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Climate change impacts on yield and grain quality: Implications for food security, health and nutrition

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Abstract

Climate change is projected to have significant impacts on agriculture, especially in Africa where crop production is highly sensitive to climate change and extreme weather conditions. However, majority of the current studies on climate change have focused on impacts on yield (grain weight per hectare) and area suitability, while neglecting other important yield components such as the nutritional quality, which are important aspects of food security. The timing of different variables along the development stage of maize is particularly important to the final grain weight and quality. Therefore, the aim of this study was to apply a modelling approach to assess the impacts of climate change on yield and nutritional quality of crops, using maize and West Africa as case studies. The Agricultural Production Systems sIMulator (APSIM) model was calibrated and applied to assess climate change effects on maize yield and yield components (particularly protein) in 18 West African countries at 0.5° spatial resolution. In addition, we identify the most relevant climate and environmental variables that affect maize yield and grain quality to aid the design of appropriate mitigation measures. Preliminary results show that the yield and yield components vary both spatially and temporally across the region with some areas and years having higher yields and maize grain characteristics than others. We correlated the maize yields to the grain components to establish the relationships between these across space and time. We also identify the grain characteristics that are most sensitive to weather variability in the region that are at highest risk from climate change and variability. We conclude that it is important to consider other aspects of climate change impacts on crops beyond yield in designing appropriate adaptation strategies and policies towards addressing food and nutritional security across scales.

Keywords: APSIM, climate change, maize, protein, yield