

Evaluation of Water Management Options to Improve the Crop Yield and Water Productivity for Semi-Arid Watershed in Southern India Using AquaCrop Model

Authors : V. S. Manivasagam, R. Nagarajan

Abstract : Modeling the soil, water and crop growth interactions are attaining major importance, considering the future climate change and water availability for agriculture to meet the growing food demand. Progress in understanding the crop growth response during water stress period through crop modeling approach provides an opportunity for improving and sustaining the future agriculture water use efficiency. An attempt has been made to evaluate the potential use of crop modeling approach for assessing the minimal supplementary irrigation requirement for crop growth during water limited condition and its practical significance in sustainable improvement of crop yield and water productivity. Among the numerous crop models, water driven-AquaCrop model has been chosen for the present study considering the modeling approach and water stress impact on yield simulation. The study has been evaluated in rainfed maize grown area of semi-arid Shanmuganadi watershed (a tributary of the Cauvery river system) located in southern India during the rabi cropping season (October-February). In addition to actual rainfed maize growth simulation, irrigated maize scenarios were simulated for assessing the supplementary irrigation requirement during water shortage condition for the period 2012-2015. The simulation results for rainfed maize have shown that the average maize yield of 0.5-2 t ha⁻¹ was observed during deficit monsoon season (<350 mm) whereas 5.3 t ha⁻¹ was noticed during sufficient monsoonal period (>350 mm). Scenario results for irrigated maize simulation during deficit monsoonal period has revealed that 150-200 mm of supplementary irrigation has ensured the 5.8 t ha⁻¹ of irrigated maize yield. Thus, study results clearly portrayed that minimal application of supplementary irrigation during the critical growth period along with the deficit rainfall has increased the crop water productivity from 1.07 to 2.59 kg m⁻³ for major soil types. Overall, AquaCrop is found to be very effective for the sustainable irrigation assessment considering the model simplicity and minimal inputs requirement.

Keywords : AquaCrop, crop modeling, rainfed maize, water stress

Conference Title : ICACS 2016 : International Conference on Agronomy and Crop Sciences

Conference Location : Rome, Italy

Conference Dates : September 15-16, 2016