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Cassava Yield Gap and Variability: A Simulation Study in Nigeria

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Abstract

An increase in crop productivity is needed to ensure sufficient food supply for the continuously growing world population. Thereby, Cassava production is of great importance for food security in Africa and a major source of human caloric intake for the local population. Nigeria is the largest producer of Cassava, but there is still a need to increase the production of Cassava for export purpose. The climate is an important factor for the Nigerian agriculture, as temperature, radiation, humidity and water are main factors for crop growth and yield. Climate variability is a determining factor for Cassava yields. For this study, a crop model was used to assess the yield and yield gaps of Cassava based on different climatic variables such as temperature, radiation and precipitation in 10 states of Nigeria over 16 years from 1995 to 2010. The crop model LINTUL5, embedded into a general modelling framework SIMPLACE (Scientific Impact Assessment and Modelling Platform for Advanced Crop and Ecosystem Management), was used to estimate potential yield (Y_p), water-limited yield (Y_w), water- and nitrogen-limited yield and water- and nutrient-limited yield. Multiple regression shows the correlation between the observed yields and simulated yields, as well as yield gaps with the climate variables. The yield gaps in Cassava production are high and show variability across the different regions. The potential yield gap ranges from 6 t ha^{-1} to 9 t ha^{-1} depending on the region as well as over the 16 years. Spatially, the potential yield gap correlates negatively with mean temperature and precipitation and shows a positive correlation with radiation. To close the high Cassava yield gaps in Nigeria, an improvement in farm management, including soil and crop management, is indispensable.

Keywords: Cassava, LINTUL5, Nigeria, yield gap