ABSTRACT

A field experiment to study cropping systems for efficient use of irrigation water from wells was conducted at S.V. Agricultural College Farm, Tirupati campus of Andhra Pradesh Agricultural University, India in summer, kharif, late kharif, 1986 and rabi 1987 seasons. The experiment was laid out in split plot design with four frequencies of irrigation consisting of 1.0, 0.75, 0.5 IW/CPM ratios and visual method allotted to main plots and six cropping systems to sub-plots. The depth of irrigation water for each irrigation was 40 mm.

The growth characters of the crop as evaluated on plant height, BN, GR, LAI were improved in high/medium frequency in all crops. The yield attributes and yield were most favourable in kharif and late kharif in 0.75 ratio in all crops except maize which responded to high frequency. In summer all crops except sesame and groundnut gave highest yield in IW/CPM ratio of 1.0. In rabi blackgram and sesame did not respond to high frequency irrigation. Crop yields were markedly reduced in low frequency but were better with visual method of scheduling irrigation.

The water requirement and consumptive use were low during late kharif and high in summer. Sorghum and groundnut had maximum water requirement and consumptive use in the seasons in which they were grown whereas greengram had the least. Fingermillet recorded highest water use efficiency in kharif and rabi but the net return per unit of water was more in groundnut in all seasons except fingermillet in late kharif. The mean WUE was higher in rabi followed by late kharif, summer and least in kharif season. WUE was highest in medium frequency in all the seasons for all crops except black gram in summer and fingermillet in rabi where high frequency was better.

More moisture was extracted from the top 0-15 cm in high frequency whereas in low frequency the moisture extraction increased from 15-30 cm. High RMC was noticed in high frequency and decreased with low irrigation frequency. Soil temperature was reduced appre-
ciably in medium frequency whereas soil strength was least in high frequency.

Groundnut crop during summer, kharif, rabi and maize during late kharif gave higher net returns than other crops. Blackgram, greengram in summer, kharif, rabi and finger millet in late kharif gave higher benefit cost ratio. With regard to net returns, medium frequency (0.75 ratio) was better in kharif and late kharif but more or less similar with high frequency in other seasons. Groundnut has topped in per day return in rabi and summer, greengram in kharif and finger millet in late kharif. The incremental benefit cost ratio on irrigation was highest in the system comprising greengram-pearl millet-sorghum-finger millet.

A linear programming analysis has revealed that with 100 per cent availability of water but with land constraint of 5 ha, a maximum net return of Rs. 2,00,359 could be achieved with blackgram-greengram-(rice + maize) - groundnut and when the land constraint was removed the income could be increased to Rs. 3,29,913 with a field crop duration of 344 days. When the availability of water was 75 per cent with 5 ha of land constraint a maximum net return of Rs. 1,95,688 in 344 days could be realised with the above crop combination and when the land constraint was removed the annual income could be raised to Rs. 2,67,024 with the combination of crops. Considering 50 and 25 per cent availability of water, the maximum income was Rs. 1,59,863 and Rs. 79,717 respectively with the above cropping system without rice. By introducing an area of 0.25 ha for rice the net income was reduced by Rs. 6,274 in 50 per cent and Rs. 9,082 in 25 per cent availability. However inclusion of rice meets the family needs of food and fodder for cattle. When the land constraint was considered the net income could be increased to Rs. 16,184 under 50 per cent availability and with 25 per cent availability the increase was very meagre.

A simple and inexpensive method to extend the model for scheduling irrigation on farmer's field is suggested by using evaporation values from a can evaporimeter which has a positive correlation with open pan evaporimeter.