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Optimizing the Maha-Cultivation Calendar to Enhance Water-Use Efficiency and Support Third-Season Cropping in the Akkarayan Irrigation Scheme, Sri Lanka

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Abstract

The efficient utilization of irrigation water is critical for enhancing agricultural productivity in Sri Lanka's dry zone, where water scarcity and increasing climatic variability pose significant challenges to sustainable cultivation. The Akkarayan irrigation scheme in Kilinochchi District suffers from a long fallow season between Maha and Yala seasons despite having reservoir storage after the Maha season. This study examined the feasibility of growing the third season (mid-season) water-use efficiency for Akkarayan scheme. A water balance analysis was conducted using reservoir characteristics, 80 years of rainfall records, evaporation data, crop water requirements, and irrigation system efficiencies. Monthly inflows were estimated using Mod Group rainfall derived from long-term rainfall records, while crop water requirements for a 105-day paddy crop were incorporated into the water balance assessment. Four alternative Maha cultivation commencement dates (1 October, 15 October, 1 November, and 15 November) were evaluated for a 105-day paddy crop under a command area of 3,550 acres. The results showed that commencing cultivation on 1 October retained the highest post-Maha reservoir storage of 11,912 acre-ft, while 15 October retained 11,803 acre-ft. However, the 15 October option achieved the lowest irrigation duty of 0.99ft and irrigation demand of 3,500 acre-ft, compared with 1.12 ft and 3,961 acre-ft for the 1 October option. Delayed cultivation increased irrigation duties to 1.57 ft and 2.14 ft for the 1 November and 15 November options, respectively, while reducing residual storage. The results show that water-use efficiency can be significantly enhanced and adequate water storage can be maintained for possible mid-season cultivation. The study serves as a practical basis for irrigation scheduling and planning of reservoir operation for increasing cropping intensity, agricultural production and farmer livelihood in dry-zone irrigation schemes.

Keywords: *irrigation scheduling; mid-season cultivation; paddy cultivation; reservoir management; water balance analysis; water-use efficiency*