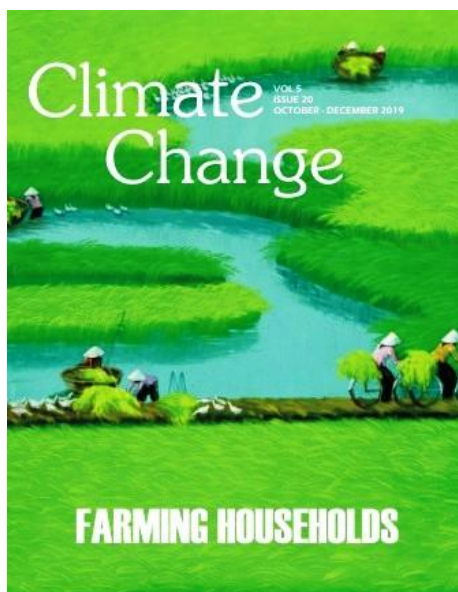


# Climate Change

## About the Cover



The study assessed gender analysis of climate change adaptation of food crop farmers in Saki-Agricultural zones of Oyo state, Nigeria. A total of 104 males and 72 females) food crop farmers were sampled. Frequency counts, percentages, weighted mean and ANOVA were used in analyzing data. Fewer males (31.7%) than females (61.1%) had no formal education. Average farm size was 2.8 and 2.4 hectares for male and females, respectively. Respective average ages were 52 and 51 years. Most important constraints to climate change adaptation of both men and women were high cost of farm inputs, destructive activities of the herdsmen and inadequate early warning information. Male and female farmers did not differ in the level of constraints to climate adaptation. Men employed ridges across the slope ( $F = 8.828$ ) and fallow system ( $F=8.828$ ) more significantly than women. There is however no significant difference between male and female level of climate change adaptation. Agricultural inputs should be made available by the government to both male and female farmers at subsidized rates, while women should have better access to land. (Ref: Olutegbe NS. Gender analysis of climate change adaptation of food crop farming households in Saki-Agricultural zone of Oyo state, Nigeria. *Climate Change*, 2019, 5(20), 228-234).

## Climate Change & Adaptation/Mitigation

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### **Gender analysis of climate change adaptation of food crop farming households in Saki-Agricultural zone of Oyo state, Nigeria**

Olutegbe NS

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*Climate Change*, 2019, 5(20), 228-234

## Climate Change impacts (Sea-level rise)

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### **Characterization of climate change manifestation in Nigeria coastal community**

Ibrahim Adeniran, Otokiti Kolade Victor

The impact of Climate change on the coastal regions of the world is unprecedented especially as it relates to sea level rise which stimulates coastal flooding and the submergence of several coastal communities. However, Nigeria coastal communities are characterized with various climate change manifestations with different magnitudes and severity. Using Ayetoro community in Ilaje Local Government Area in Ondo state as case study, a GIS and Remote Sensing model was built to determine the land area to be inundated in the study area in a scenario of 0m, 1m and 2 meters sea level rise using the Digital Elevation Model of the area. Results show that 1.08% (19.05km<sup>2</sup>), 4.71% (83.03km<sup>2</sup>) and 12.68% (223.63km<sup>2</sup>) of the total land area would be inundated at 0-meter, 1-meter and 2-meter sea level rise scenarios respectively. The implication of this there is need to make provision for these region that is likely to be affected by these sea level rise scenarios so as to minimize the resulting damage.

*Climate Change*, 2019, 5(20), 235-244

## Climate Change & Forestry

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### **Women utilisation of forest resources and its influence on climate change in selected forest reserves in Osun State, Nigeria**

Asifat Janet Temitope, Ogunbode Timothy Oyebamiji

Women dependence on forest resources as their major source of energy especially in the developing nations has environmental consequences. Thus, a research was conducted to assess the environmental effects of women utilisation of forest resources in 5 Forest Reserves (FR) in Osun State, Nigeria. The data was generated through the administration of 500 questionnaires across five settlements within each FR. Analysis was carried out using descriptive statistics. The results showed that about 90% of the women depend solely on firewood as their source of energy while more of live branches in the forest were collected (19%) than dry woods. The study further revealed that most women (84%) in the study areas were not aware of climate change scenario and so were not concerned about replanting the trees. All the findings were corroborated by the results of the in-depth interview. The implications of the findings are that more of forest resources were exploited and without replacement, the scenario which result into environmental degradation. Other sources of energy such as cooking gas, kerosene need to be made affordable and accessible to the rural women. Further studies may consider the attitude of rural women to other sources of energy.

*Climate Change*, 2019, 5(20), 245-252

## Climate Change & Carbon

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### **Contribution of coconut trees (*Cocos nucifera*) in biomass and carbon store and its' role in improving livelihood of small scale farmers of coastal areas of Tanzania**

Adili Y Zella, Yohana Lawi

Global warming and climate change are growing environmental concerns that are resulting from the accumulation of greenhouse gases such as carbon dioxide (CO<sub>2</sub>) in the atmosphere as a result of human anthropogenic activities. The CO<sub>2</sub> concentration in atmosphere increased from 280 ppm at the beginning of the industrial revolution to 368 ppm by the year 2000 and is projected to increase to 540 ppm by 2100. Land-use change and deforestation is responsible for about 25% of all greenhouse emissions. As international agreements over greenhouse gas emissions and global warming are negotiated, there is growing interest in the possibility of reducing the increase in the amount of CO<sub>2</sub> in the atmosphere through forest-based carbon sequestration project. Forests sequester and store more carbon than any other terrestrial ecosystem and are important climate change mitigation. Carbon sequestration has been globally emerged as a potential profitable business, which is oriented to socioeconomic development and environmental amelioration. However in East Africa including Tanzania, this carbon sequestration business considered some categories of forests, trees farming and trees species. There is a growing concern of some homestead forestry which grown for food and income purposes but have variety of outputs that have both production and service values including aesthetic and ecological benefits. This study concentrates on contribution of coconut trees (*Cocos nucifera*) in biomass and carbon store and its role in improving livelihood of small scale farmers in coastal areas of Tanzania through carbon market. Archive data was analysed to get the intended output. Results indicates coconut trees to have biomass stocks of 10, 818, 072.1 tons and 2, 466, 520.5 tons equivalent to 101, 689.9 tons and 23, 185.29 tons of carbon stocks producing accrued profit amounted amount of US\$ 406, 759.5 and US\$ 92, 741.17 if adapted REDD+ strategies in coastal areas of mainland Tanzania and Zanzibar islands respectively. The study concludes that coconut trees have both ecological and socio-economic benefits. It is suggested that, production, productivity and sustainable utilisation of coconut trees should be emphasized.

*Climate Change*, 2019, 5(20), 253-260

## Climate Change & Agrometeorology

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### **The effect of a warm summer on grapevine growth in southern Finland – Short report**

Karvonen Juha

Throughout Northern Europe and southern Finland, summer 2018 was exceptionally warm and long. In the Helsinki region, the grapevines 'Rondo' and 'Zilga' were mature for harvesting on September 8. The Huglin Index 1521 was 90% and the Amerine-Winkler Index 904 was 47% higher; the growing season was over three weeks longer than the average of the years 1952 – 2017. It would have allowed many pure *Vitis vinifera* varieties suitable for cool wine-growing regions to grow.

*Climate Change*, 2019, 5(20), 261-263

## Climate Change & Atmospheric Science

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### **Assessment of inter-seasonal, inter-annual and intra-annual variability in snow and rainfall recharged fresh water discharge under IPCC AR5 based climate change scenarios: A case study of Soan river basin, Potowar region, Pakistan**

Muhammad Usman, Burhan Ahmad, Syed Ahsan Ali Bukhari

Apart from being one of the most important natural resources, freshwater resources are also highly vulnerable to climate changes, especially over the past century, on global and regional levels. Freshwater resources in Pakistan are extremely exposed to climatic changes, and especially the semi-arid basins are susceptible to hydrological implications of climate change. This study aimed to investigate the variations in freshwater resources of the semi-arid Soan River Basin (SRB) under changing climate scenarios till mid of the twenty first century. In the present study, state of the art, conceptual, semi-distributed, lumped hydrological model, Hydrologiska Byrans Vattenavdelning (HBV) light, a modified version of the HBV model was implemented to simulate projected flows of two sub-catchments of the SRB namely, the Sihala sub-catchment (SSC) and the Kani sub-catchment (KSC). HBV-light is calibrated for the time period (1984–2008) and validated for (2009–2017) for both the sub-catchments of the SRB. HBV-light exhibited good performance both during calibration and validation for both the sub-catchments of the SRB. After calibration and validation, the hydrological model was induced with future climate projections data of the Swedish Meteorological and Hydrological Institute Rossby Centre Regional Atmospheric Model (SMHI RCA4), forced with the two Representative Concentration Pathways (RCPs), i.e. the RCP 4.5 and RCP 8.5 to simulate projected flows of the (SRB) for the time period (2018–2047). Climate changes in the future suggest warming under both the RCPs and a significant increase in precipitation amount (yearly and seasonal basis, while decrease and increase could be seen for monthly basis), and an increase in evapotranspiration (but the magnitude of change in

precipitation outweigh the change in evapotranspiration). Mean annual flows of the SSC showed an increase of 467% (593%) and an increase of 270% (316%) for KSC under the RCPs 4.5 (8.5). A decrease of up to 39% and 29% is projected under RCP 4.5 for spring transitioning months for both sub-catchments and a decrease of up to 41% for winter months under RCP 8.5 for the SSC. Highest increase amongst all the seasons is projected for the summer season in the SSC under both the emission scenarios. However the winter flows seems to decrease under the RCP 8.5. Overall an increasing pattern could be observed for the rest of the seasons. This study would be beneficial for multiple stakeholders and sectors including water resource managers, agriculture, hydropower generation, and socioeconomic development.

*Climate Change*, 2019, 5(20), 264-326

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### **Use of the Standardized Precipitation and Evapotranspiration Index (SPEI) from 1950 to 2018 to determine drought trends in the Senegalese territory**

Cheikh Faye, Manuela Grippa, Stephen Wood

The management of water resources in our states has become increasingly difficult in recent times because of the frequency and intensity of droughts. In the context of climate change, extreme weather and climate events such as floods and drought, which are increasingly occurring, have a negative impact on the socio-economic development of the Senegalese territory. In this study, the Standardized Precipitation and Evapotranspiration Index (SPEI) was applied to characterize drought conditions in Senegal between 1950 and 2018. The SPEI was calculated from precipitation and temperature data for different periods of time accumulation. Based on the SPEI, multi-scale models, trend and spatio-temporal extent of drought were evaluated, respectively. The results explicitly show a tendency to dry out Senegalese territory. The average SPEI values at five time scales all decreased significantly. Some moderate and severe droughts were recorded after 2005 and have even been aggravated. In examining the spatio-temporal extent, the aggravating condition of the drought has been revealed. To study the performance of SPEI, a correlation analysis was performed between the SPEI and the standardized precipitation index (SPI). The results showed that SPI and SPEI correlations were approximate and that SPEI could better monitor soil moisture than SPI in months with a significant increase in temperature.

*Climate Change*, 2019, 5(20), 327-341

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### **Climate Change in Bangladesh: a closer look to temperature and rainfall data**

Kazima Khatun, Md. Sahadat Hossain, Md. Humayun Kabir, Ahmad Kamruzzaman Majumder

Bangladesh is identified as being at specific risk from climate change due to its exposure to sea-level rise and extreme events and concentrated multidimensional poverty. Bangladesh's population is at risk of sea-level rise which is predicted to grow to 27 million by 2050. The country has a sub-tropical humid climate characterized by wide seasonal variations in rainfall and moderately warm temperature and high humidity. The broad aim of this research is to analyze the temperature and rainfall dynamics of the Bangladesh during the period from 1091 to 2015 and future trends of temperature and rainfall pattern till 2050 through ARMA model and CMIP5 model. This research has been carried out on the basis of secondary data. Temperature and rainfall data recorded at different metrological stations over the time period 1901-2015 were used to assess recent changes in the climate of Bangladesh. The results depict that temperature is increasing day by day whereas precipitation reducing. The result also shows that the climate change and global warming is currently happening in Bangladesh and in 2050 the scenario of country will be worse. This research analyzes the temperature and rainfall dynamics of Bangladesh that would be helpful for planning in climate change mitigation and adaptation.

*Climate Change*, 2019, 5(20), 342-349

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## **Climate Change & Agriculture**

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### **Assessment of climate change variables affecting cassava production in Nigeria**

Nwakor FN, Adiele-Ezekiel C, Mbanaso EO, Asumugha GN

Climate change is a global challenge affecting agricultural production, Climate change affect cassava production in diverse ways. Total amount and variability of rainfall and the poor deteriorating nature of most Nigerian soil are causing low yields among cassava farmers which consequently result to hunger, poverty, malnutrition and diseases outbreak. The study was conducted in Nigeria to assess the Climate Change variables affecting cassava production among farmers in Nigeria. Both primary and secondary data were used for the study. They were collected from NRCRI umudike and other individual publications. The result shows that climate change had impacted negatively on cassava production. Adaptation of cassava to climate change during production and post harvest activities and the diversification of livelihood sources through the use of different farming methods and improved agricultural

practices will help to increase production in the phase of climate change. Examples are establishment of forestry, planting of improved and disease resistance crop varieties, addition of value into agricultural products and post harvest activities for climate change adaptation and sustainable development.

*Climate Change*, 2019, 5(20), 350-356

## Climate Change & Adaptation/Mitigation

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### **Indigenous technologies for adaptation to climate change by crop farmers in Ogbia local government area of Bayelsa state, Nigeria**

Ezekiel PO, Nnah MB

This study investigated indigenous technologies for adaptation to climate change by crop farmers in Ogbia Local Government Area of Bayelsa State. Specifically, the study assessed the socio-economics characteristics of crop farmers, farmers' awareness to climate change, indigenous technologies employed by crop farmers and constraints to adaptation practices. A simple random sampling technique was used to select two hundred (200) respondents for the study. Data collected from the respondents through questionnaires were analyzed using descriptive statistics (simple mean and percentages). Results obtained from the study showed that farmers in the study area were mostly male, with a mean age of 42.2 years. Major climate related constraints observed were increasing hotness, increasing flood, coastal erosion, rise in sea level, early arrival of rain, late arrival of rain, incidence of drought, unpredictable rain, low rainfall intensity, drying of rivers, streams and lakes, high wind speed, provenance of pests and diseases, high rate of weed growth, premature ripening of fruits and low crop yield. Indigenous technologies employed by farmers in Ogbia local government area of Bayelsa State for climate change adaptation are early planting of crops, use of early maturing crop varieties, employing mixed cropping, use of climate tolerant varieties, mulching of farms, application of organic manures, reduction of farm size, use of zero tillage, diversification into off-farm activities, and clearing the land during flooding. It is therefore recommended that relevant bodies should from time to time hold seminar and workshop in the study area on the issue of climate change, disseminate information early on climate change issues, empower farmers by granting them loan and credit facilities as well as provision of early maturing and climate change tolerant crop varieties. It is further suggested that Extension Workers regularly visit farmers to ascertain their challenges so as to prepare them ahead of time.

*Climate Change*, 2019, 5(20), 357-365