

Assessment of Water Productivity of Different Cropping Systems under Drip Irrigation in Arid Region of Western India

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Abstract: The production potential of four different cropping system were assessed for two successive years in field conditions during 2008-2010 at ICAR-CAZRI, Jodhpur. Among the four different cropping systems evaluated, based on their production potential, ladyfinger-tomato-melon system gave the highest total yield (117.2 t ha⁻¹) under drip irrigation system. This system also gave the highest water use efficiency (1.73 kg m⁻³) while the lowest consumptive use of water (97.5 cm) was registered in ladyfinger-gladiolus-melon system. In terms of the economics, tomato-gladiolus-ladyfinger crop sequence was the most economical followed by ladyfinger-tomato-melon under both irrigation systems (check basin and drip). The ladyfinger-tomato-melon crop sequence was ranked first with respect to production and WUE, whereas it ranked second with respect to net returns. From the present study it is clear that ladyfinger-tomato-melon is the most suitable cropping system under arid ecosystem of western India.

Key words: Cropping system, water use, net returns, drip irrigation.

Undoubtedly, the water is a scarce and precious resource in arid regions. About 50% of the area is irrigated through ground water using conventional irrigation practices. This leads to heavy losses on sandy soils as a result of which groundwater is falling at the rate of 0.5 to 1.0 m yr⁻¹ bringing 60-70% area under dark zone (Saxena *et al.*, 2014). The ground water is very deep, saline at many places and thus inappropriate for use. The situation of overexploitation of ground water is more serious in the region where out of 11 districts, 6 are in category of over exploited and remaining 5 are in category of semi-critical (grey zone). The average annual rainfall of the western arid region is 360 mm. The rainfall is highly variable and erratic with frequent spells of drought. This emphasizes the need for an efficient management of scarce water. The water in arid region shall remain very precious and scarce. Here, crop yields per unit of land are quite low. Furthermore, untimely and non-judicious delivery of irrigation water through traditional means of irrigation, and plant water stress at critical growth stages affect yield adversely. Reduction in crop water use may be achieved either by employing efficient irrigation methods or by proper crop selection in a system mode for economising water and income in wider perspectives.

The cropping system diversification is necessary to get higher yield and economic gain, to maintain soil condition, optimum utilization of available resources and meet daily requirement of human (Samui *et al.*, 2004). Vegetable plays an important role in human nutrition and economic security. They are rich source of minerals and vitamins and are known as protective food. In Rajasthan area under vegetable cultivation is about 1.48 lakh hectares with an estimated production of 11.14 lakh tons and productivity of 7.50 t ha⁻¹ (Anon., 2014). Strikingly, the productivity of the vegetables in Rajasthan is very low compare to all India vegetable productivity. Efficient cropping system with respect to water utilisation with higher produce is the need of the region besides, to insure round the year production and income to the farmers. Tomato is one of the most important crops and grown during rainy season and winter season. Both muskmelon and ladyfinger are grown during summer season, while ladyfinger is also taken during rainy season. Gladiolus, a prized winter cut flower can be a newer option for this region, where most of the high value crop produce arrive from adjoining states or even far places, prompting the higher produce price.

Considering the above, the present study was aimed to assess the production potential of different cropping systems involving

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