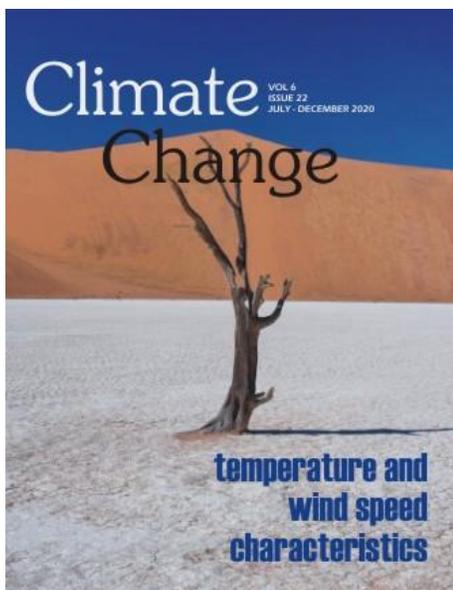


Climate Change

About the Cover



The study analysed trend in temperature and wind speed characteristics over Fidi area of Makurdi Local Government Area of Benue State. Temperature and wind speed data for Makurdi synoptic weather station for a period 30 years (1986 and 2015) were acquired from Nigerian Meteorological Agency, Oshodi, Lagos. Least Square Regression model was used to analyse trend, while Student's 't' Test statistics was to determine the significance of the trends at 0.05 degree of confidence. Mean, standard deviation and coefficient of variation were also employed in data analysis. The result shows that the variation in mean minimum, maximum and mean temperatures over Fiidi area of Makurdi indicates slight negative trends which are not significant at 0.05 confidence level. The result further shows that temperatures in Makurdi have periodicity of ten (10) years which means that Makurdi usually go through cooling and warming phases in cyclic pattern of ten years with maximum temperatures currently upward oscillation (warming phase) after a downward oscillation of just six years instead of the usual 10-year periodicity. The result generally showed that wind speed in Fiidi, Makurdi varied seasonally during the study period with the months of December – April which constitutes dry season in Makurdi having high wind speed with the highest wind speed of 5.78m/s occurring in the month of April, while the lowest wind speed of 3.52m/s on average occurred in the month of October. Annually, result generally indicates a sharp declining trend in the wind speed in the study area during period with yearly decreasing rate of 0.0485m/s. Wind speed showed greater degree of variability than temperature characteristics. Consequently, the study recommends tree planting so as to ensure moderate temperature that would enhance physiological comfort of the inhabitants. (Ref: Monday Akpegi Onah, Sunday Akuratse Akuratse, Peter Saater Anjember. Trend analysis of temperature and wind speed characteristics over Fidi area of Makurdi, Benue State, Nigeria. *Climate Change*, 2020, 6(22), 168-176).

Trend analysis of temperature and wind speed characteristics over Fidi area of Makurdi, Benue State, Nigeria

Monday Akpegi Onah, Sunday Akuratse Akuratse, Peter Saater Anjember

The study analysed trend in temperature and wind speed characteristics over Fidi area of Makurdi Local Government Area of Benue State. Temperature and wind speed data for Makurdi synoptic weather station for a period 30 years (1986 and 2015) were acquired from Nigerian Meteorological Agency, Oshodi, Lagos. Least Square Regression model was used to analyse trend, while Student's 't' Test statistics was to determine the significance of the trends at 0.05 degree of confidence. Mean, standard deviation and coefficient of variation were also employed in data analysis. The result shows that the variation in mean minimum, maximum and mean temperatures over Fidi area of Makurdi indicates slight negative trends which is not significant at 0.05 confidence level. The result further shows that temperatures in Makurdi have periodicity of ten (10) years which means that Makurdi usually go through cooling and warming phases in cyclic pattern of ten years with maximum temperatures currently upward oscillation (warming phase) after a downward oscillation of just six years instead of the usual 10-year periodicity. The result generally showed that wind speed in Fidi, Makurdi varied seasonally during the study period with the months of December – April which constitutes dry season in Makurdi having high wind speed with the highest wind speed of 5.78m/s occurring in the month of April, while the lowest wind speed of 3.52m/s on average occurred in the month of October. Annually, result generally indicates a sharp declining trend in the wind speed in the study area during period with yearly decreasing rate of 0.0485m/s. Wind speed showed greater degree of variability than temperature characteristics. Consequently, the study recommends tree planting so as to ensure moderate temperature that would enhance physiological comfort of the inhabitants.

Climate Change, 2020, 6(22), 168-176

Climate Change & Agriculture

The impacts of shade trees on fodder and food crops integrated with or without coffee farming system in times of climate change: brief review

Miftah Fekadu, Yunusa Isa

Shade trees can be planted either as wind breaks, woodlots or scattered individuals to buffer outdoor environmental conditions for crops and livestock. The aim of this paper is to summarize the current understanding of the use of shade trees on fodder, food and coffee farms, and identify research gaps in Africa. Shade trees influence agricultural productivity by altering microclimates, mulching the soil, altering heat exchange, conserving soil and providing substrate for soil arthropods. Shade trees also improve the health and biodiversity status of agricultural landscapes. The productivity of coffee under shade trees is optimal with improved carbon dioxide assimilation and better quality of beans. However, farmers are reluctant about shade trees because of arboreal wild animals' and allelopathy. Although there is a general awareness of the negative and positive impacts of shade trees, minimal attention has been given to develop targeted strategies of planting shade trees by smallholders. Benefits of shade trees on coffee farms have been inconsistent in low input small scale farms, while limited investment is made to improve adoption and management of shade trees, which are highly needed in drylands, especially in times of climate change. Shade trees are removed where annual crops are planted. Actually, effective shading need to minimize competition and this can be achieved with deciduous trees that have thin and small leaves like *Acacia albida*. Since the majority of farmers in rural areas of Africa are poor, smallholder, and less educated, there should be extensive training on shade tree species selection and management.

Climate Change, 2020, 6(22), 177-185

Climate Change & Pollution

Advection and its applications: Trajectories over Busia County in Kenya

Juma GS, Nebert Kituni, Makokha JW

Advection is defined as a conservative transport of a substance by bulk motion. The substances include pollutants, enthalpy or any material that contains thermal energy. This paper introduces the concept of advection as applied in air pollution modelling of possible pollutants using Hybrid Single Particle Lagrangian Integrated Trajectory Model (HYSPLIT). A three dimensional (3-D) advection equation is specified and a graphical output of a forward air trajectory given over Busia County. The study reveals transboundary flow of air pollutants to the Eastern parts of Uganda and across counties in Western, Central, Rift valley and Eastern

Kenya respectively. An intercounty environmental monitoring policy framework is recommended in this study due to the transcounty nature of air pollution issues.

Climate Change, 2020, 6(22), 186-190

Climate Change & Agriculture

Understanding Farmers' Vulnerability to Environmental Change in Semi-Arid Region: A Key to Agricultural Sustainability

Jude Nwafor Eze, Patience Chinyelu Onokala

The study assessed the extent of farmers' vulnerability to environmental change in the semi-arid region of Nigeria. The research seeks to proffer a solution to farmers' vulnerability to environmental change and promote Agricultural sustainability in the face of climate change in dryland areas. The study classified biophysical and socio-economic indicators of vulnerability into exposure, adaptive capacity, and sensitivity to determine the level of farmers' vulnerability to environmental change, which is important to agricultural sustainability. The study adopted a survey design and the method utilized for the study was a questionnaire administered to 400 farmers in the study area. The levels of farmers' vulnerability identified in this study were 4. The vulnerability levels identified include very high with a mean index of 1.20, high with a mean index of 2.44, low with a mean index of 4.00, and very low with the mean index of 6.94. Thus, the extent of farmers' vulnerability to environmental change could be attributed to the availability of infrastructural facilities which is more in some areas than the other. The availability of infrastructural facilities which drives economic growth in the study area, enhance the coping capacity of the farmers to environmental change. Consequently, there is a need to integrate adaptation options into the community development process for Agricultural sustainability. These measures are poverty reduction, good agricultural practices and development of cattle ranches.

Climate Change, 2020, 6(22), 191-200

Climate Change & Adaptation/Mitigation

Determinants of Climate Change Adaptation Strategies among Farmers in Borno State, Nigeria: Multinomial Logit (MNL)

Approach

Mohammed D, Onu JI, Jongur AUU

The study assessed climate change adaptation strategies and their determinants among smallholder farmers in Borno State, Nigeria. The study was conducted in Sudan savannah and Guinea savannah Agro-Ecological Zones (AEZ) of the State. Multi-stage sampling procedure was used in selecting 360 smallholder farmers for the study. Both descriptive statistics (percentages; frequencies, means); and inferential statistics (multinomial logit regression) were used to analyze the data. Findings revealed that in both AEZs, farmers adapt to climate change through various farm level practices. These adaptation strategies however, vary slightly among the two AEZs. The adaptation strategies practiced by respondents in Sudan AEZ were multiple cropping (98.9%), early planting (63.9%), mulching/use of cover crops (36.1%) and increased fertilizer application (25.00%). In Guinea AEZ, the most widely used adaptation strategies include multiple cropping (93.30%), use of new crop varieties tolerant to new climate regime (72.20%), increased application of fertilizer (47.20%) and application of chemical (25.00%). Result of marginal effects derived from multinomial logistic regression estimate revealed that variables such as farm experience, household size, farm size, perceived change in temperature, perceived change in rainfall, dry spell experience and access to information on climate change were found as the major factors influencing the choice of adaptation strategies been practiced by respondents. The study concludes that farmers adapt to the menace of climate change using different strategies. It is recommended that adaptation materials such as improved crop varieties, fertilizers and chemicals should be provided to farmers at subsidized rate in order to increase farmer's capacity to adapt.

Climate Change, 2020, 6(22), 201-211

Climate Change & Environmental Science

Estimating the impact of climate extremes and their future projections over drought prone regions of Punjab, Pakistan

Khurram Riaz, Burhan Ahmad, Syed Ahsan Ali Bukhari, Tahir Khan

Climate change is unequivocally altering natural systems and impacts on drought prone regions of Pakistan. Extreme climate often has a substantial impact on agricultural production. The Punjab province is the primary food production region of Pakistan. Over the time it has become increasingly sensitive to alternating extremes like droughts and floods. Current study provides an outlook of

Coupled Model Intercomparison Project Phase 5 (CMIP5) in simulating climate extremes indices defined by the Expert Team on Climate Change Detection and Indices (ETCCDI) for historical (1850-2005) and future periods (2020-2100) under two representative concentration pathways (RCPs) 4.5 and 8.5 across Punjab districts. Changes generally present relatively larger magnitudes under RCP8.5 than RCP4.5. Projected ensemble results show a significant increase in summer days over Rajanpur and DG Khan Districts. Additionally, significant increases in warmest days and nights are seen widespread over central Punjab districts. The precipitation related indices are reported to significantly increase over the district of Narowal. Meanwhile, the districts of the Western belt are likely to experience more drought events with increasingly warming temperatures. The study findings indicate that the projections of precipitation-based indices are closer to historical patterns with smaller variability and changes in the future period, while temperature-related extreme indices show significant shifts and increases along the projections. It would result in drought frequencies to recur with similar patterns of the historical period, but with augmented warmer climate in the RCPs forced future climate over the Punjab province. This study provides complementary information of climate extremes over Punjab province for local decision-makers to incorporate into policymaking, disaster management, and infrastructure planning.

Climate Change, 2020, 6(22), 212-227