total annual rainfall amount has increased by 46.2mm. The mean total annual rainfall amount is 1177.2mm, with lowest rainfall of 770.4mm (2003) and highest of 1772.4mm (1992). The wet season average rainfall amount in 5 yearperiod revealed a consistent drop in rainfall amount in the month of July. Between 1980 and 1984, average rainfall was highest in July and by 2005 to 2009 it was lowest. Also, there has been an increase in average rainfall trend in August (8.33mm/38 years) and a decrease in July (-473.0mm/30 years) and September (-2.32mm/38 years). According to Federal Ministry of Environment (FME), (2003.), this situation is contrary to previously experienced and documented rainfall pattern in Nigeria prior to the 1970s, in which there is double rainfall maxima in June and September with a break in August, which supports Odjugo (2005) and Odjugo (2007) which indicated that the short dry period during the raining season is gradually moving from August to July. These are key disorders in the climatic patterns of Nigeria showing indications of a changing climate. The shifts in rainfall pattern are becoming a worrisome development, as among other things farmers find it difficult to time their farming operations.Figure 2B discloses the trend analysis of record of the level of temperature between 1980 and 2018 in the study area, which shows an increasing trend. The forgoing investigation is confirmed by Odjugo (2010) showing that the temperature trend in Nigerian since 1901 indicates increasing pattern. The increase was slow up to the late 1960s and there was a sharp rise in air temperatures from the early 1970s, which continued until date. Thus, the slight difference between farmers' perceptions and statistical results is due to the fact that farmers' responses are based solely on recall. The high illiteracy rate among farmers and pastoralists impedes their capability to keep formal or official records, and so precisely remembering long-term trends of climatic elements could be challenging

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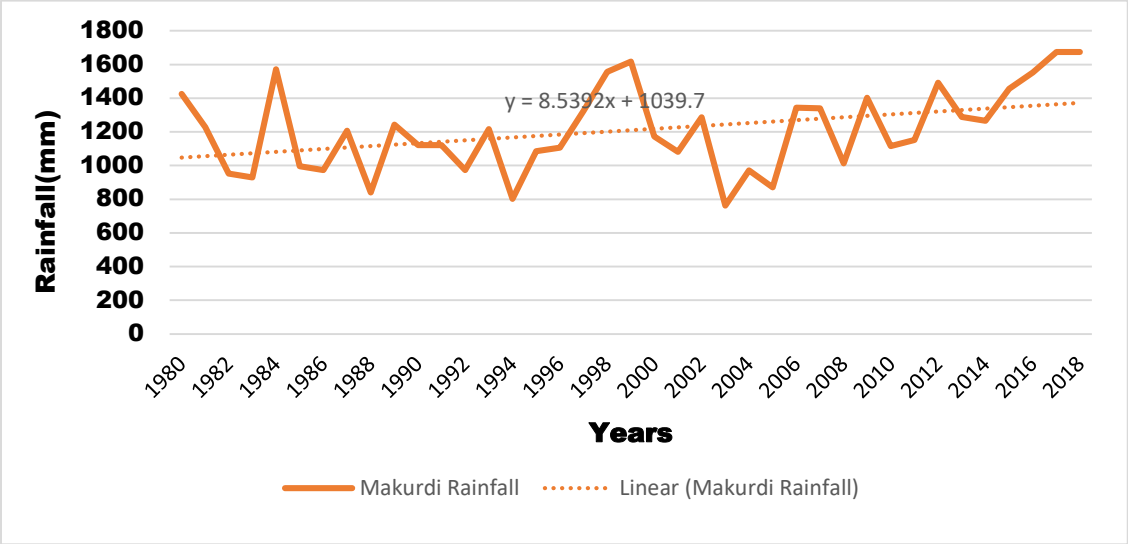

Figure 2 A: Annual mean Rainfall for Makurdi (1980-2018)
Source: NMetS Makurdi.

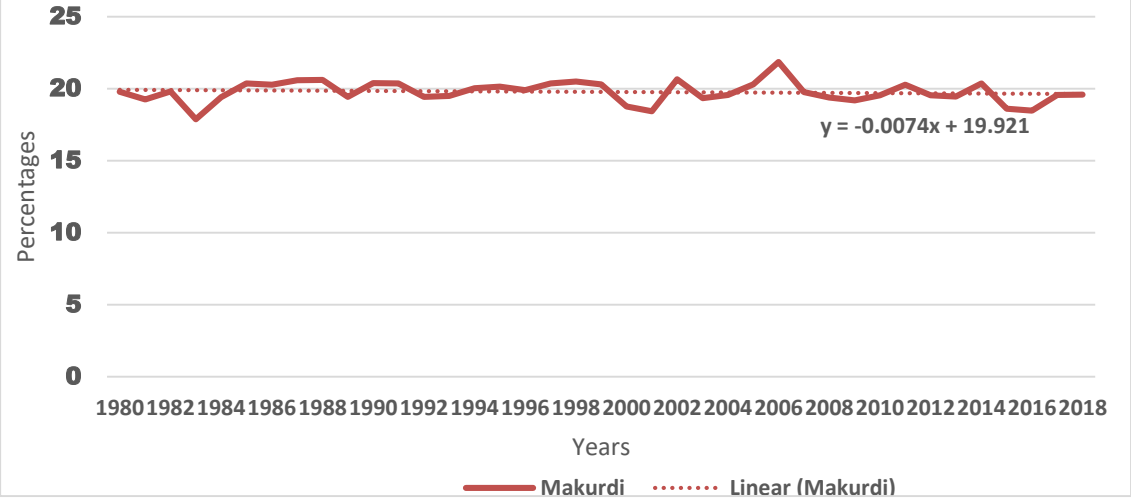

Figure 2 B: Annual mean Temperature for Makurdi (1980-2018)
Source: NMetS Makurdi.

4. Famers and Pastoralists Perception of the Causes of Farmers/Pastoralists Conflict

Information was obtained from the respondents on their perception of the causes of farmers/pastoralists conflict in Benue state (Table 4). Result shows that the major cause of conflicts in Benue state as perceived by farmers was destruction of crops by cattle ($\bar{x} = 3.30\ R1$) while the pastoralists perceived land tenure system as the main cause of farmers/pastoralists conflict ($\bar{x} = 2.58\ R1$) in Benue state. This is followed by pasture depletion ($\bar{x} = 3.24\ R3$) and poor access to drinking water ($\bar{x} = 2.42\ R3$) perceived by farmers and pastoralists respectively. Blench, 2010 validated the forgoing assertion by stating

that the most frequent causes of conflicts between the nomadic cattle herders and by cattle, particularly during the planting season and immediately after the harvesting period. Similarly, Abubakar (2012) affirmed that land tenure system or ownership of land was also regarded as a cause of farmers/ pastoralists conflicts. He further stressed that in most societies in Nigeria, farmers are regarded as those that own the land, and therefore determine how it is used; while the pastoralists are regarded as the landless group, who do not own land to use and settle on. The perception of farmers and pastoralists on sedentary farmers in Nigeria are illegal invasion of farms and destruction of crops the causes of conflict, centered on the following factors: pasture depletion, encroachments of farmland into grazing routes and reduction in water points. These can be supported by the understanding that the underlying causes of most resource conflicts are related to changing weather patterns manifested through the excessive build- up of heat on the earth's surface, meteorological changes which result in a reduction of rainfall, and reduced cloud cover, all of which results in greater evaporation rates.

Table 4 Farmers and Pastoralists Perceptions of the Causes of the Conflicts

S/N	Causes of Conflicts	Farmers				Pastoralists				Total	
		% of A	**% of D**	$\bar{x}$	**R**	**% of A**	**% of D**	$\bar{x}$	**R**	**F**	**P**
1	Blockage of grazing routes	60	40	2.80	6	58	42	2.30	6	235	72
2	Destruction of crops by cattle	93	7	3.30	1	46	54	2.53	2	235	72
3	Pollution of drinking water	55	45	2.88	5	51	49	2.36	5	235	72
4	Inadequate access to pasture	64	36	2.55	8	65	35	2.14	8	235	72
5	Poor access to drinking water	53	47	2.69	7	54	46	2.42	3	235	72
6	Negligence by law enforcement agents	81	19	3.21	4	57	43	2.18	7	235	72
7	Pasture depletion	87	13	3.24	3	54	46	2.40	4	235	72
8	Land tenure system	85	15	3.26	2	44	56	2.58	1	235	72

Source: Fieldwork, 2019

Note: A=Agreed, D=Disagreed, $\bar{x}$ = Mean, R= Ranking, F=Farmers and P=Pastoralists ($\bar{x} \geq 2.5$)

5. Effects of Conflicts on Farmers and Pastoralists' Livelihoods.

The study sought to find out the perceptions of farmers and pastoralists regarding the effects of conflicts on their livelihood activities. Hence, information was obtained from respondents on the effects of conflicts on the livelihood of pastoralists and herders in the study area. The result is displayed in Table 5.

Data in Table 5 has revealed that in Benue state, the major impact of conflict on farmers/pastoralists activities is shift in livelihood activities (Mean RII= 0.83, R1). This is followed by insecurity (Mean RII= 0.80, R2) and increase in animal mortality and crop loss (Mean RII= 0.77, R3). The high impacts of conflicts on farmers and pastoralists' socio-economic activities cannot be unconnected with the increase in temperature and high rainfall variability in the areas as revealed in Figures 2A and B. In support of this finding, Scoons (1995) stated that farmers/pastoralists conflicts are most acute around the semi-arid zones due to the frequency of shortage of rain. Similarly, NRC (2002) confirmed that climate change could influence the economic viability of livestock production systems worldwide.

Table 5: Farmers and Pastoralists' Perception of the Effects of Conflicts on their Livelihood

Effects	Farmers RII	Pastoralists RII	Over all Mean RII	Rank
Loss of lives and Properties	0.91	0.58	0.75	5
Destruction of Farms	0.94	0.49	0.72	9
Shift in livelihood activities	0.97	0.69	0.83	1
Reduction in both animal and crop productivity	0.82	0.66	0.74	6
Forced migration	0.80	0.65	0.73	7
Increase in the cost of living	0.88	0.63	0.76	4
Increase in animal mortality and crop loss	0.91	0.62	0.77	3
Reduction in Income	0.84	0.61	0.73	7
Insecurity	0.91	0.68	0.80	2

Source: Fieldwork, 2019. Note: Strongly Disagree =1 = Disagree, 2 = Agree= 3, strongly Agree 4

Table 6: Regression Estimates of the Factors Responsible for Farmers/Pastoralists Conflict

Variables	Coefficient	Standard error	p-value
Destruction of crops by cattle	-3.665	0.053	0.000*
Pollution of drinking water	0.450	0.074	6.095*
Inadequate access to pasture	0.550	0.40	13.659**
Poor access to drinking water	2.632	0.067	0.000**
Negligence by the law enforcement agents	-3.774	0.057	0.000*
Pasture depletion	1.860	0.077	0.000**
Land tenure	-1.453	0.84	0.000
Constant	7.772	0.045	0.000*
Model Chi Square		288.79	
Log Likelihood		3.463	
Negelkerke R- Square		0.96	
N=234			

Source: Fieldwork, 2019.

*P< 0.05 and **P<0.01 levels of probability

6. Relationship between the Likelihoods of Farmers/Pastoralists Conflict and the Causes of Conflict in the study areas.

The relationship between the probabilities of farmers/pastoralists involvement in conflict and the perceived causes of conflict in the study area was assessed with the aid of regression analysis (Table 6). Result from the regression analysis in Table 6 indicates that, out of eight independent variables tested, six were statistically significant in predicting the outcome, which is the farmer/pastoralist conflict. Out of these variables, three has a significantly strong affinity ($p < 0.01$) with the conflict. Note also that four of the variables included in the model had positive signs, implying their direct relationship to the respondents' involvement in conflict. The -2 log likelihood (-2LL) of Table 6 model estimating the causes of conflict between farmers and pastoralists in the study area, indicated that there is no difference between the estimated logistic model and the hypothesized model.This as well implies that

there is a significant relationship between the probabilities of engagement of farmers and pastoralists in conflict and the explanatory variables included in the model. The Nagelkerke R-Square values and the model Chi-Square also suggest that the estimated conflict model had a good explanatory power. Furthermore, Table 6 has indicated that an inadequate access to pasture has a direct influence on the farmer/pastoralists conflict and is statistically significant at $p < 0.01$. The implication is that, the more the grazing reserves continue to shrink, the more the probability of occurrence of the conflict. Poor access to drinking water and pasture depletion were also found to be statistically significant ($p < 0.01$) and have direct relationships with the conflict between farmers and pastoralists. The outcome of this analysis can be supported by the view that the underlying causes of most resource conflicts can be related to changing weather patterns manifested through the excessive build-up of heat on the earth's surface, meteorological changes which result in a reduction of rainfall, and reduced cloud cover, all of which results in greater evaporation rates. The above assertion is supported by Johnston (2008), Lee, (2009) and Odoh and Chilaka, (2012) who affirmed that competion for natural resources induced by climate change is the major trigger of conflicts in most African countires and beyond.

7. Conclusion

It is obvious from the study that farmers and pastoralists are experiencing change in climate, resulting in competition-driven conflicts between farmers and pastoralists. Irregular rainfall pattern affects the availability of water and pasture which is crucial to crop and animal productivity. Consequently, livestock are usually subjected to long treks to find water and pasture in the more southerly areas of the country during the dry seasons. While farmers usually expand farmlands as adaptation strategy encroaching into grazing routes. Hence, reduction in rainfall and its inter-annual variability in the study area necessitate adaptation of these rural producers and environmentally induced conflicts especially by the cattle rustlers as well as farmers owing to space contestation.The contradiction of pastoralists' perception of climate variability and recorded climatic data in the study area shows poor scientific knowledge of climate variability and change among the farmers and pastoralists. This could pose a threat to acceptance of innovations in adaption strategies by farmers and pastoralists in the study area.

Extreme warming hinders livestock production and reproduction by reducing animal weight gain and dairy production as well as income. Therefore, the increasing warming trend in the study area poses a threat to animal performance. In addition, the decline in animal and food productivity, reduction in income from livestock farming and cropping as well as shortage in forage availability and quantity identified in the study areas have shown that pastoralists and farmers in the study area are highly constrained by unproductive agricultural practice and hence prone to out-migration to favourable environment or diversification of livelihood. Fulani herdsmen, in the seasons when rainfall is very low and the graze lands are unable to sustain the population of livestock in the zone, geared their livestock to farmland area in the zone or down south in the country, situation that has caused violent conflicts between the farmers and pastoralists. Hence, climate change is the bane of incessant resource use conflicts in the study area.

8. Recommendations

The following recommendations based on the findings of the study were made:

I. **Improving climate information forecasting and dissemination:** As adaptive capacity is somewhat determined by knowledge (local knowledge inclusive) and the awareness of climate change threats, it will be essential to improve pastoralists and farmers' awareness of possible climate induced hazards, along with appropriate mechanism to address such risks. This could be done through local awareness campaign, mainstreaming climate change issues into other trainings and conducting awareness meetings.

II. **Boosting of adaptive capacity**: Government and other development partners should create conducive policy that will improve enhance capacity of the rural producers. In consideration of the high degree of climate variability and pastoralists and croppers' vulnerability, government policy intervention in the States should centre largely on addressing the fundamental causes of vulnerability and their low adaptive capacity of the rural producers such as their high dependence on natural resources, medium income, inadequate education and employment alternatives/opportunities.

III. **Enhancement of ranch management:** There should be review of land tenure system to provide land for grazing by the federal Government. However, government should take appropriate measures to minimize the allocation of rural land for purposes not compatible with the interest of residents of rural areas and owners of the rural lands, which are not conducive to their welfare. Government policy by the way should aim at transforming nomadic subsistence livestock production into sedentary and more commercially oriented system. Hence, government should establish ranches, where animals will be kept and grazed solely within the ranch limits to curb crop farmers –herders' conflict.

IV. **Formation of alternative investment opportunities:** Government and NGOs should encourage pastoralists and farmers to invest on non-farm activities to reduce the pressure on natural environment. This would go a long way in increasing the profitability of farming by increasing the availability of inputs and improving access to market outlets.

V. **Provision of credit facilities to livestock and crop farmers**: Government and development actors should simplify the access to credit by pastoralists and farmers through encouraging micro finance institutions to widen their coverage of credit delivery to smallholder farmers and relax some of the requirements to give loans. These would enable rural producers afford adaptation options that are somehow expensive given rise to high levels of productivity under changing climatic conditions.

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