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The Role of Government Institutions in Supporting Smallholder Farmers' Adaptation to Climate Change in Gombe State, Nigeria

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Abstract--- *Climate change has now been realized to be an everyday reality, with far reaching consequences, especially for poor agricultural communities, who suffer the most diverse effects of climate change. Over the past few years, efforts have been diverted from reaction, to pre-emptive, in a bid to ensure that the most vulnerable can adapt to the challenges of climate change. As pointed out, most impacts of climate change are felt by poor communities who depends on subsistence agriculture for survival, and therefore in order for them to adapt to climate change, there is need for them to be supported in various ways, by both government and non-government entities. This study aimed to investigate the role played by government institutions in supporting climate change adaptation among smallholder farmers in Gombe State, Nigeria. The primary data used in this study was generated through using structured questionnaire. This was administered to 240 randomly selected members of the farming communities, local leaders, as well as members of government institutions working on environmental management in the State. Data was analyzed using both descriptive and factor analysis methods. Results show that a number of factors are responsible for determining the government support towards adaptation in both crop and animal production among smallholder farmers. The findings also show that government support towards adaptation was provided through different ways, for both crop and animal production. The study findings also revealed different challenges encountered by crop farmers, livestock farmers and government institutions in trying to implement mechanisms of adaptation to climate change in Gombe State, Nigeria. The study recommended that government should engage rural smallholder farmers, non-governmental organizations and civil society in this effort, and that it should encourage local mechanisms in order to ensure sustainability of the adaptation efforts.*

Keywords: *Agricultural communities, Climate change, Government institutions, Smallholder farmers and subsistence agriculture.*

I. INTRODUCTION

The demanding situations of climate change which result partially from will growth in greenhouse gases are anticipated to cause growth in global temperatures and shift in sample of rainfall. This is predicted to seriously have an effect on human livelihoods especially in sub Saharan Africa (Intergovernmental Panel on Climate Change (IPCC), 2013). Climate alternate is understood to be a global phenomenon to be able to affect all countries in inside the worldwide in a unmarried way or the opposite (IPCC, 2007). The forecast of the Intergovernmental Panel on Climate Change (IPCC) famous that sub-Saharan Africa (SSA) is one of the regions that allows you to be worst affected by weather changes no matter the reality that it is the least contributor to the trouble of worldwide warming. The weather of Sub Saharan Africa is idea to be warming up at an growing charge than every other location in the global. This is similarly made worst through the reality that Sub Saharan Africa is understood to be a few of the poorest area socio-economically inside the international (IPCC, 2014).

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The exposure and vulnerability of the African continent to the annoying conditions of weather trade is as excessive as as lots as forty consistent with cent of the overall population living in arid and semi-arid areas, on the equal time as only 25 in keeping with cent of the populace dwelling in coastal areas, which are areas believed to be maximum at risk of the impact of climate change (IPCC, 2014).

There are so many uncertainties on how climate trade is related to and impacts intense activities. According to O'Brien et al (2009) these uncertainties make it critical for improved expertise of those family members, as a way to decorate movement that reduces vulnerability. The frequencies, intensities and impacts of herbal screw ups have these days increased unprecedentedly, thereby affecting the poorest in least superior international locations of the arena (IPCC, 2007). These herbal screw ups are the cease result of exposure of prone households, communities and ecosystems, to shocks or stresses that are beyond their potential to cope or recover from with out aid of outside groups or institutions (Ireland, 2010). Climate exchange has consequently end up a completely critical factor in redefining the possibilities of financial development and growth of maximum households and groups, and this can be decided via how they respond to the demanding situations of climate exchange. Scholars which includes Agrawal (2008) have determined that with the current obvious chance of modifications in institutional and social relationships, there can be tons that desires to be recognized approximately the function of governmental corporations and establishments in adaption to climate alternate. O'Brien et al (2009) opined of their have a look at that the placement of nearby companies and institutions addressing the hassle of adaptation to weather trade in informal settlements can be nicely understood through ethnographic look at in phrases of weather version (O'Brien et al, 2009).

Thus, from the above, it is able to be seen that the relationship amongst climate change and disasters is regularly times no longer continually smooth. However, the rising stage and intensity of intense climate occasions along with growing ranges of rainfall and warmth waves have been referred to to be some of the number one manifestations and probable affects of climate alternate in Sub Saharan Africa and had been common to the fundamental motives of screw ups (IPCC, 2013). Moser et al. (2010) reported that environmental refugees laid low with weather related stressors are already growing the depth of rural-city migration in masses of factors of SSA. The IPCC (2013) positioned that many places in SSA are already stricken by climatic changes which include developing danger of flooding, landslides, droughts, warm temperature waves and lines on close by food production. Natural risks are believed to be socially built and consequently strongly laid low with vulnerability and version to weather trade. While herbal hazards often arise, the exchange into threat and potential for disaster is based upon human exposure and shortage of capability to address its adverse influences. For humans with immoderate vulnerability and occasional adaptive capability and resilience, such incidents can be very unfavourable (Ireland, 2010).

Individuals, government establishments, civil society businesses and businesses operating on the neighborhood stage frequently times straight away experience on-the-ground results of climate change. Adaptation to the traumatic situations of weather trade calls for adjustments in reaction to more than one stresses, for the duration of multiple scales and thru many institutions (Crane, 2013). Thus, the role of government institutions just like the close by government councils, neighborhood businesses including cooperatives (every formal and informal), women and young human beings businesses, and Non-governmental organization is notably not unusual in lots of research of weather alternate version. Two studies, that of Adger (2010) and Agrawal (2008) had been very outstanding in highlighting the significance of government establishments in enhancing version to weather alternate at neighborhood degree and amongst different topics

managing and enforcing domestically pushed version projects, developing possibilities for collective studying and through mediating interventions appropriate to the nearby context (Moser et al., 2010).

Many students in conjunction with Adger et al. (2009) and Berkhout (2011) have explained the roles of government establishments to consist of giving protection to susceptible corporations, making statistics available to plot and stimulate variation, and shielding important public items which include social infrastructure. Few scholars on the other hand, have cautioned the position of presidency almost about the function of market. For instance, Fankhauser et al. (1999) advised the need for a reserved characteristic for government, arguing that 'the number one duty of government can be to create the right prison, regulatory and socio-financial environment on the way to help impartial variation', which takes vicinity via the herbal strain of the loose market.

It has been found that maximum of the studies to date accomplished had been as a substitute prescriptive or normative pointers on the function of presidency. There are handiest few research that have almost furnished empirical exams on what form of roles governments organization is absolutely gambling. Swart et al. (2009) and Biesbroek et al. (2010) had been a number of the few research finished on this regard. These research outlined priority sectors which is probably contained in countrywide variant techniques (NAS) amongst seven European international locations. However, such research pay precise hobby to the drivers and processes in which these NASs had been developed. Careful seek of gift literatures famous that beyond research that gives empirical assessment of sorts of roles or rationales for authorities intervention, most significantly on the countrywide degree are not to be had. The explanation of this will be that most version strategies (at national degree) have no longer existed for an extended period of time and lots of these strategies does no longer have giant motion plan and specific charge variety allocation this is required to recognize wherein the priorities lies (Crane, 2013).

The paintings of Fankhauser et al. (1999) is one in every of such times, of model paintings that explains how the position of government as it relates to the function of marketplace has accompanied the normative idea of presidency intervention and wherein marketplace forces are dominant in determining version actions. Government intervention is widely wide-spread while it may enhance the overall efficiency of the market via correcting any marketplace imperfections that exist. At the give up of the day, that is the mainstream approach for max environmental guidelines in Western international places (Thampapillai, 2011). However, it remains no longer clean whether such technique that emphasizes efficiency of public intervention may be effectively applied to version policy in such places in which there are such loads of inherent uncertainties. Scholars together with Stern (2006) has positioned that quantitative information on costs and advantages of model are very limited at the moment. These uncertainties have the tendency of making the fulfillment of green version selection-making tough to attain.

Two greater critical theories which might be applicable to the have a look at and which offer possibility explanation on how government intervention is decided in version are highlighted. One of this examine is based on the finances maximization idea which has taken a important view of government intervention. The extraordinary idea is that based mostly on social settlement idea which provide greater dynamic angle on the relationship many of the function of the government and the market (Adger et al., 2009; Berkhout, 2011). Government institutions are regarded as the formal and informal organizations, social businesses and people which can be involved with duty and legitimacy this is set up in the jurisdictions in which they perform in. These government institutions are categorized into 3 most essential corporations and encompass; public (bureaucratic administrative gadgets, and elected neighborhood governments), civic (people, families, club and cooperative companies) and marketplace (provider and organisation businesses) (Agrawal, 2008). Climate however is regarded as a degree of the common sample of model of winning climate situations which encompass temperature, relative humidity, rainfall

and unique climatic variables of a given area over a long term frame. IPCC (2007) offer a definition of climate change because the adjustments within the climate of an area that arise over prolonged time body due to herbal variability or human sports. The IPCC moreover argues that even though the climate has continually been converting, the current fee and significance of trade is first-rate mainly due to human activities.

Climate alternate edition (CCA) has been defined by means of IPCC (2007) as the adjustment in human or herbal systems to real or predicted adjustments in weather or their impacts, that eliminates or reduces their dangerous affects or exploits their beneficial opportunities. Climate change therefore, is the taking of motion in anticipation or reaction to the impacts of climate change which cannot be mitigated. CCA motion is carried out through establishments in each the public and private sectors the usage of guidelines, development of infrastructure and generation and through behavioral trade. There are many distinctive sort of version sports. This embody those primarily based totally on purposefulness of model (spontaneous vs. Deliberate), timing (anticipatory vs. Reactive), adapting agent (non-public vs. Public) and scope (short-term vs. Long term; localized vs. Local).

In Nigeria, the problem of climate change has dimensions. The first is the dimension which has been stated with the aid of households and companies in unique elements of Nigeria and feature in addition been recommended by means of using the Nigerian Meteorological Agency (NIMET) (2008). This measurement is the adjustments which have already been determined in weather parameters which encompass temperature, rainfall and extreme weather events. The 2d dimension has to do with changes which is probably to be predicted within the destiny. According to NIMET (2008) between 1941 and 1970, fine patches of the u . S ., inside the northeast, northwest, and southeast experienced past due onset of rains. However, from 1971 to 2000 overdue onset of rains had spread to most components of Nigeria, leaving only a slim strip within the center of america of the usa with regular situations. From 1941 to 2000 there has been evidence of lengthy-term temperature growth in most components of the usa of a. The most essential exception modified into within the Jos region, in which a mild cooling became recorded. The maximum extensive will growth have been recorded in the intense northeast, excessive northwest and immoderate southwest, in which average temperatures rose thru among 1.Four℃ and 1.9℃ respectively.

Climate alternate is having unfavourable results at the population at all stages of society in Nigeria, inflicting disasters of immeasurable proportions. In reaction to this, the authorities has initiated emergency response and model techniques thru diverse establishments, both at countrywide, kingdom and neighborhood tiers, such as: the Forestry Research Institute of Nigeria (FRIN), National Oil Spill Detection and Response Agency (NOSDRA), Nigeria National Petroleum Corporation (NNPC), Nigerian Metrological Agency (NIMET), National Environmental Standard Regulation and Enforcement Agency (NESREA), State Emergency Management Agency (SEMA) and Gombe State Environmental Protection Agency (GOSEPA) amongst others. Over the modern-day beyond, government motion has been shifted from reactive emergency reaction to version mechanisms, on attention primarily based on diverse environmental studies acknowledging the truth and severity of climate trade (Thampapillai, 2011).

The huge goal of this have a have a look at became to make a crucial assessment of the placement done via means of presidency institutions in Nigeria inside the route of the procedure of variant to weather exchange among smallholder farmers in Gombe State. Specifically, the look at sought to: have a look at the aid of government establishments in facilitating smallholder farmer’s adaptation to weather exchange and test the traumatic conditions to the implementation of climate exchange edition strategies in Gombe nation, Nigeria.

II MATERIALS AND METHODS

Description of Study vicinity

Gombe State, the look at place is determined in the Northeastern region of Nigeria Figure 1. The u . S . A . Is placed among latitude nine°30'N to 12030'N and longitude 08005'E to eleven°forty five'E. The State is bordered by means of Yobe State to the North, Adamawa and Taraba States to the South, Borno State to the East and Bauchi State to the West. It covers a land area of 20,265km2. It has a populace of two,587,159 human beings (1,296,166 - 50.1% men and 1,290,993 - forty nine.9% ladies) in keeping with the 2006 populace census. The have a take a look at vicinity has an annual populace increase price of three.2%. The examine region is located in the Sahel Savannah plant life region and has tropical continental type of climate characterised with the aid of long dry season and a quick rainy season. The physical terrain of the State includes undulating hills developing above 1200m above sea degree. The examine region is tired through the usage of River Gongola, that is a tributary of River Benue (Upper Benue River Basin). The critical mineral sources located in the State include silica, gypsum, uranium, limestone, dolomite, talc, and kaolin. The nation is a multi-ethnic u . S ., with a few ethnic groups collectively with Tangale, Terawa, Waja, Kumo, Fulani, Kanuri, Bolewa, Jukun, Pero/Shonge, Tula, Cham, Lunguda, Dadiya, Bambuka, Hausa and Kamo/Awak. The humans of Gombe state are on the entire farmers (about sixty four%) producing food and coins vegetation along with cereals, legumes culmination, vegetables and tree flowers (Mahmoud, 2016). The carrier and business place employs an envisioned 29% even as the economic place employs the least with an predicted 7% of the place's universal work pressure. The place falls within the Tropical Continental Zone of Nigeria and hence, critiques an extended dry season observed through the use of a quick rainfall season which starts in April/May and lasts till September/October (NIMET, 2008). High temperatures are skilled maximum instances of the yr with the mean month-to-month temperature ranging amongst 21°C and 32°C, highest temperatures are recorded simply before the onset of the rains with temperatures growing to about 40ºC.

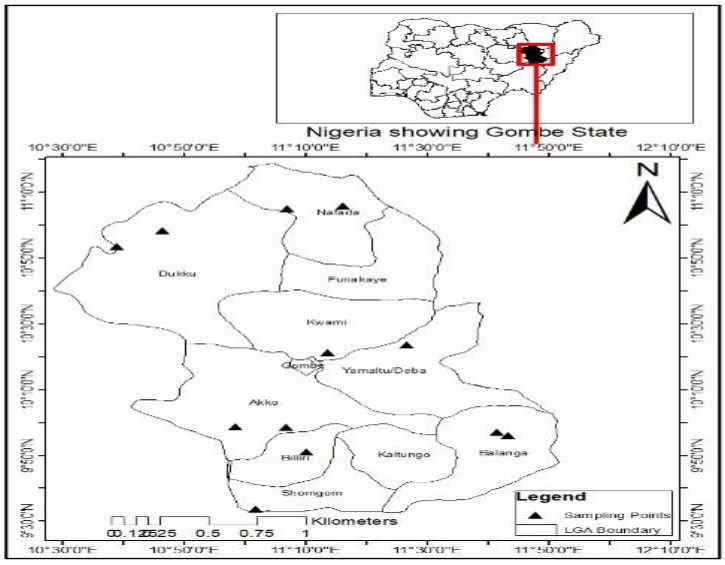

Figure 1: Study Area

Source*:* GIS and Remote Sensing Laboratory, Department of Geography, Gombe State University, Gombe.

Sampling and Data Collection Procedures

The population of the study comprised of local leaders, members of the local farming communities and staff of the various government institutions working on climate change

mitigation in Gombe State. The sample size used in the study comprised of 240 respondents. Purposive sampling was used to select the respondents from among the local farmers and simple random sampling was used to select respondents from among the local leaders and staff of government institutions. The data with similar characteristics were edited, classified, grouped, coded and tabulated into tables and charts before interpretation Table 1. Descriptive statistics were used to analyze the data collected.

Table-1. Interpretation guides.

S/No	Mean range	Respond mode	Interpretation
1	4.20 – 5.00	Strongly agree	Very satisfactory
2	3.40 – 4.20	Agree	Satisfactory
3	2.60 – 3.40	Undecided	Fairly satisfactory
4	1.80 – 2.60	Disagree	Not satisfactory
5	1.00 – 1.80	Strongly agree	Poor satisfactory

Source: field survey, 2017.

Table 1 show how the result was interpreted with the mean ranges of 4.20 -5.00 as strongly agree and interpreted very satisfactory, 3.40–4.20 as agree and interpreted as satisfactory, 2.60-3.40 response as undecided and interpreted as fairly satisfactory, 1.80–2.60 response as disagree and interpreted as not satisfactory and the last Likert scale with a mean range of 1.00–1.80 with a response mode as strongly disagree and interpreted as poor satisfactory.

III. RESULTS OF THE FINDINGS

GOVERNMENT SUPPORT FOR CROP PRODUCTION

The results on the support provided by government institutions to farmers towards crop production is presented in Table 2. The Table show that on whether the government provides improved seeds to crop producers, 75% of the respondents agreed, while 25% of the respondents disagreed with the mean of 3.88 and interpreted as satisfactory. On whether government institutions provide training to crop producers about compositing, mulching and crop rotation, 84% of the respondents agree, while 16% of them disagree with the mean of 4.07 and interpreted as satisfactory. On whether the government institutions provide funding for irrigation schemes, 84% of the respondents agreed, 5% of them were undecided, while 11% of them disagreed, with mean of 4.02 and interpreted as satisfactory. On whether government institutions provide reliable pesticides for treating crop pests and diseases, 79% of the respondents agreed, 16% of them were undecided, while 5% of them disagreed with mean of 4.12 and interpreted as satisfactory. When the respondents were asked whether government institutions provide tree seedlings to promote on-farm tree planting, 77% of the respondents agreed, 16% of them were undecided, while 7% of them disagreed, with mean of 4.02 and interpreted as satisfactory. This implied that government institutions provide support to crop producers in various ways in a bid to adapt to climate change in Gombe State, Nigeria with an overall average mean of 4.022 and interpreted as satisfactory.

Table 2. Government support to crop farmers in the study area.

Support of government institutions towards adaptation in crop production	**Percentage responses (%)**					**Mean**	**Interpretation**
	SA	**A**	**U**	**D**	**SD**		
Provision of improved seeds	33	42	0	9	16	3.88	Satisfactory
Training on compositing, mulching and crop rotation	26	58	0	14	2	4.07	Satisfactory
Funding irrigation schemes	37	47	5	5	6	4.02	Satisfactory
Provision of crop pesticides	42	37	0	16	5	4.12	Satisfactory
Provision of tree seedlings to promote on-farm tree planting	35	42	16	5	2	4.02	Satisfactory
Average mean	35	45	4	10	6	4.022	Satisfactory

Source: Field data, 2017.

Key: SA - Strongly Agree, **A -** Agree, **U -** Undecided**, D -** Disagree**, SD -** Strongly Disagree.

GOVERNMENT SUPPORT TO LIVESTOCK FARMERS

The result on the support provided by government institutions to livestock farmers is presented in Table 3. From the Table, it can be seen that on whether government institutions provide pesticides to treat animal pests and diseases, 84% of the respondents agreed, 7% of them were undecided, while 9% of them disagreed, with the mean of 4.12 and interpreted as satisfactory. On whether government institutions provide rainwater harvesting equipment to help livestock farmers conserve water for animals to drink, 86% of the respondents agreed, while 14% of them disagreed with the mean of 4.23 and interpreted as satisfactory. On whether government institutions provide training to local livestock farmers about conservation of feeds/pasture, 81% of the respondents agreed, 15% of them were undecided, while 4% of them disagreed with the mean of 4.07 interpreted as satisfactory. And on whether government institutions provide funding for irrigation schemes to enable all-year growth of pasture/feeds, 71% of the respondents agreed, 12% of them were undecided, while 17% of them disagreed with mean of 3.91 and interpreted as satisfactory. This implied that government institutions had various ways of supporting local livestock farming communities in adapting to climate change in Gombe State, Nigeria with the average mean of 4.083 and interpreted as satisfactory.

Table-3. Government support to livestock farmers in the study area.

Support of government institutions towards adaptation in livestock production	Percentage responses (%)					Mean	Interpretation
	SA	A	U	D	SD		
Provision of animal pesticides	39	45	7	7	2	4.12	Satisfactory
Provision of rainwater harvesting equipment	39	47	0	12	2	4.23	Very satisfactory
Training on feed/pasture conservation	32	49	15	2	2	4.07	Satisfactory
Funding irrigation schemes for all year feed/pasture growth	39	32	12	12	5	3.91	Satisfactory
Average mean	37	43	9	8	3	4.083	Satisfactory

Source: Field data, 2017

Key: SA - Strongly Agree, **A** - Agree**, U** - Undecided**, D** - Disagree**, SD** - Strongly Disagree.

ADAPTATION STRATEGIES ADOPTED BY LOCAL FARMERS TO COPE WITH THE EFFECTS OF CLIMATE CHANGE

The findings of the study on the adaptation strategies adopted by local farmers in crop production is presented in Table 4. The result show that some of the adaptation strategies adopted by farmers in the area include planting of crop species that are more drought resistant in order to ensure higher crop yields, practice of local irrigation techniques to help farmers deal with climate change, crop rotation and application of local fertilizers in their gardens to counter the loss of soil fertility.

The findings of the study show that some of the adaptation strategies adopted by local farmers in livestock production include paddocking to minimize spread of animal pests and diseases, increase use of pesticides to control animal pests and diseases, tree planting to prevent further effects of climate change, rain water harvesting to conserve drinking water for animals during dry season and conservation of animal feed (dry grass) for use in the dry season. The results on the effectiveness the various adaptation mechanisms adopted by farmers in the local communities show that majority of the respondents believe that the adaptation mechanisms adopted by farmers are largely effective in combating the effects of climate change in their communities.

These findings are supported by the IPCC (2014) which stated that adaptation is important in order to reduce these effects of climate change. This is not just because of the inevitability of changes in climate, but also because of the need to increase the stock of knowledge about future impacts of climate change, mitigates against potential greater future costs of adaptation especially for poor populations. It is also important to mitigate against potentially larger negative social economic and ecological effects of unplanned adaptation. Kusakari *et al.* (2014) also posits that, farmers in southern Nigeria tend to practice more ecologically sustaining practices such as, intercropping, agroforestry and the use (and) or maintenance of local food crop genotypes to ensure their adaptability to climate change.

CHALLENGES OF CLIMATE CHANGE ADAPTATIONS ON CROP PRODUCTION

The results on the challenges faced by local farmers' in the implementation of climate change adaptation to crop production in Gombe State is presented in Table 4. The result show that on whether massive poverty is a challenge to climate change adaptation among crop producers,

where most farmers cannot afford to finance adaptation techniques, 84% of the respondents agreed, 5% of them were undecided, while 11% of them disagree with mean of 4.02 and interpreted as satisfactory. On whether there is a challenge of lack of knowledge among crop farmers of the new farming techniques, 79% of the respondents agreed, while 21% of them disagreed with mean of 4.12 and interpreted as satisfactory. On whether there is a challenge of lack of information about availability and access to government support, 86% of the respondents agreed, while 14% of them disagreed with mean of 4.23 and interpreted as very satisfactory. And on whether there is a challenge of unavailability of improved seeds for farmers, 81% of the respondents agreed, 15% of them were undecided, while 4% of them disagreed with mean of 4.07 and interpreted as satisfactory. This implied that there are various challenges faced by crop producers in implementing government institutional support to climate change adaptation in Gombe State, Nigeria with an average mean of 4.11 and interpreted as satisfactory.

Table-4. Challenges of climate change adaptation in crop production.

Challenges of climate change adaptation strategies in crop production	**Percentage responses (%)**					**Mean**	**Interpretation**
	SA	**A**	**U**	**D**	**SD**		
Massive poverty where most farmers cannot afford to finance adaptation techniques	37	47	5	5	6	4.02	Satisfactory
Lack of knowledge among crop farmers of the new farming techniques	40	34	1	16	9	4.12	Satisfactory
Lack of information about availability and access to government support	39	47	0	4	7	4.23	Very satisfactory
Unavailability of improved seeds	32	49	15	2	1	4.07	Satisfactory
Average mean	37	45	5	7	6	4.11	Satisfactory

Source: Field data, 2017
Key: SA - Strongly Agree, **A –**Agree, **U –**Undecided, **D –**Disagree, **SD -** Strongly Disagree.

CHALLENGES OF CLIMATE CHANGE ADAPTATION ON LIVESTOCK PRODUCTION

The results on the challenges faced in the implementation of farmers' climate change adaptation in livestock production in Gombe state is presented in Table 5. The result show that on the assertion that there is a challenge of unavailability of reliable pesticides, 75% of the respondents agreed, and 25% of them disagreed with the mean of 3.88 and interpreted as satisfactory. On the assertion that there is challenge of limited affordability of adaptation techniques by livestock farmers, 84% of the respondents agreed, while 16% disagreed with mean of 4.07 and interpreted as satisfactory. And on the assertion that there is a challenge of lack of proper training on rainwater harvesting and feed conservation, 70% of the respondents agreed, while 30% of them disagreed with the mean of 4.02 interpreted as satisfactory. This implied that

there are various challenges faced by livestock producers in implementing climate change adaptation in Gombe state, Nigeria with an average mean of 3.99 and interpreted as satisfactory.

Table-5. Showing responses on the challenges of climate change adaptation in livestock production.

Challenges of climate change adaptation strategies in livestock production	Percentage responses (%)					Mean	Interpretation
	SA	A	U	D	SD		
Unavailability of reliable pesticides	33	42	0	9	16	3.88	Satisfactory
Limited affordability of adaptation techniques	26	58	0	14	2	4.07	Satisfactory
Lack of proper training on rain water harvesting and feed conservation	37	43	5	7	6	4.02	Satisfactory
Average mean	32	48	2	10	8	3.99	Satisfactory

Source: Field data, 2017.
Key: SA - Strongly Agree, **A -** Agree**, U**–Undecided**, D** –Disagree**, SD -** Strongly Disagree.

CHALLENGES OF CLIMATE CHANGE ADAPTATION IMPLEMENTATION BY GOVERNMENT INSTITUTIONS.

The results on the challenges faced by government institutions in the implementation of farmers' climate change adaptation measures in Gombe State is presented in Table 6. The result show that on whether there is lack of clear mandate that leads to competition and duplication of duties, 79% of the respondents agreed, while 21% of them disagree, with mean of 4.12 and interpreted as satisfactory. On the assertion that there is a challenge of massive corruption and misappropriation of climate change adaptation funds, 76% of the respondents agreed, 14% of them were undecided, while 10% of them disagree, with mean of 4.02 and interpreted as satisfactory. On the assertion that there is a challenge of lack of inadequate skilled manpower (extension workers, coordinators, veterinary specialists etc.), 81% of the respondents agreed, 9% of them were undecided, while 10% of them disagreed, with mean of 4.12 and interpreted as satisfactory. And on whether there is a challenge of political influence peddling among the government institutions, 86% of the respondents agreed, while 14% of them disagreed, with mean of 4.23 and interpreted as satisfactory. This implied that government institutions also face various challenges in implementing adaptation support to farmers on climate change in Gombe State, Nigeria with an average mean of 4.12 and interpreted as satisfactory.

Table-6. Challenges faced by government institutions in climate change adaptation.

Challenges of government institutions in climate change adaptation	Percentage responses (%)					Mean	Interpretation
	SA	A	U	D	SD		
Lack of clear mandate leads to competition and	42	37	0	16	5	4.12	Satisfactory

duplication of duties						
Massive corruption and misappropriation of adaptation funds	35	39	16	6	4.02	Satisfactory
Lack of enough skilled manpower (extension workers, coordinators, veterinary specialists etc.)	31	45	7	7	2	4.12 Satisfactory
Political influence peddling among the government institutions	39	47	0	12	2	4.23 Satisfactory
Average mean	37	42	6	11	4	4.12 Satisfactory

Source: Field data, 2017

Key: SA - Strongly Agree**, A –**Agree**, U–**Undecided**, D –**Disagree**, SD -** Strongly Disagree.

CHALLENGES OF IMPLEMENTATION OF CLIMATE CHANGE ADAPTATION STRATEGIES

The results on the challenges faced in the implementation of farmers' climate change adaptation strategies in crop production show that some of the challenges include; massive poverty, resulting in most farmers not being able to afford the financing of climate change adaptation techniques. Other challenges include lack of knowledge among crop farmers of the new farming techniques, lack of adequate information about availability and access to government support and unavailability of improved seeds for farmers.

The results on the challenges faced in the implementation of farmers' climate change adaptation in livestock production show that some of the challenges include; unavailability of reliable pesticides, limited affordability of adaptation techniques by livestock farmers and lack of proper training on rain water harvesting and feed conservation methods.

The results on the challenges faced by government institutions in the implementation of farmers' climate change adaptation include; lack of clear mandate which leads to competition and duplication of duties, massive corruption and misappropriation of adaptation funds, inadequate of skilled manpower (extension workers, coordinators, veterinary specialists etc.) and political influence peddling among the government institutions.

These findings are supported by Rahman (2008) who stated that there is sometimes a disconnection between institutions and the farmers. Studies reviewed around this topic shows that, in most cases farmers lacked the necessary information to help them cope with the changes that are being experienced within the sector and especially climate change. Yaro (2010) also pointed out other factors which are less frequently cited in literature. Such other factors which include weak farm management which is expressed in lack of bookkeeping and land tenure security, inadequate finance, limited spacio-temporal reach, lack of human resources and poor information are issues that challenged the effectiveness of institutional support amongst farmers.

Hall *et al.* (2013) also acknowledged that another factor that may result in challenges for farmers accessing climate change adaptation support especially from financial institutions is the lack of bookkeeping (record) by small farmers. This especially creates problems for smallholder

farmers when they seek support to adapt from institutions which require collateral agreements as they usually have nothing to show as evidence for their ability to pay back the loans. Agrawal *et al*. (2008) also argued that the security of the land tenure system being practiced in an area has been identified as another factor which may affect smallholder farmers' decision to access institutional support.

IV CONCLUSION

This study has examined the role of government institutions in supporting smallholder farmers' adaptation to climate change in Gombe State, Nigeria. The findings show that climate change adaptation support provided by government institutions to crop farmers include improved seeds, training to crop farmers about compositing, mulching and crop rotation, provision of financial assistance for irrigation schemes, pesticides for treating crop pests and diseases and tree seedlings to promote on-farm tree planting. For livestock farmers, government institutions provide pesticides to treat animal pests and diseases, rain water harvesting equipment, training of livestock farmers about the conservation of feeds/pasture and financial assistance for purchase of irrigation equipment. The findings of the study reveals that some of the factors determining adaptation support provided by government institutions in crop production include; the number of people affected, the severity of drought among the affected people, availability of resources to support farmers, and the government policy on emergency support. The results also show that the factors determining adaptation support provided by government institutions in livestock production include the number of animals affected, the percentage contribution of livestock production to farmers' livelihoods, the availability and number of extension and the severity of floods and/or droughts in the area. The study conclude that climate change has had significant and far reaching impacts on small famers in the study area. Hence, government institutions have been identified to play important roles in adaptation as they shape the response and strategies households adopt to reduce the impacts of climate change.

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