

ABSTRACT

Challenges brought on by climate and land use changes have a negative impact on food security in a variety of ways. These changes have impacts on ecosystem products and services leading to migration of people, particularly rural residents. In order to evaluate the impacts of climate and land use changes in the selected States of the North Central Region of Nigeria (Niger, Kwara, and Benue), as well as their consequent impacts on migration and food security in these areas, this study used NASA Power Data, multispectral satellite remote sensing, net migration data, crop yields data, expert interviews, focus group discussions, and household survey (structured questionnaire) methods. The spatio-temporal changes in climate parameters (minimum, maximum, and average temperatures; and rainfall) between 1985 and 2020 were assessed using the Mann-Kendal test and non-parametric test. Landsat images were utilised to extract remote sensing data and images for 1990, 2000, 2013, and 2020. The link between the climate parameters, net migration and crop yields (maize, yam, cassava, rice, and groundnut) was investigated using regression analyses. The focus group discussion, expert interview, and questionnaire were all analysed using descriptive statistics. The results indicated an upward trend in the annual temperature of Niger ($p < 0.0001$, $\alpha = 0.05$, $Q = 0.059$) and Benue ($p < 0.0001$, $\alpha = 0.05$, $Q = 0.044$) and downward trend in the annual rainfall of Niger State ($p = 0.006$, $\alpha = 0.05$, $Q = -14.324$) and Benue State ($p = 0.010$, $\alpha = 0.05$, $Q = -11.661$) but no significant trend in both temperature ($p = 0.099$, $\alpha = 0.05$, $Q = 0.012$) and rainfall ($p = 0.902$, $\alpha = 0.05$, $Q = -0.328$) of Kwara State. The results of Land Use and Land Cover (LULC) of the areas between 1990-2020 show that the majority of the vegetation, agricultural land, and water body areas have been converted to built-up areas and barren land in Kwara and Benue States, whereas there has been a noticeable rise in agricultural land (45.29 per cent increase) and built-up areas (4.41 per cent increase) in Niger State. Furthermore, in Niger State, there was a statistically significant negative relationship between maize yields and temperature ($p = 0.0294$, $\alpha = 0.05$, $t = -2.4469$, $R^2 = 0.417$) while there was a statistically insignificant relationship between temperature and other crops. There was a statistically insignificant relationship between average annual temperature and all the five food crops in Kwara State. Also, in Benue State, there was a statistically significant positive relationship between temperature and groundnut ($p = 0.0119$, $\alpha = 0.05$, $t = 2.924$, $R^2 = 0.310$) but statistically insignificant relationship between temperature and other crops. In addition, there was a statistically significant positive relationship between rainfall and maize yields ($p = 0.00036$, $\alpha = 0.05$, $t = 4.779$, $R^2 = 0.0217$) and cassava yields ($p = 0.0112$, $\alpha = 0.05$, $t = 2.951$, $R^2 = 0.218$) in Niger State and there was also a statistically significant positive relationship between rainfall and maize yields ($p = 0.0405$, $\alpha = 0.05$, $t = 2.274$, $R^2 = 0.0360$) and cassava yields ($p = 0.0326$, $\alpha = 0.05$, $t = 2.392$, $R^2 = 0.0472$) in Kwara State but a statistically insignificant relationship between rainfall and other crops in these two States whereas in Benue State, there was a statistically significant positive relationship between rainfall and maize yields ($p = 0.000216$, $\alpha = 0.05$, $t = 5.0674$, $R^2 = 0.4073$), cassava yields ($p < 0.00001$, $\alpha = 0.05$, $t = 24.5975$, $R^2 = 0.34016$) and rice yields ($p = 0.000613$, $\alpha = 0.05$, $t = 4.48553$, $R^2 = 0.1532$) but there was a statistically insignificant relationship between rainfall and other crops. These findings imply that climate change and land use change have caused the increase in rural-urban migration leading to the fluctuation in the yields of the five crops. Changing of farming methods, income diversification, supports from external bodies, and change of profession were all mentioned by respondents as sustainable adaptation strategies that help them to reduce the negative impacts of climate change, land use change, and migration. It is recommended that the relevant stakeholders should provide adequate weather forecasts, climate smart technologies and an attractive environment to boost agricultural production and reduce rate of rural-urban migration.

Keywords: Climate Change, LULC, migration, food security, farmers, North Central Region of Nigeria