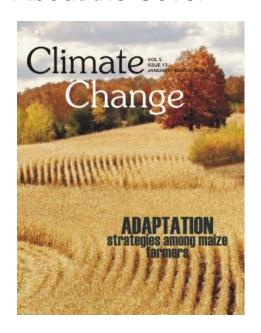# Climate Change

About the Cover

Despite the efforts of both government and non – governmental organizations on recommendation of climate change adaptation strategies to crop farmers, which were aimed at reducing its adverse effects on crop yields, the demand for food is still at an alarming rate, because of the ever increasing population in Nigeria. It is therefore imperative to determine the adoption of climate change adaptation strategies amongst maize farmers in Ogbomosho Agricultural Zone of Oyo State, Nigeria. Multistage Sampling Procedure was adopted in the selection of 111 maize farmers in the zone; data were obtained through structured interview schedule. The data collected were analyzed with frequency distribution, percentage, mean and ranking as descriptive statistical tools, while Tobit regression was used as inferential tool to make inference about variables used in the study. Both male (80.2%) and female (19.8%) have different educational backgrounds, while 34.2% do not have formal education. The mean age and year of farming experience are 47 and 23 years respectively. Most of the respondents (88.3%) have contact with extension agents. Maize farmers adopted different adaptation strategies against the effects of climate change and have different perceptions about the effects of climate change on maize production. Tobit regression analysis revealed that years of farming experience (-1.87*) and extension contact (2.53***) have significant relationships with adoption of climate change adaptation strategies adopted amongst maize farmers, in the study area. Therefore, the needs to improve on extension contact (which is the major source of information available to maize farmers on climate change) and intensification of efforts on extension services, as a whole (which will encourage adoption and application of different climate change adaptation strategies available to maize farmers) were recommended, in order to increase general food production (particularly maize), in the study area, and the State at large. (Ref: Akintonde JO, Tiamiyu AO, Akintaro OS, Gbadamosi SA, Agunloye TO. Adoption of climate change adaptation strategies among maize farmers in Ogbomosho agricultural zone of Oyo state, Nigeria. *Climate Change*, 2019, 5(17), 29-33).

Climate Change & Society

Effects of climate variability on household food availability among rural farmers in central river region-south of The Gambia

Momodou Badjie, Sidat Yaffa, Mamma Sawaneh, Alagie Bah

In The Gambia, over-dependence on rain-fed agriculture for livelihoods increases farmers' vulnerability climate change. For farmers to increase crop production there is the need for them to be aware of climate change and how they can sustainably respond to its variability. This study examines the effects of climate variability on household food security among rural farmers in Central River Region-South of The Gambia. Multi-stage sampling techniques were employed to collect data from 219 farmer household heads through a household survey, focus group discussions and key informant interviews. Descriptive statistics were used to summarize the household information on food security status. The study also used Pearson correlation to establish the relationship between climatic variables and crop production in the study area. The findings indicated that 90% of the farmers obtained food from their own production. Moreover, an overwhelming majority of 75.5% % of the households responded that they faced food shortage and August is the most difficult month to obtain food. As to coping strategies, the majority of the household resort to a combination of strategies to cope with food shortages such as rely on less preferred and cheaper foods, borrow food, or rely on help from a friend or relative, limit meal sizes among others. Therefore, the study recommends Government in collaboration with other stakeholders to clearly outline climate change adaption needs and implementation plans especially for smallholder farmers who depend on rain-fed to improve their climate change knowledge thereby enhancing their adaptive capacity to climate change effects, thus improving household food security status.

Climate Change & Agriculture

Scheduling planting dates to manage drought in the northern lake basin, Kenya: An assessment of annual crop performance during drought in northern lake basin, Kenya

Joab Onyango Wamari

It is generally observed that drought affects various stages of all the crops growth cycles and it was also more advantageous to plant early in the south west and north east rainfall regions but a month later after rainfall onset in the south east rainfall region since the off season rains seem to favour late planting in the last region. Drought stress in the early planted crops in the south east frequently occurs in March interfering with the establishment stages but also the peak phases of some crops as well. Later planting foregoes these drought stress problems with relatively few if any stress problems occurring. In the north east drought may affect the peak and sometimes pre and post peak phases of late planted crops although cassava and potatoes are virtually unaffected by any drought stress in this rainfall region. Late planted long maturing crop varieties perform better than short maturing crops. In the southwest, drought stress is worse in the latter planted crops as compared with early planted ones although both plantings may suffer drought stress from the pre peak phase all the way to the end of the season. Cassava and potatoes have better chances of survival in this rainfall region than any of the other seven crops investigated. These inherent establishment phase stress intensities may however be avoided by planting later in the season. In the south west more crops would suffer intense drought stress of the order of some 40 mm of rainfall deficiency from the pre-peak to post-peak phases. It is recommended that, upland rice (i.e. rice that do not require flooding conditions) can by no means be grown particularly at KadengeYala swamp and Bunyala 's second season where otherwise higher water supplements would be required especially in the peak phases of the crop, plant crops in later in April rather than March in the southeast, plant early in March and apply irrigation schedule particularly in the crop establishment phases, planting should be done as early as possible and it is even more advisable to plant dry about half a month before the onset of the rains especially in the south west, fast-track, and if present expanded low water consuming plants, normally associated with C4 carbon pathway, use root crops such as cassava and potatoes should be enhanced in addition to the usual crops especially in the drier south west rainfall region and initiate irrigation programs to absorb the largely unemployed youthful labor force especially in the south western rainfall region.

Climate Change & Strategy/Policy/Law

Adoption of climate change adaptation strategies among maize farmers in Ogbomosho agricultural zone of Oyo state, Nigeria

Akintonde JO, Tiamiyu AO, Akintaro OS, Gbadamosi SA, Agunloye TO

Despite the efforts of both government and non – governmental organizations on recommendation of climate change adaptation strategies to crop farmers, which were aimed at reducing its adverse effects on crop yields, the demand for food is still at an alarming rate, because of the ever increasing population in Nigeria. It is therefore imperative to determine the adoption of climate change adaptation strategies amongst maize farmers in Ogbomosho Agricultural Zone of Oyo State, Nigeria. Multistage Sampling Procedure was adopted in the selection of 111 maize farmers in the zone; data were obtained through structured interview schedule. The data collected were analyzed with frequency distribution, percentage, mean and ranking as descriptive statistical tools, while Tobit regression was used as inferential tool to make inference about variables used in the study. Both male (80.2%) and female (19.8%) have different educational backgrounds, while 34.2% do not have formal education. The mean age and year of farming experience are 47 and 23 years respectively. Most of the respondents (88.3%) have contact with extension agents. Maize farmers adopted different adaptation strategies against the effects of climate change and have different perceptions about the effects of climate change on maize production. Tobit regression analysis revealed that years of farming experience (-1.87*) and extension contact (2.53***) have significant relationships with adoption of climate change adaptation strategies adopted amongst maize farmers, in the study area. Therefore, the needs to

improve on extension contact (which is the major source of information available to maize farmers on climate change) and intensification of efforts on extension services, as a whole (which will encourage adoption and application of different climate change adaptation strategies available to maize farmers) were recommended, in order to increase general food production (particularly maize), in the study area, and the State at large.

Climate Change, 2019, 5(17), 29-33

Climate Change & Water Resources

Hydro-morphology monitoring, water resources development and challenges for Turag River at Dhaka in Bangladesh

Sazzad Hossain, Md. Ashraful Islam Chowdhury

The Hydro-morphological regime of Dhaka city lies on several connected rivers and channels with extensive inundates flood plain in both side of the river areas. The current study exposed the Hydro-morphological condition and challenges of water resources development for Turag River. The Hydro-morphological data that was used in this study were collected from Bangladesh Water Development Board (BWDB). Arc GIS 10.1 software has been used for map preparation. Tidal flow is dominated at downstream of Turag River and water level varies 1m to 2m with discharge of 124 and 1136 cusec in dry and monsoon period respectively. Morphologically Turag is irregular meandering tide dominated river with sinuosity ration is 1.5. Cross-section of Turag River with different ID 1 to 10, 11 and 12 at different year has been analyzed to investigate the change of thalweg shifting. Major bed level shift has been observed between 2005 and 2014 at cross-section ID-6. For protecting Dhaka city from flood, improve drainage system and environment a 12.5 km embank has been constructed. But the challenges for Turag River to maintain its natural hydro-morphology and water resources development are the population, pollution, industrialization, encroachment and so on. The mighty Turag River is dying and the ecology of this river is now in critical situation. So a sustainable river management is necessary to save the river.

Climate Change, 2019, 5(17), 34-40

Climate Change & Agriculture

The analysis of climate smart agricultural indices on groundnut farming household enterprise in Katsina State, Nigeria

Ekpa D

The current level of poverty in Nigeria is disturbing and climate change impends food security and increases poverty indirectly and directly on individuals or households. Farming households are changing agricultural practices as a result of global observation of climatic and environmental changes. This research work recognised a link which exists between climate change, climate smart agricultural practices (CSAP) and poverty status of farming households in North West Nigeria. The study examined the factors influencing indicators of climate smart agricultural practices on groundnut farming household enterprises in the study area. This is with a view to establishing the consequences of climate variation and its influence on poverty status among rural farmers in North West Nigeria. The multi-stage, sampling techniques was used to select three hundred (300) respondents who provided the relevant primary data for this study through a set of pre-tested structured questionnaires. The data were analyzed with descriptive statistics, Principal Component Analysis (PCA), Ordinary Least Square (OLS) regression model. The regression analysis result showed that age, education and farm size were significant at 1, 5 and 10% respectively. The study recommended that Governmental and farmers' organisations can fashion out a favourable training workshop to inspire the low-users of CSA to improve on their performance. Also, the policies on informal education should be enhanced and enforced in the curriculum to meet the CSAP challenges. Extension delivery system approach should be upgraded to meet the present information age.

Climate Change, 2019, 5(17), 41-47

Determinants of extent of adaptation to climate change by female farmers in Enugu State, Nigeria: a hurdle model application

Ume Chukwuma Otum, Adeosun Kehinde Paul, Ihemezie Eberechukwu Johnpaul

The influence of gender in climate change adaptation among farm households have emerged as a topical issue in the climate change literature, thus, the study examined the determinants of the extent of adaptation to climate change by female farmers. Primary data was used for the study. 80 female headed households were systematically randomly selected from the list of female farmers provided by the community heads and they were interviewed with the aid of semi-structured questionnaire. Hurdle model which consists of probabilistic and truncated negative binomial regression model was used to analyse the data collected. The results from the hurdle model show that farming experience (0.1027) and membership of cooperative (1.1123) significantly influence the probability of female farmers adapting to climate change, while, farming experience (0.0276), squared farming experience (-0.0005) and farm size (0.0144) significantly influence extent of adaptation to climate change among female farming households. Hence, the study recommends that climate change adaptation among female farming households must take on board these three variables. In this regard, adaptation policies and strategies in the area must be validated against these critical factors. Otherwise, current and future adaptation efforts would be compromised.

Climate Change, 2019, 5(17), 48-54

Climate Change & Atmospheric Science

Spatio-temporal Trends of Rainfall and Rainy Days in the Marathwada Region of Maharashtra State

Mandale VP, Jedhe SH, Khadtare MY

Rainfall variability causes serious threats such as flood and drought which has severe impact on crop production, productivity, availability of water and biodiversity. Present study performed spatial and temporal trend analysis of annual and monthly (June to October) rainfall and rainy days in the Marathwada region of Maharashtra state. District-wise trend analysis of annual and monthly rainfall and rainy days were carried out by using non-parametric Mann-Kendall and Sen's slope test with 90 per cent, 95 per cent and 99 per cent confidence level. Results revealed that, annual rainfall showed non-significantly decreasing trend in most of the districts except Parbhani which was decreased significantly in the region. Rainfall during June month was reduced significantly in Jalna, Beed, Osmanabad, Latur and Parbhani district, whereas it was also dimming during August month in Parbhani and October month in Osmanabad district. Rainy days in the region did not evinced any significant change except during June month in the Nanded district which was decreasing significantly.

Climate Change & Agrometeorology

Rainfall and drought characteristics for crop planning in Plain zone of Chhattisgarh

Rajesh Khavse, Chaudhary JL

Daily rainfall data of 55 years (1960-2015) of Raipur district of Chhattisgarh have been considered to analyse the long term average and its temporal variability on weekly, monthly, seasonal and annual basis. The average annual rainfall at Raipur was 1158 mm with 29 per cent coefficient of variation indicating thereby that the rainfall was not much stable over the years. July was the highest rainfall recipient month (616 mm) followed by August (519 mm) during the monsoon period. Trend analysis on rainfall of past 55 years exhibited a decreasing pattern of 8.33 mm and 7.04 mm per year in annual and kharif season rainfall, respectively. Agricultural drought was most frequently observed in early (23-26 SMW) as well as late (37-40 SMW) stages of kharif crops. Meteorological droughts of different intensities, *viz.*, no drought, moderate drought and severe drought over the observed periods showed that station is prone to mild-moderate type of drought. Short duration, low water requiring but high value crops like maize, pulses, oilseeds and some vegetables can be opted for this region to minimize the production risk.

Climate Change & Atmospheric Science

PDF based seasonal changes in AgMERRA observations and GCM20 and RegCM4.3 projections over Pakistan Region

Burhan A, Athar H

Using recently published reanalysis dataset viz. Agriculture Modern-Era Retrospective Analysis for Research and Applications (AgMERRA), the present study has made use of Probability Density Functions (PDFs) to evaluate changes in mean, standard deviation, skewness and kurtosis of the two basic climate variables (mean temperature and mean precipitation) on seasonal basis in vulnerable and data sparse region of Pakistan. The historical (1980–1998), present and near future (2008–2025), and far future (2080–2098) climate datasets of a super high resolution GCM viz. GCM20 (20 Km horizontal resolution, A1B scenario), and of a high resolution RCM viz. RegCM4.3 (25 km horizontal resolution, RCP8.5 scenario) are used to construct the PDFs to assess probable changes in their statistics and to asses range of associated uncertainties. The AgMERRA dataset indicates that ninetieth percentile has increased (DJF = 0.50°C) in 1990–1998 DJF daily mean temperature relative to 1980–1989 DJF daily mean temperature. For JJAS seasonal mean precipitation, the AgMERRA dataset shows relative decrease in the ninetieth percentile (JJAS = –1.8 mm/day).The GCM20 (RegCM4.3) has shown a 2.1°C (4.7°C) warm shift in the ninetieth percentile of DJF daily mean temperature in 2008–2016 projection period relative to 1990–1998 baseline period. Moreover, the GCM20 (RegCM4.3) suggests a substantial JJAS mean precipitation increase of 9.0 mm/day (29.2 mm/day) in the ninetieth percentile for the 2008–2016 projection period.