Tropentag, September 18-20, 2019, Kassel

"Filling gaps and removing traps
for sustainable resource management"

Evaluating the African Cassava Agronomy Initiative's Framework for Site-Specific Fertiliser Recommendation

Kodjovi Senam Ezui[1], Meklit Chernet Tariku[2], Veronica N.E. Uzokwe[3], Joy Adiele[4], Adeyemi Olojede[4], Mutiu Busari[5], Mark Tokula[4], Florence Olowokere[5], Rebecca Enesi[6], Ademola Adebiyi[6], Christine Kreye[6], Stefan Hauser[6], Shamie Zingore[1], Bernard Vanlauwe[2], Pieter Pypers[2]

[1] *African Plant Nutrition Institute, African Cassava Agronomy Initiative, Kenya*
[2] *International Institute of Tropical Agriculture (IITA), Kenya*
[3] *International Institute of Tropical Agriculture (IITA), Tanzania*
[4] *National Root Crops Research Institute (NRCRI), Nigeria*
[5] *Federal University of Agriculture Abeokuta (FUNAAB), Nigeria*
[6] *ETH Zürich, Dept. of Environmental Systems Science, Switzerland*

Abstract

The African Cassava Agronomy Initiative (ACAI) is set to develop decision support tools (DST) to provide advise on site-specific fertiliser recommendations to extension agents and farmers to sustainably intensify and increase cassava production with a focus on commercial farmers. A crop modelling framework comprising two complementary models, LINTUL (Light Interception and Utilisation) and QUEFTS (Quantitative Evaluation of the Fertility of Tropical Soils) was used. QUEFTS is known for understanding N, P and K nutrient interactions and effects on crop production. However, as a static model, QUEFTS is limited in capturing the effect of seasonal weather variability on root yield, which is effectively handled by mechanistic models like LINTUL. Using daily historical weather data from CHRISP (rainfall) and NASA-POWER (solar radiation, wind speed, minimum and maximum temperature), and soil grid data from ISRIC (International Soil Reference and Information Centre), water-limited yields of cassava roots were simulated with LINTUL for a series of planting dates over the year. With the simulated water-limited yield as maximum attainable yields, the site-specific fertiliser rates to achieve target yields were generated with QUEFTS considering indigenous soil fertility, fertiliser price and the cassava root price in order to maximise net returns. Model evaluations using field experiment data from Nigeria in 2016 and 2017 indicated good performance of QUEFTS on the one hand. LINTUL on the other hand performed sub-optimally, especially for planting dates later than July, by overestimating water stress during the long dry season, which lasts from late November to end of March. With additional data collected in 2017 and 2018 from researcher-managed experiments, and from validation trials to test the recommendations, the current efforts are focussing on enhancing the predictions' accuracy and precision for year-round planting dates. Nigerian farmers have moved to stretch planting and harvesting over longer periods to provide roots to the processing industry throughout the year and to benefit from temporal price peaks. With improved fertiliser recommendations, profitable and higher yields can be attained in addition to using off season marketing opportunities.

Keywords: African Cassava Agronomy Initiative (ACAI), decision support tool, LINTUL, QUEFTS, water stress

Contact Address: Kodjovi Senam Ezui, African Plant Nutrition Institute, African Cassava Agronomy Initiative, ICIPE Compound, Kasarani, Nairobi, Kenya, e-mail: g.ezui@apni.net