Maize Yield Gains from Seasonal Forecasts Using the CCAFS Regional Agricultural Forecasting Toolbox (CRAFT)

Andree Nenkam Mentho[1], P. C. Sibiry Traoré[1], Vakhtang Shelia[2], Sridhar Gummadi[3], James Hansen[4], Anthony M. Whitbread[5], Gerrit Hoogenboom[2]

[1]*International Crops Research Institute for the Semi-arid Tropics (ICRISAT), Mali*

[2]*University of Florida, Agricultural and Biological Engineering Department, USA*

[3]*International Rice Research Institute (IRRI), Philippines*

[4]*International Research Institute for Climate and Society, United States of America*

[5]*International Crops Research Institute for the Semi-arid Tropics (ICRISAT), India*

Abstract

The 'maizification' of Sudan Savannah associated with agricultural intensification increases smallholder farmers' exposure to inter-annual rainfall fluctuation related risk, hence rising their dependence on agricultural inputs, as well as on weather and climate information. However, agricultural input allocation remains a serious issue because farmers do not have access to the required quantity at the right time, thus jeopardising crop productivity and consequently food security. The integration of weather and climate data and crop modelling with the CCAFS Regional Agricultural Forecasting Toolbox (CRAFT) offers new insights into regional yield forecasting for maize and presents a great opportunity to optimise resource allocation and thus improve food security. CRAFT is a multi-model gridded framework that provides access to regional agricultural production at approximately 10 km resolution with up to three administrative levels for the region of interest. CRAFT is being piloted in Southern Mali to assess the sensitivity of the maize cropping system to recent climate variability, to evaluate its potential for maize regional yield forecasting and to assess its benefit for agronomic decision-making. The study uses one-year farmers' observed management practices and 26 years (1990–2015) observed yield aggregated to the third administrative unit of the region of study to calibrate and evaluate the crop models employed in the framework. CRAFT performance was tested for four fertiliser management scenarios. Our results show high variability in predicted yield with NRMSE of 27 %, 25 %, 13 % and 17 % kg ha^{-1}, respectively. This result further suggests that fertiliser application should be based on seasonal rainfall amount for its optimal use when there is sufficient rain for crop growth and associated fertiliser requirements. The performance of CRAFT for maize yield forecasting is still being explored. Nonetheless, CRAFT has the potential to improve decision making at regional level through the optimisation of agricultural resource input allocation and food security improvement when yield forecasts show that food demand will not be met.

Keywords: CRAFT, gridded crop modelling, maize, Mali, yield forecast

Contact Address: Andree Nenkam Mentho, International Crops Research Institute for the Semi-arid Tropics (ICRISAT), Icrisat Bp 320, 91093 Bamako, Mali, e-mail: a.nenkam@cgiar.org