ABSTRACT

Unscientific land management and water deficit under climate change scenarios are affecting productivity of rainfed agriculture in semi-arid tropics (SATs). These issues necessitates to develop integrated land-water and nutrients management to increase cereal-based system productivity and resource conservation in SATs. The present investigation was undertaken on cereal-based cropping systems through field experiment and crop simulation to study the effect of different land-water and nutrient management on system equivalent yield (SEY), grain nutrients accumulation, soil water content, and soil fertility in SATs. The field experiments were conducted during 2014 to 2016 at International Crops Research Institute for the Semi-Arid Tropics, Patancheru in India. In this experiment, three cropping systems (two sequential cropping: sorghum-chickpea and maize-groundnut; and one intercropping: pearl millet + pigeonpea) were studied with two land-water management i.e. flatbed and broad bed furrow (BBF), and four nutrient management-N1: Control (no fertilizer), N2: 100% recommended application of N, P and K through chemical fertilizer (CF), N3: N2 + 100% recommended application of S, Zn and B through CF, and N4: 50% of N2 + 50% N or P through organic fertilizer. Among the cropping systems, sorghum-chickpea gave significantly highest SEY with higher N harvest index and physiological efficiency. Between the land-water management, the SEY of BBF was significantly higher (26% in 2014-15 and 14% in 2015-16) than flatbed. The soil water content in BBF was higher over flatbed by 9.4-10.4%, 4.6-9.3%, and 3.9-5.3% in top, middle and bottom layers, respectively during the crop growing period. The BBF combined with N3 increased the SEY and improved soil fertility (available macro- and micronutrients) significantly compared to flatbed with N2 nutrient management. Simulation analysis stated that the sorghum grain yield in SAT is expected to decline by 16 to 20% in future period (2030 and 2050) compared to base period (1988-2007). The yield reduction, however, can be minimised with shifting sowing time in future period. Hence, the integration of land-water and nutrients management with sowing decision could be utilized to minimise the adverse effect of climate change on productivity of cropping systems in SAT region.

Keywords: Agro-adaptations, Broad bed furrow, Cereal-based cropping systems, Climate change, Land-water-nutrient management, Soil water content, System equivalent yield