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Research Paper

The role of communication media in mitigating climate change effects on agricultural production in Cross River State, Nigeria

Nneoyi Ina Ofem[1] • Ghinini F. Elemi[2] • Ejeje I. Agube[3]

[1,2,3]Department of Agricultural Economics and Extension, Faculty of Agriculture, Forestry and Wildlife Resources Management, University of Calabar, P.M.B. 1115, Calabar, Cross River State, Nigeria.

E-mail: ofeminas@yahoo.com. Tel: +2348098914210.

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Abstract. The study analyzed the role of communication media in mitigating climate change effects on agricultural production. The study was conducted in Cross River State, South East Nigeria. Descriptive and inferential statistics were used to analyse data generated from the field. The study revealed that climate change information available to farmers includes those from traditional weather forecasts (33.3%) and downscaled weather disaster predictions (30.3%). The study revealed further that the major sources of climate change information were those from members of the community (31.7%); Non-Governmental Agencies (29.2%) and traditional weather forecasters (18.9%). Channels of climate change information dissemination include: Town crier (73.1%), village meeting (61.7%), television (68.9%), radio (62.5%), neighbours (49.4%) and agricultural extension officers (37.5%). The study also shows that there is a strong and positive relationship (+0.7) between climate change information dissemination and farming activities. A test of significance for r shows that T-calculated (3.0996) was greater than the T-tabulated (1.812) implying that there is a significant relationship between climate change information dissemination and farming activities. In other words, climate change information made available to farmers on time could help them adapt and possibly mitigate adverse weather changes.

Keywords: Agricultural production, climate change, communication media, mitigation.

INTRODUCTION

The world today is confronted by several crises ranging from food, energy, financial and climate crises, respectively. Climate variation is common and quite a natural phenomenon. Anijah-Obi (2001) conceives climate change as a long-term change in the climate of the earth. While Slater et al. (2007) defined climate change as a process of global warming, in part attributable to the greenhouse gases generated by human activity. The author noted that climate is the average weather condition of a particular locality. It comprises the various elements of temperature, precipitation and cloudiness. Ivuerah (2007) reported that, the issue of climate change is interwoven with the basket of six gases, “Green House Gases (GHG) which includes: carbon dioxide (CO_2), Methane (CH_4), Nitrous Oxide (N_2O), Hydro-fluorocarbons (HFLs), Per-fluorocarbons (PFLs), and sulphur hexafluoride (SF_6). These greenhouse gases are primarily from the anthropogenic activities that include carbon-dioxide emission from the combustion of fossil fuels, production of cement, bush burning, agriculture and other land use activities (including deforestation).

Nigeria is in the tropics and the effects of climate change have already been felt and have impacted on the national economy. Agriculture is the mainstay of the economy, with about 65% of the populace engaged in farming activities and residing in rural areas (UNDP/NPC, 1998/1999 Report, 2001). As the nation struggles with the challenges of increasing food production and reducing hunger and poverty, the issue of climate change is a major and serious threat to agricultural development. Several agencies of government, the Ministries of Agriculture, the Agricultural Development Programmes (ADPs), the Meteorological Stations, the various Emergency Response Centres, scientists and farmers have directly or indirectly responded to this climate change phenomenon. Climate change has been predicted to be more pronounced in developing countries like Nigeria, which already experiences lower agricultural yields and suffers more extreme weather events (Wilson, 2001). The author noted that though global food security may not be imperiled; climate change is likely to cause hunger and displacements in many parts of the world. Agriculture according to Wilson produces about 18 to 24% of the greenhouse emissions that are responsible for global warming. At the same time, climate change has severe and negative consequences on agriculture. Machhi (2008) reported that rural communities who live in marginal lands and whose livelihoods are highly dependent on natural resources are among the most vulnerable to climate change. While climate change situations persist and affects the rural farmers who produce three-quarter of the food consumed in the country, the extent to which they perceive this problem and thus evolve response mechanisms has not been adequately analyzed. Moreover, Darwin (2001) noted that despite recent advances in analyzing the economic impacts of global warming, the process of integrating climate change information management in adaptations and mitigation initiatives is still extremely limited. Climate change information management is obviously related to evolving effective response measures. It is therefore surprising that the climate change literature pays little attention to information management among rural farm communities. The Food and Agriculture Organization (2008) reported that many assessment studies look at only the implications of climate change on agricultural production without taking into consideration the role of development communication and extension services. Similarly, Hellmuthet al. (2007) reported that climate change information has not been incorporated into many development initiatives and decision making frameworks and thus media like the ICTs, radio, and local extension services have been grossly underutilized in information sharing. While several climate change information exist from various sources, the type of information that is relevant to farmers and that can be applied to farm activities is scarce. Awuor (2008) noted while traditional sources of weather information have been useful and are widely accepted among the rural communities they however do not provide enough and sufficient information needed to help farmers' plan their activities in the long run. At the same time, farmers do not have adequate access to scientific weather information. And where these information is available, the impacts they have on farming activities in the rural communities already vulnerable to these changes has not been adequately documented. Climate change information relevant to agriculture is important, but most often there are problems associated with generating, collecting, processing and disseminating these information to farmers.

Objectives of the study

The main objective of this study is to analyze the role of communication media in mitigating climate change effects on agriculture in rural communities of Cross River State; identify climate change information and their sources in the study area; ascertain channels of climate change information dissemination to farmers and determine the effects of climate change information on farming activities within the study areas, and to make policy recommendations.

Development communication and climate change

Climate change does not only pose a challenge to National Development, but it challenges such disciplines as agricultural extension and development communication. Reports have shown that several technologies and response mechanisms have been developed to help farmers adapt to and also respond to this challenge, yet majority of farmers are yet to apply these adaptive and response approaches to local farm situations to mitigate the climate change effects (Bellarby et al., 2008). LEISA (2008) reported that knowledge and information play a vital role in helping farmers build resilience towards the issues of climate change. Information is vital when farmers are trying to adapt to changing weather and climate conditions. Radio is an effective way of reaching small-scale farmers with useful information in climate-change. Other media identified to enhance information on climate variability include; scriptwriting, television, newspapers, and agricultural extension officers. In some parts of the world, extension communication support to climate change effects in farming communities have come in the form of Climate Field Schools (CFSs) developed in 2005-2006 in Indonesia, with the aim of increasing farmers' knowledge of using climate information in their decision making.

Their collaboration included; the Indonesian Ministry of Agriculture, the Asian Disaster Preparedness Centre, the Indonesian Agency for Meteorological Centre, etc (Winarto et al., 2008). It has also been reported that farmers' local knowledge and traditional sources of information have helped farmers adapt and respond to changes in climate (Awour, 2008; Humala, 2008). Nigeria is in the tropics and the effects of climate change have already been felt and have impacted on the national economy. Agriculture is the mainstay of the economy, with about 65% of the populace engaged in farming activities and residing in rural areas (UNDP/NPC, 1998/1999 Report, 2001). As the nation struggles with the challenges of increasing food production and reducing hunger and poverty, the issue of climate change is a major and serious threat to agricultural development. Several agencies of government, the Ministries of Agriculture, the Agricultural Development Programmes (ADPs), the Meteorological Stations, various Emergency Response Centres, scientists and farmers have directly or indirectly responded to this climate change phenomenon. The thrust of this study therefore is to analyze the effects communication media could have on mitigating the climate change effects on agriculture in Cross River State of Nigeria.

MATERIALS AND METHODS

Description of study area

The study was conducted between the months of February and April in 2010 in Cross River State, South East of Nigeria. The state lies within longitude 4°50′ and 9°28′ East of the Greenwich Meridian and latitude 5°23′ and 4°27′ North of the Equator. It shares boundaries in the East by the Republic of Cameroun and South by the Atlantic Ocean. In the North and West, it is bounded by Benue and Ebonyi, and Abia and Akwa-Ibom States, respectively. Cross River State has a landmass of 22, 226,373 km^2. It is located within the tropical rainforest belt of Nigeria. Arising from its location, the state is found within the tropical climate with the Obudu Plateau at an altitude of 1.595 m above ground level, thereby enjoying a temperate climate. The state records heavy rainfall during the wet season (May to October) and severe sunshine during the dry season (November to April). Cross River State experiences a distinct climatic variation ranging from tropical climate to temperate climate in the Obudu plateau (Dunn, 1994). The economy of the state is dominated by agricultural production, with 75% of its people engaged in subsistence farming (Cross River State Economic Empowerment and Development Strategy Document, 2005). Moreover, the Cross River State Agricultural Development Programme (CRADP Report, 2002) reported that Cross River State is delineated into three agro-ecological zones which includes: the mangrove and swamp forests which cover the Calabar Agricultural Zone comprising Calabar South, Calabar Municipality, Akpabuyo, Bakassi, Odukpani and part of Akamkpa and Biase Local Government Areas with the vestiges of rainforest. The rainforest belt of Ikom Agricultural Zone comprises of Ikom, Abi, Yakurr, Obubra, Boki and Etung Local Government Areas respectively. Finally, the derived and Guinea Savanna belts of Ogoja Agricultural Zone comprises of Ogoja, Yala, Bekwarra, Obanliku and Obudu Local Government Areas respectively. According to the Cross River State Forestry Commission Report (2007), the state has the largest vestiges of rainforest remaining in Nigeria. About 89% of the rainforest in Nigeria is found in Cross River State consisting of 7,290 km^2 (72.9 ha). The rainforests are found in Ikom, Obubra, Etung, Boki, part of Yakurr and Abi, and Akamkpa. Out of 7,290 km^2 of rainforest, more than 4,000 km^2 is under the control of the National Park, while the rest are managed as Forest Reserves and Community Forests. These forests play an important role in environmental sustainability and at the same time constitutes an important source of livelihood to the communities around the forest area. In terms of climate change, these forest resources serve as important greenhouse gas sinks, especially carbon dioxide sinks. They help to reduce GHG emissions into the atmosphere as they absorb CO_2 from the atmosphere. However, since agriculture is the major occupation of the people, activities like slash and burn, deforestation, bush burning, livestock rearing are very common thereby releasing GHGs into the atmosphere. Consequently, the effects of climate change in the environment is common and highly noticeable and with high potentials to threatening agricultural production and food security in the state.The population of the study is drawn from the population figures of the National Population Commission for the state. The NPC (2006) estimated figures give the population of Cross River State as 3,862,634. Based on this figures, a sampling design was formulated to enable the selection of a representative sample size that cuts across the three agro-ecological zones of the state. Based on an earlier study by Dunn (1994) involving the three ecological zones in the state, a multi-stage clustered sampling technique was used to sample various communities and respondents in the various agro-ecological zones in the state. The first stage of sampling was the use of purposive sampling technique to select one local government per agro-ecological zone. Hence, from Calabar Zone (mangrove/swamp ecosystem) Akpabuyo Local Government was randomly sampled. From Ikom Zone (rainforest ecosystem), Etung Local Government was randomly selected while in Ogoja Zone (Derived and Guinea Savannah), Yala Local Government

was equally randomly selected. Hence, three (3) local governments were sampled. In another stage of sampling, about three rural communities were randomly selected from each of the sampled Local Governments; hence about nine (9) rural communities were selected and used for the study. From each rural community, about 40 respondents were randomly sampled based on a sampling frame drawn from a community survey programme involving local community people and from where they were registered as part of the research project by the researcher. Accordingly, each rural community had 40 respondents. A total of 360 respondents were used as the sample size for the study.Two types of data were collected and used for the study. Secondary data on climate change effects were sourced from past and relevant literatures and journal articles. Secondary data on farmers' perception of climate change farming activities sensitive to climate change, types of climate change information and channels of dissemination were also obtained from the websites of the United Nations Framework Convention on Climate Change, the Food and Agriculture Organization, the Federal Ministry of Environment and Agriculture.Primary data were collected using Participatory Rural Appraisal techniques such as Focus Group Discussions, Participants Observations and unstructured questionnaire. At the same time, structured research instruments were designed to elicit responses on farmers' perception of climate change, farming activities sensitive to climate change, types of climate change information available to farmers and the sources of this information.The research instruments were validated by experts in the department of Agricultural Economics/Extension and those in Crop Sciences Department and Geography/Regional Planning of the University of Calabar. This was to ensure that items raised in the questionnaire were suitable to address the various issues addressed by the study.A reliability test was conducted using the Test-Retest method. 10% of the research instruments were distributed to respondents outside the sampled rural communities. The exercise was repeated in another agro-ecological zone. A Pearson Product Moment Correlation was used to test the reliability of the instrument. A reliability coefficient of 0.73 was obtained indicating that the instruments were indeed reliable and suitable to be administered to the sampled respondents. Variables as used in the study were those specified in the objectives of the study. Farmers "perception of climate change was measured as the specific environmental changes occasioned by climate change which farmers are aware of and have acknowledged.

These include reduced soil fertility, disappearance of major cash crops, disappearance of forest and wildlife**,** changes in rainfall pattern, proliferation of disease and pests, proliferation of obnoxious weeds increase in the incidence of drought, unpredictable wind movements, changes in temperature, delays in on-sets of rain, disappearance of wetlands and water resources: all the items where expressed as percentages of the total responses. Farming Activities Sensitive to climate change were equally identified as follows: selection of suitable seed varieties and crops,dates for land preparation and sowing, tilling operations, planting operations, land management activities**,** depth and spacing of seeds, application of manure, pest and disease control weeding activities, crop rotation, packaging, storage and transportation and conservation of livestock feeds: all were equally measured as percentages of the total responses in each of the agro-ecozone.

Climate Change Information based on: Highly Available (HAV), Slightly Available (SAV), Available (AV) and Not Available (NA) where all expressed as percentages. In analyzing data obtained from the field, descriptive and inferential statistics were used. Descriptive statistics like percentages and frequencies were used to describe and present results for objectives one, two, three and four respectively. Inferential statistics like the Pearson Product Moment Correlation to test objective five and the hypothesis that guided the study.

RESULTS AND DISCUSSION

Climate change information available to farmers

Table 1 shows the climate information for agricultural production that is available to farmers in the study area. Table 1 reveals that for scientific weather forecasting, only 20.6% of the respondents indicated that scientific information is available for managing changing weather conditions while 61.1% indicated that it is not available. By implication, scientific weather information is relatively scarce for farmers use in the study areas. On the other hand, Table 1 shows that about 33.3% of the respondents indicated that traditional weather forecasting is highly available for farmers' use, while 28.9% indicated that it slightly available. This may also imply that traditional weather forecasts form the bulk of the climate information used by farmers as noted by Shah and Ameta (2008).

Table 1 further shows that information on changes in temperature is not available as 69.7% of the respondents have indicated. Likewise information on changes in rainfall pattern also shows that about 52.2% of the respondents indicated that it is not available. For seasonal weather changes, 76.1% indicated that it is not available, while 62.7% also indicated that weather information for agricultural planning is grossly not available for farmers' use. Moreover, the study reveals that about

Table 1. Climate change information for agriculture available to farmer in Cross River State.

S/No	Type of information	HAV	SAV	AV	NAV
1	Scientific weather forecasting	10 (2.8)	56 (15.6)	74 (20.6)	220 (61.1)
2	Traditional weather forecasting	120 (33.3)	104 (28.9)	91 (25.3)	45 (12.5)
3	Information on change in temperature	12 (3.3)	56 (15.6)	41 (11.4)	251 (69.7)
4	Information on changes in rainfall pattern	63 (17.5)	42 (11.7)	67 (18.6)	188 (52.2)
5	Seasonal weather changes	43 (11.9)	16 (4.4)	27 (7.5)	274 (76.1)
6	Weather information on agric planning	15 (4.2)	63 (17.5)	56 (15.6)	226 (62.7)
7	Weather calendars	73 (20.3)	96 (26.7)	61 (16.9)	130 (36.1)
8	Suitable crop and seed varieties for a given season	48 (13.3)	101 (28.1)	53 (14.7)	158 (43.9)
9	Dates for land preparation and sowing	79 (21.9)	121 (33.6)	81 (22.5)	79 (21.9)
10	Interpreted weather indices	18 (5.0)	28 (7.8)	42 (11.7)	272 (75.6)
11	Expected dates of the onset and cessation of rain	29 (8.1)	116 (32.2)	73 (20.3)	186 (51.7)
12	Downscaled weather disaster predictions	109 (30.3)	86 (23.9)	72 (20.0)	93 (25.8)

Source: Field survey (2009). N = 360. Figures in parenthesis are percentages. Key: HAV = highly available; SAV = slightly available; AV = Available, NAV = Not available.

Table 2. Sources of climate information in the study area.

S/No.	Source of information	No.	%
1	Ministries of Agriculture	50	13.9
2	River Basin Development	58	16.1
3	Agric Development Projects	68	18.9
4	Meteorological Centres	12	03.3
5	Emergency Response Centres	42	11.7
6	Traditional Weather Forecasting	72	20.0
7	Local Community Agencies	65	18.1
8	Non Governmental Agencies	105	29.2
9	Local Government Authorities	25	6.9
10	Members of the Community	114	31.7

Source: Field Survey (2009). N = 360.

36.1% of the respondents show that weather calendars are not available for farmers' use.

Moreover, Table 1 shows that information on suitable crops and seed varieties for given seasons are not available nor provided as indicated by 43.9% of the respondents. Furthermore, information on dates for land preparation and sowing was noted by 33.6% of the respondents to be slightly available for farmers' use in the area. In addition, information on interpreted weather indices shows that about 75.6% of the respondents indicated that they are not available.Information on the expected dates of the onset and cessation of rain was indicated by 51.7% of the respondents as not being available. However, the table reveals that information on downscaled weather disaster and predictions were indicated by 30.3% of the respondents as being highly available. On the whole, the results indicate that there is a dearth of climate information for agriculture which is necessary to help farmers adapt and respond to the challenges of climate change in Cross River State.

Sources of climate information in Cross River State

Table 2 shows the various sources of climate information for farmers. Table 2 reveals that the Ministry of Agriculture accounts for only 13.9% of information on climate generated for farmers use. While the River Basins Development Authority accounts for 16.1% of weather information for farmers. At the same time, the Agricultural Development Projects (ADP) account for only 18.9% of weather information in the state. Moreover, the table reveals that Meteorological Centres accounts for only 03.3% of weather information that is useful to farmers. This is however true as the only Meteorological Centre in the state is located in the airport, servicing only

Table 3. Channels of climate information dissemination to farmers.

S/No.	Communication channels	No.	%
1	Weather calendars	10	2.8
2	Cropping calendars	116	32.2
3	Slide shows	09	2.5
4	Focus group discussions	105	29.2
5	Booklets	115	31.9
6	Radio	225	62.5
7	Television	248	68.9
8	Newspapers	118	32.8
9	Video documentary	106	29.4
10	Agric extension officers	135	37.5
11	Neighbours	178	49.4
12	Village meetings	222	61.7
13	Town crier	263	73.1
14	Drama plays	16	4.4
15	Script writings	27	7.5

Source: Field Survey (2009). N = 360.

the needs of aircrafts travelling within and outside the airport.The table also reveals that the State Emergency Response Centre (ERC) accounts for only 11.7% of the climate information useful to farmer's needs. The study further reveals that traditional weather forecasters provide about 20% of the climate information needed by farmers. Moreover, local community agencies provide about 18.1% of weather information while Non-Governmental Agencies provides about 29.2% of weather information required by farmers. At the same time, Local Government Authorities only provides 6.9% of weather information relevant to farmer's needs. However, the table reveals that members of the community form the major source of weather information as 31.7% of the respondents have indicated. From this result, it is implied that climate information management – generation, retrieval, collating, storage, processing and dissemination is yet to be fully incorporated into the official schedules of relevant government agencies and this challenge has been identified and reported by the United Nations Framework Convention on Climate Change (2007).

Channels of climate information dissemination to farmers

Table 3 shows the various channels of communicating climate information to farmers in the study area. From Table 3, weather calendars and cropping calendars accounts for only 2.8 and 32.2% of climate information dissemination to farmers. Slide shows containing weather information account for only 2.5%, while focus group discussions with farmers account for 29.2% of the media for disseminating weather information to farmers in the study area. At the same time, weather information from booklets accounts for 31.9% while weather information from radio accounts for 62.5%. This implies that majority of the farmers hear about weather information from the radio. The survey also reveals that the frequency of broadcast is low and usually during network news of the Federal Radio Broadcasting stations and the Nigeria Television Authority (NTA) which takes place during 7.00am every morning and 9.00pm. Though this weather information is not targeted at the farming communities, but the respondents interviewed upheld that information provided guides in planning farming activities. Moreover, the study shows that television also accounts for about 68.9% of weather information, though the information is not directly targeted to farm activities yet it is a useful guide to farm planning. The respondents also indicated that newspapers account for only 32.8% of weather information dissemination channels, while video documentary accounts for only about 29.4%. At the same time, Table 3 reveals that Agricultural Extension Officers (37.5%) serve as channels for climate information dissemination. Neighbours (49.4%) were also indicated as useful channels of climate information dissemination to farmers in rural farm communities. Other channels of weather information dissemination analyzed by the survey shows village meetings (61.5%) as an important channel of information dissemination; town crier accounts for 73.1% being the most important channel indicated by respondents during the survey. Other sources like drama plays (4.4%) and script writing (7.5%) only accounts for a small percentage of the media used by the surveyed communities for weather information dissemination.

Table 4. Problems associated with climate information management in Cross River State.

S/No.	Problem variable	No.	%
1	Inadequate policy framework for addressing climate change	125	34.7
2	Weak institutional capacities	203	56.4
3	Inadequate manpower	116	32.2
4	Inadequate human capacity on climate change issues	138	38.3
5	Inadequate weather information for agric planning.	286	79.4
6	Inadequate extension officers to handle weather information	342	95.0
7	Lack of training for extension staff on climate issues	291	80.8
8	Few meteorological centres in the state	300	83.3
9	Lack of integration of agricultural activities in climate change issues	312	86.7
10	Non incorporation of traditional weather predictions into official weather forecast	325	90.3
11	Inadequate climate data for farm production	296	82.2
12	Lack of awareness on the effects of climate change of agriculture	116	32.2
13	Ineffective climate information dissemination	286	79.4
14	Infrequent weather information dissemination by the media	192	53.3
15	Inadequate disaster information dissemination infrastructure	263	73.1
16	Inadequate personnel to disseminate climate information	206	57.2
17	Lack of specialized training on climate information management	263	73.1

Source: Field Source (2009). N = 360.

Problems associated with climate information management in Cross River State

Table 4 addresses the problems associated with climate information management in the study area. Table 4 shows that inadequate policy framework accounts for only 34.7% of climate change management problems in the state implying that there is an intervention in the area of climate change but with no pragmatic efforts to execute proposed initiatives. This is evident in the state Environmental Summit held in April 2008, where issues of climate change were brought to the fore and the issues raised not implemented. The table also shows that about 56.4% of the respondents indicated that there is a weak institutional capacity to handle the problems of climate change in the study area. In addition, the results reveal that about 32.2% of the respondents indicated that there is inadequate qualified and skilled manpower to handle the issues of climate change information. Furthermore, the survey results show that about 38.2% of respondents indicated that there is inadequate human capacity building programmes on climate change. Also, about 79.4% of the respondents indicated that there is inadequacy of weather information for agricultural planning in the study area while about 95% indicated the relative lack of extension personnel to handle climate change information. Moreover, about 80.8% of the respondents reveal that there are no training programmes for extension staff on climate change issues in the area. The study further reveals that about 83.3% of the respondents indicated that there are few meteorological centres in the study areas to handle weather related indices considered relevant to agricultural production. More so, that about 86.7% of the respondents also indicated the lack of integration of agricultural activities in climate change issues. At the same time, Table 4 reveals that about 90.3% of the respondents agreed that traditional weather predictions are not incorporated into official weather forecasts. Moreover, 82.2% of the respondents attested to the fact there is grossly no climate data for farm activities in the study area. The survey results also show that about 32.3% of the respondents affirmed that there is no awareness created on climate change effects on agricultural production. This low figure however revealed that the majority of the respondents are aware to an extent that climate change impacts on agriculture. At the same time, 79.4% of the respondents indicated the ineffectiveness in climate change information dissemination to farmers in the area, while about 53.3% indicated that the media/channels of communication in the study areas do not disseminate weather information frequently to farmers. Furthermore, the table shows that about 73.1% of the respondents indicated that there is inadequate disaster information dissemination infrastructure, this result shows that the Emergency Response Centre established in the state only focus attention on state security matters while the National and State Emergency Management Agencies and their impacts are not truly felt in rural areas especially in areas of weather forecasts and predictions. About 57.2% of the respondents also indicated that there are actually inadequate personnel to

Table 5. Pearson Product Moment Correlation Coefficient (r) for climate change information and farming activities.

Variables	r	T-cal	T-tab
X – Climate change information Y – Farming activities	+0.7	3.0996	1.812

P < 0.05 significant; Degrees of freedom = 10.

disseminate climate information to rural farmers in the study area. Finally, the survey results indicate that about 73.1% of the respondents agreed that there is lack of specialized training on climate information management for extension personnel working with farmers in rural areas of the study area.

Effects of climate information dissemination on rural farm activities

The effects of climate information dissemination on rural farm activities were determined by testing the null hypothesis using the Pearson Product Moment Correlation Coefficient. In testing the hypothesis, climate change information and farm activities were quantitatively measured at the interval level based on data obtained on weather information sub-station of the meteorological centre. The test of Pearson Coefficient between climate change information dissemination and farming activities in the study area gave a +0.7. The result shows that there is a strong and positive relationship between climate change information dissemination and farming activities, in other words, climate information dissemination positively influences farming activities. Using the t-test, to test the significance of r at 0.05 levels of significance, the result shows that the calculated t-value of 3.0996 was greater than the tabulated or critical t-value of 1.812, at degree of freedom (N-2, that is, 12 – 2), 10, thereby rejecting the null hypothesis. Hence, climate change information dissemination has a significant influence on farming activities (Table 5). In other words, climate change information made available to farmers on time could help farmers adapt and also mitigate adverse weather changes.

CONCLUSION AND RECOMMENDATIONS

Climate change effects on agriculture are obvious. These effects are already noticeable by local farmers who through indigenous and traditional methods are evolving coping and response mechanisms (Shah and Ameta, 2008). If farmers in rural areas are to adapt effectively to climate variability, then knowledge and information on climate becomes essential component of the adaptive process. Several best practices on climate change adaptation have been evolved which have not been brought to the knowledge of local farmers. To address this problem therefore requires that communication channels like the radio, television, posters, script writing, and local media like town crier, village meetings, and local drama among others be mobilized. Most importantly, agricultural extension services are important in terms of training and building capacities of farmers whose livelihoods depends on agriculture and other natural resources. Bahadur and Bhandari (2008) have opined that Integrating agricultural extension and development communication within the entire framework for climate change mitigation will therefore be necessary to achieve far meaningful results that will impact on rural farm communities. Based on the findings of this study, the following policy recommendations were made:

1. Since climate change effects on rural farm activities is highly noticeable, indigenous and local coping measures should be isolated and integrated into international best practices.
2. International best practices on adapting and mitigating climate change effects should be packaged for farmers in rural areas through agricultural extension services.
3. Training of extension personnel on climate issues, coping strategies and response mechanisms should be incorporated within extension training curriculum.
4. Relevant climate change information and database should be developed for dissemination to farmers.
5. Ministries of agriculture and agricultural agencies should develop a database for climate change information and should include climate change information dissemination as part of their line of activities.
6. Traditional weather forecasting techniques should be integrated into scientific weather prediction systems.
7. Capacities of Non-Governmental Organizations to address the issues of climate change, climate change information and dissemination should be carried out through government and international donor support.
8. The need for Interdepartmental Committee on Climate Change (IDCCC) at the states and local government levels involving all relevant agencies and stakeholders including NGOs, CBOs and farmers is necessary to address the problems of the dearth of information on climate change effects on agriculture.

9. Channels of communication like radio, television and print media should enhance their frequencies of information dissemination on climate change issues relevant to farm needs.
10. Traditional communication media like town crier, village meetings among others should be developed and enhanced in the information dissemination of climate change issues.
11. Specialized training on climate change information management should be carried out for communication experts in agriculture.
12. Major weather predictions and disaster information such as flooding, drought among others should be disseminated to farmers promptly to enable them evolve coping techniques.
13. Cropping and weather calendars should be developed by extensionists and disseminated to farmers.
14. Finally, a study to analyze local farmers' response strategies on climate change and its implications for agricultural extension should be carried out.

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