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Assessing the impacts of climate change on agricultural land suitability for cash and staple crops in Ghana and Benin

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Abstract

Climate change poses significant challenges to agricultural land suitability and crop production worldwide, particularly in vulnerable regions like Sub-Saharan Africa. This study investigates the impact of climate change on agricultural land suitability for twelve crops in Ghana and Benin. The analysis utilises land suitability assessment methodologies, incorporating climatic and soil data. Through the study, we aim to address the scientific gap regarding the impact of climate change on crop land, in order to support sustainable and climate-resilient agriculture in the region.

The study area includes Benin and Ghana, where agriculture plays a crucial role in the economy and employs a significant portion of the population. The climate data is from the Inter-Sectoral Impact Model Intercomparison Project (ISIMIP), soil pH data from the International Soil Reference and Information Centre (ISRIC). This data is employed by the EcoCrop model to assess thermal and precipitation suitability scores for each crop by taking the crop requirements from the Global Agro-Ecological Zones (GAEZ) v4 Data Portal. EcoCrop evaluates temperature and precipitation ranges during growing seasons, considering optimal and permissible conditions for crop growth and also soil pH. The minimum suitability score between climate and soil factors determines overall crop suitability.

Results indicate varying impacts on crop suitability over time and across different climate scenarios (SSPs). Notably, maize exhibits increasing viability compared to rice and millet in response to worsening climate conditions. However, there are fluctuations and decreases in suitability for maize and millet across different SSPs and timeframes.

The study underscores the importance of understanding climate change impacts on agricultural land suitability for informed decision-making and adaptation strategies. By identifying crops and regions most affected by climate change, policymakers and stakeholders can prioritise interventions to support sustainable and resilient agriculture in Ghana and Benin.

Keywords: Agricultural land suitability, climate change, crop suitability, Ecocrop, land use

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