AWARENESS LEVEL AND APPROACHES ADOPTED BY FARMERS IN MITIGATING THE IMPACT OF GLOBAL WARMING IN AGRICULTURAL PRODUCTION IN BENUE STATE

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Abstract

The study determined the level of awareness and approaches adopted by Farmers in mitigating the impact of global warming on agricultural production in Benue State. Two research questions were developed to guide the study while two null hypotheses were formulated and tested at 0.05 level of significance. The population for the study was 30,942 made up of 30,782 registered farmers and 142 extension agents while the simple size was 3,102 respondents. Multistage sampling technique was employed to obtain 3,100 registered farmers while 132 extension agents were involved in the study. A structured questionnaire called Global Warning Awareness and Mitigation Questionnaire (GAM) containing 20 questionnaire items was used for data collection. The instrument was validated by three experts, two in the Department of Agricultural Education and one from Department of Science Education, all from University of Agriculture, Makurdi. The validated instrument was trial tested on 30 respondents using Cronbach alpha method and reliability coefficient of 0.80 was obtained. Mean and t-test statistical tools were adopted for data analysis. The findings revealed that farmers were aware of 10 impacts of global warming and adopted 10 approaches in mitigating them. It was recommended that these approaches in mitigating the impact of global warming be taught to prospective farmers to increase their knowledge of global warming mitigation. Also, extension agents should educate farmers on approaches that are less costly and easy to increase their level of adoption and food production for national development.

Introduction

Agriculture is the only sector that provides food for human beings and livestock throughout the whole world. Food satisfies the hunger needs and supplies nutrients to the body. Nutrients such as carbohydrates – the major source of energy to both man and livestock, proteins – responsible for body building and replacement of dead cells, vitamins and minerals – essential for normal regulation of metabolic activities in the body and healthy growth and development of both man and animals. All comes from agricultural production.

Agriculture is also the major employer of labour in the country. About 80% of the populations in Nigeria are farmers (Alawa, Asogwa and Ikulusi, 2014). Apart from the above benefits, agriculture is the source of raw materials for agro-allied industries such as leather, beverages and textile industries among others. Nigeria is a country with vast arable land suitable for the production of food and cash crops though out the year if climatic conditions are favourable. Recently, changes have been noticed from the onset and ceasation of rainy season dates, frequent incidents of extreme weather events such as flood, droughts, desertification and others (Adewale, 2012). All these changes are attributed to global warming.

Global warming is the rise in the average temperature of the earth's atmosphere and oceans since the late 19th century and its projected continuation (Intergovernmental Panel on Climate Change IPCC, 2007). Furthermore, Mastrandrea and Schneider (2009) defined global warming as the measurable increase in the average temperature

of the earth's atmosphere, oceans and land masses. IPCC (2007) reported the warming of the earth to be caused by the rising levels of heat trapping gases identified as greenhouse gases in the atmosphere. The panel further stated that the accumulation of these greenhouse gases in the atmosphere leads to gradual increase in the average temperature of the earth's atmosphere and oceans causing a permanent change in the earth's climate. Mastrandrea and Schneider (2009) asserted that, greenhouse gases are released into the atmosphere through natural and anthropogenic factors and the later contribute ninety percent (90%) of global warming. Anthropogenic factors responsible for inducing global warming include; bush burning, fossil fuel burning, deforestation, tillage, rearing of herbivorous animals, changing land surfaces, nitrogenous fertilizer application and other human related activities. Global warming scenarios include; the increase in temperature, decrease in rainfall, flood, increased outbreak of both human and livestock diseases (for example, cerebrospinal meningitis) long period of drought especially in the sub-Sahara African region to which Nigeria belongs (Odjugo, 2010).

Global warming scenario decrease agricultural yield (both plants and livestock) especially cereal crops which form the major component of diet in Nigeria. This leads to less food available for human consumption, low nutrient level in the available food crops due to the denaturing of amino acids in proteinous foods stuffs, extinction of species that are unable to adapt to the prevailing environmental conditions and arable land becoming arid (11% in developing countries). McClean, Doswald and Kuper, 2005; FAD 2005). Nigerian Environmental Study Team, NEST (2003) affirmed that, 2/3 of the population are subsistent farmers who depend on rain fed agriculture for their food and economic needs. Thus, the impact of global warming on the teeming population of Nigeria is worsening the food crises situation that already exist and is also reducing the net farm revenue which is a stumbling block to national development (United Nations Environmental Programme (UNEP, 1996; FAO, 2007).

According to IPCC, (2007) the impact of global warming will be felt more by countries in sub-Saharan Africa to which Nigeria / Benue state belong. To mitigate the impact of global warming, farmers and extension agents need to have high level awareness of global warming and mitigation approaches to curb its menace. Awareness is the knowledge or perception of a situation or fact. In this study, awareness is the perception of the causes of global warming, its scenarios, impact on agricultural production and possible approaches that can be adopted to mitigate it by farmers and extension agents.

Adoption as used in this study is the changes in process, practices and structures to moderate potential damages associated with global warming. Agricultural extension agents encourage farmers to adopt global warming mitigation approaches (Onyeme and Iwuchukwu, 2012).

Mitigation is a response strategy to global climate change involving the adoption of measures that reduce the amount of emissions or enhance the absorption capacity of greenhouse gases (Mark, Mandy, Gray, Lan, Saleemul and Rowena (2008) in Alawa, Asogwu and Ikelusi, 2014). Mitigation of global warming can only be achieved through adoption of approaches that reduces the impact of global warming or amount of gases emitted to the earths' atmosphere.

Approaches as used in this study refers to ways or measures farmers could take to contend with or control global warming impact on the agricultural production. The approaches farmers adopt depend on their awareness of global warming, its causes and impact of global warming on physical, social-economic, political and religious life of the

people to enable them adopt sustainable approaches that can benefit all the people and subsequently bring development to the people.

In the submission of Gboyega (2003) development refers to all attempts to improve the condition of human existence in all areas of life. The author stressed that development seeks to improve the personal, physical security, livelihood and expansion of life. According to Adejo (2010) development is a process by which people create and recreate for themselves and their life circumstances conditions to realize higher levels of civilization in accordance with their choices and values. The author stressed that development relates to the ability to sustain and meet the basic needs of the people, the realization of self-esteem and the guaranteeing of freedom of ownership of development process and choice, freedom from servitude, ignorance, misery and dogmatic beliefs. Development in this study refers to the progression made in knowledge, physical, socio-economic, cultural and political aspects of life of people in the nation.

National development in the views of Lawal and Oluwatoyin (2011) is the overall development of a collective socio-economic, political as well as religious advancement of a country. National development, in this study is the overall advancement in functional education and knowledge, attitude and aptitude to create and control situations to suit a prevailing circumstance in order to attain socio-economic, political, cultural and religious freedom of its citizens. For Nigeria to be developed especially in the area of agriculture, farmers at all levels must have adequate knowledge about the conditions that prevail in their environment and be able to mitigate such conditions in order to produce food to meets needs of the people.

Large populations of farmers in Benue State are small holder farmers living in rural areas. They work together with agricultural extension agents as co-learners in agriculture to produce food for feeding the nation and for economic purposes. For the farmers to successfully mitigate the impact of global warming, they must be highly aware of the phenomenon, its causes and scenarios. Thus this study intends to determine the level of awareness and approaches they could adopt to mitigate the impact of global warming in Benue State.

Statement of the problem

Most farmers in Benue State are subsistent rural farmers who persistently engage in agricultural practices that are capable of increasing the impact of global warming such as bush burning, deforestation, clean clearing, use of inorganic nitrogenous fertilizer, complete tillage among others. The government has made several efforts through extension agents in staging campaigns and through media talks, but most farmers are adamant in carrying out these practices. It is in this light that the researcher seeks to determine the level of awareness of the farmers and extension agents on the effects of global warming and to identify the approaches they adopt in mitigating the impact of global warming. Specifically the study sought to;

1. Ascertain the level of awareness of global warming by farmers and extension agents in Benue State.
2. Identify approaches adopted by farmers and extension agents in mitigating the impact of global warming on agricultural production.

Methodology

The study adopted a survey research design. Survey research design was used because the researcher collected data from sampled registered farmers and extension agents considered to be representative of the population, analyzed the data and generalized the findings to the entire farmers in Benue State (Emaikwu, 2006). The area of study was Benue State. Benue State is made up of three agricultural zones. The State is made of 23 local governments and has a rich soil on which many crops and animals are reared for food and economic sustenance. 75% of the populations

of people in Benue State are farmers (BNARDA, 2005).

The population for the study was 30,914 made up of 30,782 registered farmers and 142 agricultural extension agents. The sample size for the study was 3,102 respondents made up 2,970 registered farmers and 132 extension agents. Multistage sampling technique of purposive, random sampling and proportionate stratified random sampling techniques were applied at various stages to arrive at the actual number of farmers in each sampled ward in the three zones that were used for the study. A 20 item structured questionnaire titled Global Warming Awareness and Mitigation Questionnaire (GAM) was developed by the researcher from literature reviewed for the study and used for data collection. The questionnaire was divided into two parts; Part 1 and 2.Part 1 sought information on demographic characteristics of the respondents. Part 2 was divided into two sections. Section A and B. Section A had ten item statements where respondents were expected to rate each item statement on a four response options of High level (HL), Average level (AL), slight level (SL) and low level (LL) with corresponding values of 4,3,2 and 1 respectively. Section B also had 10 item statements and respondents were required to rate each item statement on a four response options of Strongly Agree (SA), Agree (A), Strongly Disagree (SD) and Disagree (D) with corresponding values of 4,3,2, and 1 respectively.

The instrument was face validated by three experts, two from Department of Agricultural Education and one from Department of Science Education (measurement and evaluation) all of University of Agriculture, Makurdi. All the contributions of the validators were integrated to produce the final copy of the questionnaire.

The validated questionnaire items were subjected to reliability test to determine the internal consistency of the items and a reliability coefficient of 0.80 was obtained. Three research assistants familiar with the area of the study assisted in the administration of the questionnaire to the respondents. Three thousand one hundred and two copies of questionnaire were distributed to respondents and three thousand and seventy two copies were retrieved and analyzed. Mean was used to analyze data on research questionnaire while t-test statistic was used to test the null hypotheses. In taking decision on the item to which there is awareness or agreed, any item with a mean value of 2.50 or above was accepted as high level or agreed while any item whose mean was below 2.50 was regarded as low level or disagreed. With reference to hypothesis tested, the hypotheses of no significant difference was retained where the t-calculated value was greater than 0.05, but where the t-calculated value was less than 0.05 the null hypothesis of no significant difference was rejected.

Results

Data of the study was obtained from research questions answered and hypotheses tested and were presented in tables 1 and 2.

Research question 1: what is the level of awareness of global warming by farmers and extension agents?

Hypothesis 1: There is no significant difference between the mean responses of farmers and Extension agents on the level of awareness of global warming

Table 1: Mean Ratings and t-test statistics on the Responses *Lan M. T.*
the Level of their Awareness of Global Warming**. (**N= 3072 farmers and extension Agents)

Statement	$\overline{X}_1$	SD_1	$\overline{X}_2$	SD_2	$\overline{X}_G$	SD_G	t-cal	Sig.	Remarks

									RQ	HYP OTH
Delay in onset of rain is common recently	3.81	0.39	3.80	0.40	3.80	0.40	0.364	0.716	HL	NS
Erratic rainfall pattern	3.75	0.45	3.75	0.45	3.75	0.45	0.21	0.983	HL	NS
Higher temperature	3.71	0.58	3.72	0.56	3.72	0.56	0.230	0.824	HL	NS
Reduced annual rainfall	3.70	0.60	3.70	0.60	3.70	0.60	0.10	0.992	HL	NS
Prolonged periods of drought are common	3.66	0.56	3.70	0.52	3.70	0.52	0.866	0.386	HL	NS
Excessive sunshine is experienced recently	3.68	0.60	3.70	0.57	3.70	0.57	0.343	0.732	HL	NS
Heavy windstorms before rain	3.61	0.65	3.66	0.59	3.66	0.59	0.950	0.342	HL	NS
Increased flooding	3.65	0.59	3.66	0.58	3.66	0.58	0.111	0.912	HL	NS
Desertification or loss of forest resources	3.60	0.49	3.64	0.48	3.64	0.48	0.949	0.343	HL	NS

$\overline{X}_1$ = Mean of farmers, SD1 = Standard Deviation of farmers, X_2 = Mean of extension agents, SD2 = Standard Deviation of Extension agents, X_g = Grand mean of farmers and extension agents, SD_2 = Grand standard deviation of farmers and extension agents, Sig. =P-value, significant at P≥0.05, S=Significant, NS = Not significant, HL =High level

Table 1 revealed that all 10 items on awareness of global warming by farmers and extension agents had their grand mean values ranged from 3.64 to 3.80 which were all within the range of high level. This indicated that the respondents were highly aware of global warming in Benue State. The grand standard deviation ranged from 0.40 to 0.60 which was an indication that the respondents were not far from the mean and the opinion of one another in their responses on level of their awareness on global warming in Benue State. The Table also revealed that all the items had their calculated p-values ranged from 0.342 to 0.992 which were greater than the alpha value of 0.05 indicating that there was no statistical significant difference in the mean ratings of the responses of the two groups of respondents on awareness of global warming by farmers and extension agents in Benue State. Therefore, the null hypothesis of no significant difference was retained for the 10 items on awareness of global warming by farmers and extension agents in Benue State

Research question 2: what are the approaches adopted by farmers and extension agents in mitigating the impact of global warming on agricultural production.

Hypothesis: There is no significant difference between the mean responses of farmers and extension on the approaches adopted by farmers in mitigating the impact of global warming on agricultural production.

Table 2: Mean Ratings and t-test statistics of the Responses of Farmers and Extension Agents on approaches adopted in mitigating the impact of global warming on agricultural production (N =3072 farmers and extension) .

Statement	$\overline{X}_1$	SD_1	$\overline{X}_2$	SD_2	$\overline{X}_G$	SD_G	t-Cal	Sig.	Remarks RQ	HYP OTH
Zero tillage practice	2.85	0.61	2.83	0.63	2.85	0.62	0.425	0.671	Agree	NS
Use of cover crops to prevent soil erosion	2.89	0.70	2.87	0.69	2.89	0.69	0.363	0.717	Agree	NS
Use of resistant breeds/varieties of crops and animals	2.83	0.66	2.80	0.64	2.82	0.63	0.554	0.579	Agree	NS
Afforestation to protect the soil against heat and erosion	2.84	0.66	2.82	0.64	2.84	0.65	0.496	0.620	Agree	NS
Use of inorganic manures instead of inorganic nitrogen fertilizers	2.85	0.69	2.82	0.68	2.85	0.69	0.549	0.583	Agree	NS
Irrigation practice instead of rain fed agriculture only	2.84	0.63	2.82	0.61	2.83	0.62	0.468	0.640	Agree	NS
Mixed farming instead of mono farming is common practice these days	2.79	0.65	2.76	0.64	2.78	0.65	0.527	0.598	Agree	NS
Inclusion of legumes in mixed cropping to improve soil fertility	2.77	0.62	2.74	0.60	2.76	0.61	0.583	0.560	Agree	NS
Controlled grazing instead of free range grazing of livestock	2.80	0.64	2.77	0.61	2.79	0.63	0.674	0.500	Agree	NS
Mulching planted crops to protect them from direct heat	2.76	0.61	2.73	0.58	2.75	0.60	0.734	0.463	Agree	S NS

$\overline{X}_1$ = Mean of farmers, SD1 = Standard Deviation of farmers, X_2 = Mean of extension agents, SD2 = Standard Deviation of Extension agents, X_g = Grand mean of farmers and extension agents, SD_2 = Grand standard deviation of farmers and extension agents, Sig. = P-value, significant at P≥0.05, S=Significant, NS = Not significant, A = agree

Table 2 revealed that all 10 items on approaches adopted by farmers and extension agents to mitigate the impact of global warming had their mean value ranged from 2.76 to 2.89 which were all within the range of agreed this indicated that the respondents adopted all the 10 approaches to mitigate the impact of global warming. The grand standard deviation ranged from 0.61 to 0.70 which was an indication that the respondents were not far from the mean and the opinion of one another in their responses on the approaches adopted by farmers and extension agents to mitigate the impact of global warming on agricultural production. The table also revealed that all the items had their calculated p-values ranged from 0.500 to 0.717 which were greater than the alpha value of 0.05 indicating that there was no statistical significant difference in the mean ratings of the responses of the two groups on the approaches they adopt to mitigate the impact of global warming on agricultural production. Therefore the null hypothesis of no significant difference was retained for the 10 items on approaches adopted by farmers and extension agent to mitigate the impact of global warming on agricultural production.

Discussion of Results

The study revealed that farmers and extension agents were highly aware of global warming and its scenarios as indicated by the mean of 3.63 to 3.80. Such scenarios included delay in onset of rains, erratic rainfall pattern, higher temperatures, reduced annual rainfall, drought and others. These findings agrees with that of Ngilangil, Oliver and Ballesil (2013) in a study on farmers' Awareness and Knowledge on Climate Change Adaptation Strategies in Northern Luzon, Philippines, where it was found out that the knowledge and awareness of farmers on global warming was generally high and the farmers believed that crop production was at great risk during extreme weather event. This study result is also in consonant with that of Bello, Salau, Galadima and Ali (2013) in a study on Knowledge, Perception and Adaptation Strategies to Climate Change Among Farmers of Central State Nigeria and the result showed that farmers were aware of global warming and their perception of global warming was directed at high temperature, decreased rainfall distribution and low production output.

The hypothesis of no significant difference between the mean ratings of farmers and extension agents on the level of awareness of global warming was retained. This findings confirms the observations of Bello, Salau, Galadima and Ali (2013) that farmers were aware of global warming and their perception of global warming was directed at high temperature, decreased rainfall and low output.

The study also revealed that farmers and extension agents adopted approaches in mitigating the impact of global warming such as zero tillage, afforestation, controlled grazing among others. These are findings is in agreement with that of Labaris (2012) in a study on Impacts of Climate Change Adaption in the Agricultural Sector: The Case of Small Holder Farmers in Nigeria, who found out that farmers adopted various approaches such as multiple cropping in the same field, minimum tillage and other approaches to mitigate the impact of global warming on agricultural production.

The study is also in line with that of Idrisa, Ogunbameru, Ibrahim and Bawa (2012) who carried out a study on analysis of awareness and adaption to Climate Change Among Farmers in the Sahel Savanna Agro-Ecological Zone of Borno State, Nigeria. Where they found out that farmers adopted mitigation approaches like

irrigation to augment the short fall in rain, mulching, planting deeper than usual and several other approaches.

The hypothesis of no significant difference between the mean ratings of framers and extension agents on approaches adopted to mitigate the impact of global warming on agricultural production was retained. This finding agrees with that of Adewale (2012) on a study on Assessment of Poor Resource Farmers' Level of Awareness on Climate Change and Adaptation/Mitigation Strategies in some selected rural areas in Oyo State where he found that farmers adapted zero tillage, mulching of planted crops and others to mitigate the impact of global warming on agricultural production.

Conclusion

Based on the findings of the study, it was concluded that farmers and extension agents in Benue State were highly aware of global warming and its scenarios. The study again revealed that farmers and extension agents adopted various approaches to mitigate global warming such as controlled grazing, mulching planted crops to protect them from direct heat, inclusion of legumes in mixed cropping to improve soil fertility, zero tillage and others.

Recommendations

The study results led to the following recommendations.

Federal government through Ministry of Education should include global warming, causes and mitigation approaches into the curriculum of primary, secondary and tertiary institutions of the nation to enable every member of the society learn about this phenomenon and adapt to it.

Extension agents should intensify their efforts on awareness creation about global warming; its impact on agricultural production and adaptation approaches to enable farmers adapts cost-effective approaches and introduces those that are alien to farmers in the study areas. The Federal government through Federal Ministry of Agriculture should formulate stable policies on climate change mitigation and adaptation to increase the farmers' level of adaptation.

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