Tropentag, September 9-11, 2020, virtual conference

"Food and nutrition security and its resilience to global crises"

Modelling Land Suitability for Expansion of Irrigated Rice and Dissemination of Alternate Wetting and Drying Water Management in Burkina Faso

Elliott Ronald Dossou-Yovo[1], Komlavi Akpoti[2], Paul Kiepe[3]

[1] *AfricaRice, Sustainable Productivity Enhancement, Ivory Coast (Cote d'Ivoire)*
[2] *University of Energy and Natural Resources, Civil and Environmental Engineering Department, Ghana*
[3] *Africa Rice Center, Research Division, Ivory Coast*

Abstract

Spatially explicit assessment of land suitability can guide the identification of cropland with the highest potential for irrigated rice development, but for many regions in sub-Saharan Africa, the knowledge is very limited. Besides, reducing water input while maintaining rice yield is important for sustainable rice production in SSA. The objectives of this study were to produce a nation-wide prediction of irrigated rice area and estimate the climatic suitability of the alternative wetting and drying (AWD) technique of irrigation. We applied three environmental niche modelling (ENM) approaches that use machine learning algorithms along with the current distribution of irrigated rice locations in Burkina Faso to determine the extent of the potentially irrigated rice area. We used a simple water balance model to estimate the climatic suitability for AWD for the two main growing seasons: February – June and July – November. The evaluation metrics of the ENMs such as Area Under the Curves (AUC) and Percentage Correctly Classified (PCC) were higher than 90 % and 80 % for both training and testing, respectively. Exchangeable sodium percentage, distance to stream networks, exchangeable potassium, precipitation of the warmest quarter, annual mean temperature, soil depth to bedrock, topographical wetness index, actual evapotranspiration, soil organic carbon stock, and total phosphorous were the top 10 predictors determining a land suitability for irrigated rice development. The modelling predicted that 3 million ha of land are potentially suitable for irrigated rice cultivation in Burkina Faso. Most of these suitable lands are located within the sub-Sahelian and north-Sudanese climatic zones while the Sahelian climatic zone only showed marginal suitability for irrigated rice. About 97 % of the suitable lands for irrigated rice cultivation were found to be appropriate for AWD in the first growing season against 57 % in the second growing season. The results of this study can guide investments in irrigated rice development and large-scale dissemination of AWD in SSA.

Keywords: Alternate wetting and drying, climate change, ecological niche modelling, land suitability, rice

Contact Address: Elliott Ronald Dossou-Yovo, AfricaRice, Sustainable Productivity Enhancement, Kennedy, 00225 Bouake, Ivory Coast (Cote d'Ivoire), e-mail: e.dossou-yovo@cgiar.org