

Increasing crop yields under climate change scenarios in Nigeria.

Popular summary

There is clear and proven evidence that the Earth's climate is warming, this has now been shown in many ways, but the clearest evidence comes from widespread and global thermometer records. These rises in temperature have huge impacts on an ecosystem level and even alter how plants grow. This research focusses on the latter, looking at how crop growth, and thus crop yield, will be affected by increasing temperatures, and also increasing levels of CO₂. The area of study is Nigeria, which, along with other countries on the continent of Africa, will experience greater average temperature increases and thus more adverse climate affects. Furthermore, in Nigeria agriculture is not so industrialised like in other countries and farmers tend to grow food in order to feed their families – therefore they are more likely to be negatively impacted if climate reduces crop yields. Regardless of whether yields are increasing or decreasing, the population in Nigeria is rising and more food will be needed to feed that population. The second area of research focusses on finding the most efficient farming management strategy to do this. Given that policy changes have scope to impact the amount of CO₂ emissions released into the climate, and therefore change the extent of climate warming which will occur, two different emissions scenarios were modelled: one which follows the idea that policy changes will result in less emissions being released and one which follows an every day scenario, where CO₂ emissions continue to increase at the present day rate.

What this study found is that, firstly, crop yields are increasing in Nigeria across both emissions scenarios. The time frame studied was 1986 to 2100, and the crop species studied were wheat, maize, sorghum, and pulses: all of which showed an increase in yields up to the year 2100. Three key management strategies were studied alongside a control scenario: the use of cover crops between seasons, using irrigation instead of just relying on rainfall, and adding extra nitrogen to the soil as fertiliser. All crop yields increased more when these were implemented than when none were used. However, Nigeria has different climates, categorised as agroecological zones, and therefore it has different quantities of rainy and dry days depending on the agroecological zone. Therefore, some strategies, such as additional nitrogen, are more effective in the East where it is cool and humid, whereas irrigation is more effective in the North where it is warm and dry. In general, crop yields were highest in the north and lowest in the south of Nigeria, with the exception of pulse crops where the opposite

was true. Overall, however, across all climates in Nigeria, additional Nitrogen was repeatedly the most effective strategy to increase crop yields. This research highlights the importance of using management strategies to increase food production for Nigeria in the face of climate change.

Key words

Physical Geography, Agriculture, Climate Change, Crop Yields and Management Strategies