ABSTRACT

Assessing Yield Response to Water in Root Crops In Present and Future Climates: An Application of The FAO Aquacrop Model For Jamaican Sweet Potato, *Ipomoea batatas*

Dale Ralston Rankine

Agricultural crop production in the Caribbean is dominated by small open field holdings that are almost totally reliant on rainfall. Sweet potato (*Ipomoea batatas*) has been identified as central to the region's pursuit of food and nutrition security, particularly in a changing climate. The crop has high nutritional value, innate drought tolerant properties, and can be grown with relatively low inputs. The routine use of crop models for yield optimisation is largely absent in the Caribbean. In this study, the FAO AquaCrop model was parameterized for sweet potato for the first time.

Parameters were developed using data from three sweet potato varieties grown in two agro-ecological zones in Jamaica under rain-fed and irrigated conditions. Digital photography was combined with an automated canopy estimator to track canopy development. The overall simulation of biomass was good with deviations of less than 30% for four out of six simulations and season-long performance of the model was commendable. The simulation of yield was more difficult, especially given the non-linear rate of tuber development. The results however, indicate that AquaCrop could be a useful tool for Caribbean agriculture in predicting productivity of sweet potato (and other crops) under varying water availability.

In the absence of long-term records of weather parameters to facilitate downscaling of climate projections for crop modelling, an alternative approach was used. Warmer and drier conditions resulted in earlier maturity, declines in biomass and yield while cooler and wetter conditions favoured production, but suggested longer maturity period. Without the influence of elevated CO2, irrigation had a net benefit for both yield and biomass in the warm and dry climate. The effect was reversed in the wetter conditions. Yield and biomass declines were reduced and subsequently reversed under that future climates (in both treatments) when the influence of elevated CO2 was factored in.

Keywords: Dale Ralston Rankine; Agro-ecology; Climate Change; Drought Tolerance; Evapotranspiration; AquaCrop; Sweet potato