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Abstract

The study adopted survey research design. The population of the study consisted 1200 respondents comprising (staff of the Zamfara State Agricultural Development Project, FADAMA III Project, IFAD, Animal rearers and Farmers). Instruments of data collection used for the study were questionnaire, interview and discussions. One thousand two hundred questionnaires were distributed to respondents and only 988 (82.2%) were dully returned and found usable. The results of the responses were interpreted using simple percentage and frequency tables. The findings of the study include, that 95% of Zamfara State population are farmers, Maru and Gusau Local Government Areas recorded the highest farmers' population. It was also discovered that there was a high rate of awareness of climate change information in the State with Radio, Television, extension services as major sources of climate change information in the State. It was also discovered that farmers in the State utilize climate change information like taking decisions on what and when to plant, planting improved crop varieties among others. There is also the challenges of reduction in annual rainfall, deforestation, insect-pests attack, high temperature among others. Recommendation was made for intensified awareness campaign on climate change, increased budgetary allocation to the agricultural sector for more mitigation and adaptation capacity for the farmers.

Introduction

The reality of Climate Change is no longer news. What will remain news for a long time to come is the level of awareness, access and capacity building for adaptation and or mitigation of the effects of climate change by the vulnerable population across the globe especially in developing countries like Nigeria. World leaders over the years has been holding international summits towards finding solutions to this global threat. Stevens, Wardle and Yonk (2017) stated that the most recent agreement formed by the UN Conference of Parties at the World Climate Change Conference (COP21) in December, 2015 has been hailed as a landmark success by many. According to them, the agreement is still not without problems. So there is doubts as to the total commitment of some world leaders to the tenets of the agreement. This work will as much as possible avoid much technicalities associated with climate change and go along with the basic laymen knowledge as our interest is on the availability, awareness, access and of course utilization of information on climate change. Banmeke, Fakoya and Ayanda (2017) emphasized that the Intergovernmental Panel on Climate Change (IPCC,2001) define climate change as a statistically significant variation that persist for decades or longer caused by human and non-human activities. Some human causes include deforestation, oil spills and gas flaring, while some non-human causes include volcanic eruptions and ocean current. From this definition we can see that it is brought about by both man's activities and uncontrollable natural circumstances. It is a very big threat to both the highly industrialized world and the less industrialized ones. It has also been reported that the third world or developing countries are more at the risk of the effects of climate change, notwithstanding the fact that the greatest emission of carbon and other high industrial waste comes from the developed countries. West African sub region is also said to be more at risk. While on the individual basis, farmers, fishermen, other rural dwellers, as well as urban dwellers are the more vulnerable groups. This high risk level of Africa and particularly, Sub-Saharan Africa, obviously is as a result of high rate of illiteracy, poverty, ignorance and corruption perpetuated by successive corrupt governments who lacked the necessary political will to implement to the later some notable sound educational, economic and agricultural policies/interventions they had developed at different times in history towards their various countries' national development plans. According to Abdulhamid (2015) some of these policies in agricultural sector aimed at achieving food security and self-reliance since 1970 included Agricultural development Project (ADP), Farm Settlement and National Accelerated Food Production Programmme (NAFPP), Operation Feed the Nation (OFN), Agricultural Credit Guaranteed Scheme (ACGS), Directorate of Food and Rural Infrastructure (DFRI) others are

National Special Programme for Food Security (NSPFS), National Food Reserve Agency of Nigeria (NFRA) and Agricultural Transformation Agenda (ATA). Despite all these laudable programmes, Nigeria have not been able to achieve food security and self-reliance, perhaps as a result of various forms of climate changes bedeviling it, ranging from desertification; recession of Lake Chad –Wakili, (2018) quoted president, Muhammadu Buhari as having reported that Lake Chard Basin has dried up to 10 percent of its original size.; oil pollution in the Niger Delta; flooding – across the country; to gulley erosion in the south east and excessive heat. An AFP news report of August 24, 2010 showed that the Nigerian Metrological Agency had forecasted low rainfalls, but it came pouring down. It does not mean that the agency was not sure of their prediction but climate change affected their prediction.

According to Rabiu (2014) quoting online dictionary (Farlex), as affirming that "information is knowledge communicated or received concerning a particular fact or circumstance, knowledge gained through study, communication, and research". The dictum information is power will for a very long time to come remain relevant in man's life. If information is needed to make an informed decision which will help us avert or at the most mitigate disasters associated with climate change, then it is the right of the citizens to have them especially the vulnerable ones. With right and timely information the vulnerable builds the capacity to adapt or mitigate the effects of this threat to humanity, otherwise the risk of human extinction should not be wished away. Nigerian government is making all efforts to diversify her economy with agriculture as the major focus. Sudden change in weather, shortage of rainfall, land degradation, desertification, and flooding, excess heat amongst others are some of the outcomes of climate change which affects food production. The Federal Ministry of Environment created a department of Climate Change with the mandate of driving the Federal Government's vision for mitigating and adapting to the impacts of climate change. Their mandate among other things include providing leadership in promoting the right adaptation culture, supporting research, education and awareness among others. Our governments are good in making policies but willful implementation of the policies to the latter is not part of their culture. Awareness to available information cannot be overemphasized. Lack of awareness makes adapting to the risks of climate change by switching to new climate-smart agricultural methods even harder (Ibrahim. 2017).

Beyioku (2016) reported that one of the solutions proffered by a 2 Day South-South Regional Workshop on Climate Change Capacity Building was raising awareness on issues of climate change which is presently at low ebb especially amongst vulnerable groups like women,

children, even at the grassroots, especially rural dwellers, as well as reviving the tree planting program by raising awareness for individuals to plant trees. This means that awareness of climate change issues in Nigeria is not encouraging, suggesting that our government have not been doing enough in this regards as climate change issues ought to be a house hold knowledge by now as that will compel them to utilize the information. It is only when the right climate change information are available and people are aware of them, and also access them, (for one thing is to know about an information and yet another thing to access it) that it can be utilized, which of course results to taking right decisions regarding what to plant at what time as well as other things to do per time can be achieved and effect of climate change on our agriculture and animal production endeavours would have been reduced or totally averted. This study therefore seeks to find out level of awareness, accessibility and utilization of climate change information in Zamfara State.

Statement of the Problem

Agriculture is vulnerable to climate change. Climate change is one of the biggest threats to the world today. Nigeria is classified as one of the 10 most vulnerable countries in the world, according to a 2015 climate change index by the global risk analytics company Verisk Maplecroft, (Ibrahim, 2017). Davidson et al. in Enete and Amusa (2010) rightly noted that the food security threat posed by climate change is greatest for Africa, where agricultural yields and per capita food production have been steadily declining, and population growth to double the demand for food, water and forage in the next 30 years. This is an indication that our agriculture sector is still operating at a subsistent level when put along our population and its growth rate of 3.3 percent. Nigeria, under this present government has been making frantic efforts to diversify our economy with agriculture as the major focus. Except this move takes our agriculture out of traditional practices to a high level of mechanization and proper budgeting and actual funding, take care of research to generate new knowledge and rightly disseminating the information so generated, it may just be another failed vision. Sudden changes in weather, shortage of rainfalls, land degradation, desertification amongst others are some of the outcomes of climate change which affects food production. Thus, the government has a very big challenge of making sure that climate change does not frustrate her efforts especially in a state like Zamfara which claims that “farming is her pride”, implying that a 95% of the population are engaged in agriculture. Timely and right information on climate change is what is needed. Farmers need information on how to adapt and or mitigate in this climate change era - a very big threat to food security and the achievement of the diversification programme of the government. Stakeholders are worried

about how much of the climate change information Zamfara State farmers has. There was reports of shortage of rainfall in 2017 farming season in some parts of the north including Zamfara State. This resulted in late farming activities in some parts of Zamfara State and consequently low yield recorded during the harvest time. Shortage of rain fall is predictable, so what went wrong? Mounting aggressive awareness campaign, having access – for one thing is for information to be available and an entirely different one to have access to it, and therefore utilization of the information would certainly help in mitigating and or adapting the effects of this menace and enhances food security and safety of lives and properties in Zamfara State. To the best of the researchers' knowledge, there is no empirical study on this in this part of the country. This study, therefore, intends to examine the awareness, access and utilization of climate change information by farmers in Zamfara State, Nigeria.

Brief background study of Zamfara State

Zamfara is one of the newly created states in Nigeria. It was announced as a state by the then military Head of State, Gen. Sani Abacha on 1st October, 1996, which brought the number of States in Nigeria to 36. Zamfara State has an area of 38, 418 square kilometers. The State was carved out of the old Sokoto State with its capital at Gusau It has three Senatorial Zones with fourteen Local Government Areas (Chukwuji, Tsafe, Sayudi, Yusuf, and Zakariya, 2018). According to Okeke (2014) the State is bordered in the North by Niger Republic, to the South by Kaduna State. While Katsina is in the East, Sokoto and Niger States are its neighbours in the West. Zamfara has a population of 3,278,873 (2006 National Census) and Farmers population of about 1,960,434.9, thus about 95% of Zamfara State population are farmers. The State has two distinct seasons –rainy and dry seasons. According to NIMET (2017) Rainfall in Zamfara become established in May and June and that Maru L.G.A. has the highest amount of rainfall with 985 millimeter and Zurmi L.G.A. the least with 533 millimeter. The Dry season begins from November to April with heavy Dry dust – harmattan. The State temperature is between 30^{0c} to 35^{0c} degree and is divided into different Savannah; Sahel, Arid and Guinea (Zamfara State Ministry of Agriculture and Natural Resources (2017). Agriculture is the main stay of the State's economy, hence, it is their livewire, as the inhabitant run their daily affairs using Agriculture and Animal production as means of income, providing employment and ensuring food security. Almost the entire Zamfaraland falls within the Jigawa soil type of the Savannah, hence, suitable for the cultivation of various crops (Chafe, 2016). All this explains why the State has its motto as "Farming is our Pride".

Objective of the Study

This study has the following objectives:

i. To identify farmers population per Local Government Area of Zamfara State
ii. To identify the types of climate change information available to farmers in Zamfara state;
iii. To examine the extent of awareness of climate change information in Zamfara State;
iv. To find out whether the target group (farmers) in Zamfara State have access to these information;
v. To find out the sources of climate change information available in Zamfara state;
vi. To find out the extent of utilization of climate change information in Zamfara state;

Research Questions

The following research question is to guide this study

i. What percentage of the population of Zamfara State are Farmers?
ii. What types of climate change information are available to farmers in Zamfara state?
iii. What is the extent of farmers' awareness of climate change information in Zamfara State?
iv. Do farmers in Zamfara State have access to climate change Information?
v. What are the sources of climate change information in Zamfara State?
vi. To what extent is information on climate change utilized in Zamfara state

Review of Related Literature

Awareness of the term climate change

According to Akpan, Anorue and Ukonu (2012) a report in The Guardian, Monday March 9, 2009, p. 31 established that Nigerians' understanding of climate change-related issues including the negative effect of the fast changing climate on lives is low. However, in their study Abdulkareem, Yusuf &Oyeniran (2012) observed that awareness of teachers on climate change was high with a high rate of 84% but on the contrary the awareness rate of the students was very low with only 31% indicating their awareness of the phenomenon. It is worrisome that the teachers have such a high rate of awareness while their students recorded a very low awareness level. This is an indication that it is not yet included in our schools curriculum. These children if they are aware of this phenomenon can help in spreading the information.

Idoma and Mamman (2016) in their study discovered that 92% of their respondents were aware of the term climate change and variability. According to them, the high rate of their awareness is an indication that climate variability is very evident coupled with the fact that 49.2% of the farmers had over forty years of farming experience. Idoma and Mamman reported that their study was in agreement with that of Nkwusi, Adeaga, Ayejuyo and Annuk who discovered high response awareness rate of 74.28% for farmers in Lagos State. Moreover, Adeleke and Omoboyeye (2016) reported a 100% awareness of climate change by their fish farmers'

respondents. This high percentage could be as a result of high literacy rate in their study area or among his respondents. Adeleke and Omoboyeye cited Mendelsohn as saying that educated and experienced farmers have more knowledge and information about climate change and adaptation practices.

Climate change information

The saying that Information is power in incontrovertible. It takes information to make a right or an informed decision. In the face of the threats posed by climate change to the world especially Nigeria, there is need for adequate and timely information to be given out to the public. This information will help the people especially the vulnerable to build capacity for adaptation and or mitigation of the effects of climate change. Idoma and Mamman (2016) in their study revealed that early warning signals, Rainfall Prediction, Drought Prediction, Adaptation Technology, Food aid, Temperature change, Human Health Services and Veterinary services had mean scores above two, placing them on top as needed climate change information. Similarly, Idoma and Mamman (2016) cited Mishra, Upadlayay and Mishra as emphasizing in their study the need for climate information and knowledge sharing between scientists, policy makers and community institutions in order to enhance practical adaptation at the grassroots level.

Causes of climate change

Climate change or global warming has been said to be caused by both human and natural factors. According to Intergovernmental Panel on Climate Change (IPCC) in Onu and Ikehi (2017), the causes of climate change can be linked basically to factors such as: Industrial revolution, for instance the activities of automobiles and other industries have led to emission of several gases like carbon dioxide into the atmosphere which over time affects the composition of greenhouse gases leading to altered climate; Burning of fossil fuels by oil producing companies and refineries which emit greenhouse gases into the atmosphere; Land use change such as deforestation and desertification which leads to climate change, and Agricultural activities such as bush burning, fertilizer application, fermentation among others, all of which are anthropological influencers of climate change. At present the world is passing through global warming situation caused by anthropogenic factor (human activities) and if it continue unabated for decades or centuries with significant ecological impacts then, the earth will attain a changed climate (warm or hot climate) (Odjugo, 2011).

Effects of climate change

Ibrahim (2017) reported that Godai village in Nigeria's Northwestern State of Kaduna is already witnessing reduced rains, with the farmers lamenting poorer rice, maize, and vegetable harvests. According to him, the long-term forecast is for still dryer conditions across the north, with the

potential decline in yields for rain-fed agriculture as high as 50 percent. Low yield is one of the effects of climate change on farmers. This is as a result of irregular/unpredictable rainfalls, severe heat, desert encroachment, flooding, shrinking of rivers and lakes, soil degradation, landslides, erosions amongst others. Dadzie, Okorley, Bosompem and Okwei (2012) in their findings agreed with this when they reported that the production experience of the food crop farmers interviewed revealed that flooding, pests and diseases outbreaks, drought and erratic rainfall are the common incidence of events they have been encountering with seasonal shifts due to climate variability and change. Sagoe (2006) also agreed with this in her report on study of climate change and root crop production in Ghana, Factors such as unreliable, irregular and unpredictable rainfall are some of the effects of climate change.

Idoma and Mamman (2016) reported major adverse effects of climate change in the area they studied as flooding of farm land, crop failure and poor harvest, poor performance and high mortality rate of livestock, wilting and decaying of farm produce, poor fish harvest and unusual pests/diseases of crop and animal. They reported that all the above variables had mean score of above two. Thus, they are serious effects of climate change on the socio-economic activities of Agatu Local Government Area of Benue State.

Sources of climate change information

Owusu-Ansah, in (Anunobi, &Udem, (2014) defined information as factual data, ideas, and other knowledge emanating from any society that are identified as being of value, sometimes gathered on a regular basis, organized in some fashion, transmitted to others, and used in some meaningful way. From the above definition it can be deduced that information is meaningless if it is not collected, processed, disseminated and used. As dissemination of information on climate change is very essential so, also is the source of the information. There is a target audience for any information and there is a right source to get that information to that very audience. It is only then that the information can be said to have been rightly and properly disseminated. Various sources of information dissemination abound, viz; the Mass Media – Print and Non- print media. Newspaper, Magazines and Radio, Television. This days the advent of Information and Communication Technology (ICT) (internet and the World Wide Web) has provided another powerful means of information dissemination. It uses various platforms such as blogs, social media network – facebook, WhatsApp, imo, Linkden etc. as well as the Libraries, extension workers (for some technical areas), posters and handbills, community channels (town criers), and so on.

Annor-Frempong and NanaAcquah (2012) in their study reported that a majority (85.3%) of their respondents used the media (Television and Radio) for information on climate change, and it is regarded as the most effective sources. Akpan, Anorue and Ukonu (2012) conducted a study on the Influence of the Nigerian Mass Media on Public Understanding of Climate Change and discovered that Interpersonal communication, internet and television still had an edge over newspapers as sources of climate change information for the respondents. That Interpersonal communication ranked the highest among the sources of information on climate change for the respondents. It was only 19 (4.75%) respondents out of 400 who indicated having ever read a story in a newspaper on climate change. The respondents who had read newspapers did not remember reading up climate change stories. Idoma and Mamman (2016) in their study revealed four major channels of climate information communication in their order of acceptance to the respondents. Community channels (extension workers, neighbours/friends) very high significant rate, Mass Media (Radio & Television) came second while Print Media (Newspapers, Pamphlets) ranked third and Electronic Media (internet, SMS) ranked fourth.

Utilization of information on climate change

When information is received, it becomes relevant only when it is utilized. Climate information is meant to avert (adapt or mitigate) the effects of climate change. In their study, Idoma and Mamman (2016) revealed that taken decision on when to plant crop came first as being very important, taken decision on when to harvests fish from ponds ranked second (important), planning mitigation for flooding was ranked third (moderately important) while general daily activities came fourth (of little importance).

Challenges in accessing and utilizing information on climate change

Idoma and Mamman (2016) reported limited access to radio, TV and internet as well as poor translation of climate change technologies with a very high percentage of (94%) as barriers to climate information communication in Agatu . Other barriers are technicality of the message (85%), lack of trust in source of information (82%) and cultural barriers (80%). Their findings was corroborated by Schubert, (2014) and Speranza, Kiteme, Ambenje, Wiesman & Makali (2010) who reported that communication of climate information to support adaptation action in Africa is hindered by several contextual factors, viz Socio-cultural, content-related and technological barriers.

Meanwhile, most of the challenges faced by farmers as gathered from discussions and interview include, reduction of annual rainfall, excessive heat (high temperature), depression of underground water, discrepancies between predicted and actual rainfall, soil erosion, afforestation activities, land tenure system and incidence of pests which attack our agricultural

produce are some of the pressing issues requiring climate change information in the state. Furthermore, other agricultural challenges beside climate change is lack of budgetary allocation to carter for the teaming farmers' population, lack of credit facilities and poor market are the major challenges. Also at times, food production is expected to be less than normal due to shorter growing season. Daily Sun Newspaper of Tuesday 7th August 2018 quoted some farmers as lamenting that they "started rice farming early last year but couldn't make any harvest because of flood and that they don't have money, hence they could not insure their farms".

Summary of Review of Literature

The above review shows that general awareness of climate change information in Nigeria is not too low, but government and all stakeholders should intensify efforts across the country to inform people about the phenomenon. It was also shown that early warning signals, Rainfall Prediction, Drought Prediction among others are some of the information on climate change needed to mitigate the effects of climate change. Climate change is caused by both human and natural factors. The climate change affects food production and a threat to human existence. The review also showed that Mass Media remains a major source of climate change information. Capacity building equips the people to adapt and or mitigate against the effects of climate change. Also access to the Mass Media and the latest technology -the internet by majority of the rural dwellers as well as some socio-cultural and technological know-how issues are challenges to optimal utilization of climate change information in Nigeria.

Methodology

Survey research design was adopted for the study because of its appropriateness to studies of this kind. The population of the study consisted 1200 respondents comprising (staff of the State Agricultural Development Project, FADAMA III Project, IFAD, Animal rearers and Farmers) all in Zamfara State. Questionnaire, interview and discussions were instruments of data collection used in the study. One thousand two hundred questionnaires were distributed to respondents and only 988 (82.2%) were dully returned and found usable. The results of the responses were interpreted using simple percentage and frequency tables.

DISCUSSION OF RESULTS

Table 1: List of Local Government Areas of Zamfara State, Their total population and Farmer's population

S/N	Local Government Area	Total Population	Farmers' Population
1	Anka	90,774	86, 235.3
2	Bakura	116,057	110, 254.15
3	BirninMagaji	114,895	109,150.25
4	Bukkuyum	130,033	123,531.35
5	Bungudu	165,236	156,974.2
6	Gummi	129,800	123,310
7	Gusau	248,839	236,397.05
8	KauraNamoda	180,763	171,724.05
9	Maradun	130,309	123,733.55
10	Maru	184,442	175,189
11	Shinkafi	85,212	81,046.4
12	TalataMafara	136,731	129,834.5
13	Tsafe	165,355	157,087.25
14	Zumi	185,282	176,017.9
	Total	**2,584,456.45**	**1,960,434.9**

Table 1 shows total population of inhabitants as well as farmers population in each of the Local Governments, thereby putting the total percentage of famers in the state at 95%. This great percentage requires that the issue of climate change deserves periodic review so as to prevent farmers from making uninformed decisions. Analysis of the data collected in table I indicates that Gusau Local Govt Area has the highest farmers population of 23,397.05, followed by Zurmi Local Govt Area with a farmers population of 176,017.9 while Shinkafi has the list with 81,046.4 farmers. This study is significant since the climate change information is aimed at taking better and scientific based decisions in order to minimize potential risks and damages from weather and climate hazards. As a result of dramatic changes in Rainfall, temperature, humidity, windfall direction, soil cultivation and farm management practices. Government and non-governmental organizations needed to contribute their quota toward a successful sharing of

knowledge in the community institutions in the state to achieve better results in Agriculture and Animal production.

. **Table 2:** Types of Climate Change Information Available in Zamfara State

S/N	Climate Change Information	Available	Not Available
1	Rainfall Prediction	✓	-
2	Warning Rainfall	✓	-
3	Rainfall Establishment	✓	-
4	Drought Prediction	✓	-
5	Drought Resistant Variety	✓	-
6	Flooding Menace	✓	-
7	Flood Prediction	✓	-
8	Temperature	✓	-
9	Humidity	✓	-
10	Windfall Direction	✓	-
11	Latitude	✓	-
12	Altitude	✓	-
13	Bush Burning	✓	-
14	Deforestation	✓	-
15	Fish Farming	✓	-
16	Depression of Underground Water	✓	-
17	Desertification	✓	-
18	Soil Erosion	✓	-
19	Time of Fertilization Application	✓	-
20	Short Time Variety Crops	✓	-
21	Long Time Variety Crops	✓	-
22	Mitigation	✓	-
23	Mulching	✓	-
24	Irrigation	✓	-
25	Mixed Farming	✓	-
26	Pesticide/herbicide Application	✓	-
27	Right Storage Facilities	✓	-
28	Bush Fallow	✓	-

29	Spring Water	✓	-
30	Rain Gauge	✓	-

Table 2 highlighted types of climate change information available in the state. This information is normally received from time to time by stakeholders in the Agricultural sector of the state with a view to boosting productivity in Agriculture. This information on climate change will enable users of those recorded information to refer to them in event of any short coming rising from loss and damages of crop as a result of low and shorter rainfall period, high temperature, humidity and outbreak of insects, pest and so on. Therefore, there are thirty different forms of information on climate change available in the state both in print and non-print media as shown in the table above. There are additional available information as reported by Idoma and Mamman (2016) in their study which recorded early warning signals, Rainfall Prediction, Drought Prediction, Adaptation Technology, Food aid, Temperature change, Human Health Services and Veterinary services had mean scores above two, placing them on top as needed climate change information. Maps & graphics were not found to be significant information. Idoma and Mamman (2016) cited Mishra, Upadlayay and Mishra as emphasizing in their study the need for climate information and knowledge sharing between scientists, policy makers and community institutions in order to enhance practical adaptation at the grassroots level.

Table 3: Awareness of Climate Change Information in Zamfara State.

S/N	**Level of Awareness on Climate Change Information**	**Aware**	**Not Aware**
1	High Temperature	✓	-
2	Heavy Flooding	✓	-
3	Slight Change in Times and Season	✓	-
4	Rainfall Prediction	✓	-
5	Drought Prediction	✓	-
6	Fertilizer Application	✓	-
7	Soil Cultivation	✓	-
8	Mixed Cropping	✓	-
9	Pesticide Application	✓	-
10	Bush Fallow	✓	-

11	Underground water Table	✓	-
12	Irrigation	✓	-
13	Effect of Insect-Pest on cropping	✓	-
14	Flooding	✓	-
15	Afforestation	✓	-
16	Deforestation	✓	-
17	Fish farming	✓	-
18	Soil erosion	✓	-
19	Crop production technology	✓	-
20	Mitigation	✓	-
21	Animal disease	✓	-
22	Storage facilities	✓	-
23	Spring water	✓	-
24	Overgrazing	✓	-
25	Animal production	✓	-

Table 3 shows that farmers are aware of climate change because the state government rigorously pursued the programme through Zamfara Agricultural Development Project using extension workers and in collaboration with agencies such as Nigeria Metrological Agency (NIMET), Community Assisted Support Programme by International Fund for Agricultural Development Project (IFAD) who greatly cover all nooks and crannies of the state where all stakeholders receive talks on current climate change and its threat to Agricultural and Animal production. This high level of awareness prevented farmers from drastic losses in their production. According to the table farmers were aware of twenty five out of the thirty climate change information available in the state and by implication how each affects positively or negatively the output in agriculture. In another study, Abdulkareem, Yusuf & Oyeniran (2012) observed that awareness of teachers on climate change was high with a high rate of 84% but on the contrary that the awareness rate of the students was very low with only 31% indicating their awareness of the phenomenon. It is worrisome that the teachers have such a high rate of awareness while their students recorded a very low awareness level. This is an indication that it is not yet included in our schools curriculum. These children if they are aware of this phenomenon can help in spreading the information. In the same vein, Idoma and Mamman (2016) in their study discovered that 92% of their respondents were aware of the term climate

change and variability. According to them, the high rate of their awareness is an indication that climate variability is very evident coupled with the fact that 49.2% of the farmers had over forty years of farming experience. Idoma and Mamman reported that their study was in agreement with that of Nkwusi, Adeaga, Ayejuyo and Annuk who discovered high response awareness rate of 74.28% for farmers in Lagos State. However, these high awareness report are in contradiction with the report of Akpan, Anorue and Ukonu (2012) who quoted a report in The Guardian, Monday March 9, 2009 as "established that Nigerians understanding of climate change-related issues including the negative effect of the fast changing climate on lives is low".

Table 4: Types Climate Change Information Accessed by Farmers in Zamfara State

S/N	Types of Climate Change Information Accessed	Agree	Strongly Agree	Disagree	Strongly Disagree
1	Rainfall Prediction	25.6%	30.2%	20.9%	23.3%
2	Warning Rainfall	20.3%	39%	20.2%	20.5%
3	Rainfall Establishment	24.1%	38%	14.7%	22.3%
4	Drought Prediction	21.7%	29.6%	15.4%	33.3%
5.	Flood Prediction	20.6%	38%	17.2%	24.2%
6	Temperature	27.1%	42.5%	18.8%	11.6%
7	Windfall Direction	20.9%	27.4%	21.5%	30.2%
8	Bush Burning	18.5%	20.3%	23.4%	37.8%
9	Deforestation	10.1%	29.3%	23.7%	36.9%
10	Fish Farming	25.1%	28.1%	21.3%	25.5%
11	Depression of Underground Water	28.1%	31%	20.0%	20.5%
12	Soil Erosion	19.2%	22.6%	25.4%	32.8%
13	Time of Fertilization Application	19.3%	23.1%	26.1%	31.5%
14	Short & Long Time Variety Crops	27.3%	38.3%	13.1%	21.3%
15	Mitigation	22.8%	34.5%	12.3%	30.7%
16	Mulching	22.3%	28.1%	21.6%	28%

17	Irrigation	23.2%	29.3%	21%	26.5%
18	Animal Disease Prediction	22.2%	23.6%	20.4%	33.8%
19	Time of Pesticide Application	19.7%	22.6%	25.1%	32.6%
20	Time of Herbicide Application	16%	26.6%	23%	34.4%
21	Storage Facilities	25.6%	17.7%	20.4%	36.3%
22	Bush Fallow	19.6%	23.8%	24.2%	32.4%
23	Spring Water	17.6%	24.3%	23.7%	34.4%
24	Rainfall Amount	8.9%	31%	28.7%	31.4%
25	Surface Water	27.2%	30.2%	19.3%	23.3%
26	Erratic Rainfall Prediction	12.1%	23.6%	22.8%	41.5%
27	Improved Crop Varieties	23.9%	33.5%	17.6%	25%
28	Afforestation	24.8%	29.7%	21.2%	24.3%
29	Over Grazing	22.3%	30.1%	22.3%	25.3%

Table 4 above indicates types and rates of climate change information accessed by farmers in Zamfara state. Based on the finding of the study, farmers accessed different forms of information on climate change in order to allow them to take a scientific decision on how to effectively carryout their farming activities. This table highlights the percentage of respondents who accessed different kinds of climate change information. Access to Temperature tops the positive list with 42.5% saying they Strongly Agreed, followed by Warning Rainfall at 39%**,** short term and long term crop varieties with 38.3%, and information on Flooding and its menace at 38%, . Access to other types of climate change information was agreed to with little or more percentage as shown in the table above. NIMET (2018) asserted that when temperature is warmer than the normal predicted in March and April, it is expected to affect livestock production especially over North Western flank: mortality of livestock is also expected to increase during these months due to temperature fluctuations, with day old chicken being most vulnerable.

On the other hand, other respondents Strongly Disagreed to have accessed climate change information like Erratic rainfall prediction with 41%, Bush burning 37.8%, Animal Diseases 33.8%, Deforestation 36.9% and Soil erosion 32.8%, Time of Fertilizer application 36.5%,

Spring Water 34.4%, Rainfall amount 31.4% and others with less percentage as shown in the table. It is in line with the information stated above that farmers need information on how to adapt and or mitigate climate change effects – a very big threat to food security and achievement of Agricultural diversification programme.

Table 5: Sources of Climate Change Information in Zamfara State

S/N	Sources of Climate Change Information	Agree	Strongly Agree	Disagree	Strongly Disagree
1	I got Information via Radio	25.3%	61.2%	5.2%	8.3%
2	I got Information via Television	24.2%	28.2%	27.9%	19.7%
3	I got Information via Extension Workers	21.2%	49.6%	9.2%	20%
4	I got Information via Social Media	13.2%	17.2%	28.6%	41%
5	Collaboration with Agencies	31.7%	40.3%	7.7%	20.3
6	Newsletters	20.5%	24.8%	22.3%	32.4%
7	Pamphlets	14.6%	20.3%	20.3%	44.8%
8	Newspapers	8.6%	10.6%	30.4%	50.4%
9	Journals	12.4%	22.8%	21.3%	43.5%
10	Books	21.8%	31%	14.7%	32.5%
11	Hand Bills	17.4%	21.8%	20%	40.8%
12	Posters	18.4%	25%	25.1%	31.5%

Table 5 shows the farmers responses on their sources of climate change information which help them take decisions on when to plant and what type of crop to plant and also the kind of animal production to engage in. The climate change information gives scientific direction on what is right or wrong practice in every farming season. From the above table, Radio announcements and jingles led other sources of climate change information with 61.2% responses. This could be because of the affordability of the gadget as the farmers are seen holding different pocket size Radios. This is in consonance with the findings of Csoto (2010) and Lwoga & Stilwell (2010) that radio, extension services and television were majorly used in rural areas to access climate forecasts because of their affordability (Idoma and Mamman, 2016). This is partly in line with

the discovery of Annor-Frempong and Nana Acquah (2012) in their study where they reported that majority 85.3% of their respondents used the media (Television and Radio) for information on climate change, and it is regarded as the most effective sources. Partly in the sense that the present study elicited information on Radio and Television separately with television having 28.8% for strongly agree. This is followed by Extension Services with 49.6% as rendered by Zamfara Agricultural and Rural Development Project and International Fund for Agricultural Development (IFAD). Idoma and Mamman (2016) in their study revealed four major channels of climate information communication in their other of acceptance to the respondents. Community channels (extension workers, neighbours/friends) ranked first with a very high significant rate, Mass Media (Radio & Television) comes second while Print Media (Newspapers, Pamphlets) ranked third and Electronic media (internet, SMS ranked fourth. The less choice of electronic media, they said could be ascribed to low education and low income among the rural farmers. From the table above Newspaper ranked first in the negative as 50.4% Strongly Disagreed to having gotten information on climate change from the Newspaper.

Table 6: Utilization of Climate Change Information by Farmers in Zamfara State

S/N	Climate Change Information Accessed	Agree	Strongly Agree	Disagree	Strongly Disagree
1	Take decision on when to plant crops	18.2%	20.6%	22.4%	38.8%
2	Planning mitigation for flooding (creating and opening drainages)	15.5%	29.9%	27.6%	27%
3	Take decision on when to harvest	24.5%	25.4%	19.9%	30.2%
4	Take decision on when to move the herd to a better grazing area	21.2%	38.3%	20.2%	20.3%
5	Early adapter categories	23.5%	38.9%	17.2%	20.4%
6	Duration of Rainfall – early or late	26.6%	38%	25.3%	10.1%
7	Afforestation activities	15.2%	23%	21.8%	40%
8	Deforestation	24.8%	25.9%	10.1%	39.2%
9	Pesticide Application	26.7%	40%	10.2%	23.1%
10	Irrigation	21.1%	28.3%	21.2%	29.4%
11	Crop Improved Varieties	20.9%	30.7%	20.2%	28.2%
12	Go into Animal Husbandry	13.2%	28.4%	27.3%	31.1%

13	Drought prediction	26.3%	29%	19%	25.7%
14	Bush burning	20.5%	25.3%	23.5	30.7%
15	Disease Resistant Crop	23.7%	33.7%	20%	22.6%
16	Observing Rainfall Prediction	30%	38%	12%	20%

Table 6 above shows the areas farmers in Zamfara State utilize the climate change information they accessed. The data collected for this study revealed that farmers impression on the importance of having climate change information as a gateway to success or failure of their farming activities whether crop or animal husbandry. The study identified proper utilization of the climate change information based on percentage of respondents. From the table above utilization rate of Time of Pesticide application is highest with 40%, with early adaptors categories 38.9%, observing Rainfall predication 38%, Using disease resistant crop has 33.7%, using improved crop varieties has 30.7%, also using drought prediction has 29%. This shows that farmers in the state really utilized information on climate change to avert the effects of climate change. Duration of rainfall prediction made farmers to decide on whether to plant early or late, while drought prediction allowed farmers to plant short or long term crops. The ordering of utilization of climate change information in the present study contradicted that of Idoma and Mamman (2016) which revealed that taken decision on when to plant crop came first as being very important, taken decision on when to harvests fish from ponds ranked second (important), planning mitigation for flooding was ranked third (moderately important) while general daily activities came fourth (of little importance).

Utilization of information is central to the achievement of objectives that was why Local, State and Federal Governments including International donor agencies are intervening seriously in Nigerian Agricultural Development. These programmes not only brings needed information to farmers but goes the extra mile to see that the farmers utilize the information. Still on the utilization table, other respondents agreed that they are not properly utilizing climate change information in the following areas, harvesting period 30.2%, and decision on when to plant 38.8%, deforestation 39.2%. Perhaps, it is in line with this argument that Beyioku (2016) stated that one of the solutions proffered at a Two Day Regional Workshop on Climate Change Capacity Building was raising awareness on issues of climate change which is presently at low

level especially among vulnerable groups like women, children, rural dwellers and community at grassroot level.

Summary of Major Findings

1. The study revealed that about ninety five percent (95%) of Zamfara State population are Farmers.

2. Maru and Gusau Local Government Areas recorded the highest farmers' population.

3. Farmers faced some challenges as a result of reduction in annual rainfall, high temperature, soil erosion, cutting and felling of trees (Deforestation), insect-pests attack on crops, lack of fund and credit facilities.

4. It was discovered that there were thirty (30) Climate Change Information available to farmers in the State, some of which are: Rainfall Prediction, Rainfall establishment, Drought prediction, Drought resistant crop varieties, causes of Flooding and its menace, windfall direction, relative humidity, time of fertilizer application.

5. Sources of climate change information to farmers in Zamfara State include, Radio, Television, Face to face interaction with farmers (Extension Services), Zamfara Agricultural Development Project, International Fund for Agricultural Development, Nigeria Metrological Agencies and FADAMA III Project, others include Posters, Handbills, Newspapers, Pamphlets and Textbooks.

6. Farmers were aware of climate change information which include actual amount of rainfall, high temperature, flooding and its menace, rainfall prediction, drought prediction, soil cultivation, irrigation systems, bush fallow, time of fertilizer application, slight change in time and season and depression of underground water.

7. Farmers in the state had access to the following information on climate change such as animal disease prediction, mitigation, fish farming, improved crop varieties, erratic rainfall, flood and rainfall prediction, planting of short time and longtime variety of crops.

8. Farmers in Zamfara State utilized information on climate change in the following areas: taking decision on when to or what to plant, planning mitigation, deciding on when to move the herd for grazing, time for fertilizer application, bush burning, planting of improved variety of crops and disease resistant crops.

Conclusion

The world leaders have for some years now been brainstorming on what or how to contend with the biggest threat of the moment, irregular change of climate otherwise known as climate change. This changes is negatively affecting the overall survival of human race and other living organisms on the surface of the earth, because lives of all living organisms depends on water, humidity, air, soil to survive. The air pollution occasioned by emission of gases from factories, vehicles, domestic use of fire woods etc greatly affects the Ozone Layer and the earth crust

thereby causing reduction in rainfall, humidity, and increases carbon dioxide concentration on earth which in turn lead to poor agricultural produce. However, the machinery put in motion by the government at all levels, international organizations and NGOs in the state to create awareness and encourage farmers to utilize given information yielded good results as the farmers awareness, access and utilization levels of information on climate change are high, therefore the State has no reason not to be at the fore front of this governments economic diversification with agriculture as the focus, thereby improving the socio-economic activities of its populace who are literally farmers.

Recommendations

Based on this study, the following recommendations were given:

1. As a result of threat posed by climate change to humanity in the area of food scarcity, there is urgent need for adequate and timely provision of information on climate change to the public, as this will allow people to build capacity for adaptation or mitigation of the effects of the phenomenon

2. Governments at all levels should increase their budgetary allocation to agriculture and provide accessible credit facilities to farmers to enable them insure their farms so as to minimize the burden of loss as a result of effects of climate change.

3. Government and Non-Governmental Organizations should do more on training of more personnel and sending them to all nooks and crannies of the State to create more awareness on current happenings concerning climate change, this will help the people to be more proactive in handling outcomes of this phenomenon.

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