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Evaluation of the Effect of Temperature and CO_2 Increase along with the Reduced Rain fall, on Water Components of Future Rice Production in Australia

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Abstract

Rice can be considered as the staple food for more than 50% of the world's population. However, production levels have rigorously dropped due to the unprecedented droughts and water restrictions. According to the future climate change projections, increased temperatures along with elevated CO_2 and reduction in water availability (due to reduced rainfall) can cause serious threats to future rice production in Australia. Therefore, this study evaluates the effect on rice water components (actual crop water use) with the elevated temperature and CO_2 concentration of future rice production in Australia using APSIM–Oryza model at two different agro climatic regions in Australia.

Four rice varieties from two different climatic zones with five temperature and rainfall levels were simulated according to the five different CO_2 concentrations. Three rice varieties used at Riverina (in South-Eastern Australia in Temperate/Mediterranean summer climatic region) were Amaroo, Langi, and Quest, representing late, mid and early maturity types respectively. However, only one variety (IR72) was used for the Kununurra region in Western Australia in Tropical hot and humid summer zone.

Five incremental changes of temperature 0 (base), +1, +2, +3, +4 °C with a combination of five rainfall changes (+10, 0, -10, -20, and -30%) were in the simulation to represent the range of projected climatic changes in Australia over the next 60 years. The total number of future climate scenarios considered for this simulation were 25. The corresponding CO_2 concentrations associated with above temperature levels in this study were 380, 435, 535, 640 and 750 ppm. Actual crop water use was increased in var. *Quest, Langi, Amaroo* and IR72 by 7.17%, 8.47%, 6.9% and 39.6% respectively along with the total irrigation demand of rice to compensate the decline in rainfall with increased temperature at both sites. Higher increase in crop water use was in var.IR72. Riverina region has relatively higher potential to cope with future climatic changes than Kununurra region. In Kununurra region predicted crop water use is comparatively higher than the rice varieties in Riverina region.

Keywords: *climate change, CO_2, rice, temperature, water components*

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