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Impact of climate change and adaptation strategies on crop production in Nigeria

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The vulnerability of agricultural to climate change is of particular interest to policy makers because the high social and economical importance of agriculture sector in Nigeria, which contributes approximately 40 percent to total GDP and support 70 percent of the population.
It is necessary to investigate the potential climate change impacts in order to identify specific agricultural sectors and Agro-Ecological Zones that will be more vulnerable to changes in climatic conditions and implement and develop the most appropriate policies to cope with these changes.
In this framework, this study aimed to assess the climate change impacts on Nigerian agricultural sector and to explore some of potential adaptation strategies for the most important crops in the food basket of the Country.
The analysis was made using the DSSAT-CSM (Decision Support System for Agrotechnology Transfer - Cropping System Model) software, version 4.5. Crop simulation models included in DSSAT are tools that allows to simulate physiological process of crop growth, development and production, by combining genetic crop characteristics and environmental (soil and weather) conditions.
In this analysis, for each selected crop, the models included into DSSAT-CSM software were ran, after a calibration phase, to evaluate climate change impacts on crop production. The climate data used for the analysis are derived by the Regional Circulation Model COSMO-CLM, from 1971 to 2065, at 8 km of spatial resolution. The RCM model output were "perturbed" with 10 Global Climate Models in order to have a wide variety of possible climate projections for impact analysis.
Multiple combinations of soils and climate conditions, crop management and varieties were considered for each Agro-Ecological Zone of Nigeria. The climate impact assessment was made by comparing the yield obtained with the climate data for the present period and the yield obtainable under future changed climate conditions. The models ran by keeping fixed all the other input parameter (e.g., crop management, soils, etc..) and changing only the climate data. Direct and indirect effects of different CO_2 concentrations projected for the future periods were separately explored to estimate the effect linked to it.
Several adaptation strategies (e.g., introduction of full irrigation, shift of the ordinary sowing/planting date, changes in the ordinary fertilization management) were evaluated with the aim to reduce the negative impact of climate change on crop production. The results of the study, analyzed at state, AEZ and country level, will be discussed.