

Research Paper :

Soil sustainability and productivity by alternative cropping sequences to sugarcane under different irrigation methods

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ABSTRACT

The drip irrigation method significantly increased sugarcane equivalent yield and nutrient use productivity than surface and subsurface irrigation method. The subsurface irrigation method significantly increased water use productivity and was at par with drip irrigation method. The Cotton-beetroot sequence significantly increased water use productivity and nutrient use productivity than sugarcane. The cotton-beetroot sequence significantly increased nutrient use productivity than sugarcane under drip irrigation. It was also observed that, subsurface irrigation method significantly increased availability of nitrogen and phosphorus over all irrigation methods followed by drip irrigation. The cotton – beetroot cropping sequence significantly availed more phosphorus over brinjal-chilli sequence and was at par with sugarcane. The cotton- beetroot sequence under subsurface irrigation method left significantly more nitrogen and phosphorus in soil. Hence, cotton-beetroot was better alternative to sugarcane under subsurface or drip irrigation to increase soil sustainability and water use productivity

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Sugarcane account 4 % of gross cropped irrigated area in Maharashtra but consumes around 60 per cent of total irrigation (Rath and Mitra, 1986). Beside that, due to continuous monocropping decrease the nutrient availability in the top 15-30 cm surface layer (Kapur, 1994) and increase soil salinization (Das, 1994). Cotton is another cash crop cultivated in this region. Many farmers are adding vegetable to their crop rotation in response to increased consumer demand and sharply shooting prices. The high water requirement crop particularly with higher irrigation schedule adversely affects the soil characteristic (Bharambe *et al.*, 2003). The advanced micro-irrigation method introduced recently such as drip, micro-sprinkler and irrigation through subsurface porous pipe help to increase water use efficiency significantly, besides increasing productivity of the crops. Irrigation efficiency of micro irrigation is more than 90 per cent. Adoption of well designed situation specific alternative cropping sequence along with appropriate method of irrigation, helpful in conservation of soil resources, improvement of soil health by minimize nitrate leaching, beside improving nutrient and water use efficiency. It is, therefore, very essential to identify simple and flexible alternate cropping sequence to sugarcane, which can be well fitted under scarcity of water as well as under irrigated conditions and will more productive and sustainable.

MATERIALS AND METHODS

The field experiment was conducted during the seasons of 2005-06 and 2006-07 at All India Co-ordinated Research Project on Water Management, Mahatma Phule Krishi Vidyapeeth, Rahuri, Dist. Ahmednagar (M.S.). The soil was well drained, clayey in texture, low in available N (188.16 kg ha⁻¹) and medium in available P (16.45 kg P₂O₅ ha⁻¹) and very high in available K (720.8 kg K₂O ha⁻¹). The experiment was carried out in strip plot design with three replications. There were total 12 treatment combinations. Four irrigation methods *viz.*, surface, subsurface irrigation through porous pipe, drip and micro-sprinkler irrigation methods assigned in one strip at East-West direction and three cropping sequences includes *suru* sugarcane, cotton-beetroot and brinjal-chilli assigned in another strip at North-South direction. Except beetroot, all crops were planted by paired row planting technique of 90-180 cm. For beetroot four row planting technique (45-90 x 10 cm) with BBF was adopted. The surface irrigation was scheduled at a depth of 8 cm on 75 mm CPE for sugarcane and cotton, at 6 cm depth on 50 mm CPE for brinjal and at 3cm depth for 25 mm CPE for beetroot and chilli. The drip and micro sprinkler operated at alternate day on the basis of CPE values. In subsurface irrigation method water was provided through approtech porous pipe through water tank. The total irrigation water applied was worked out in hacm.

The equivalent yield of cropping sequences converted