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Long-Term Evaluation of Irrigation Water Use and Agricultural Water Productivity in a Municipality-Operated Open-Canal Scheme: Evidence from Kütahya, Türkiye

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Abstract

This study evaluated long-term irrigation water use and agricultural water productivity in the Kuruçay Pond Irrigation Scheme, a municipality-operated open-canal scheme located in Tavşanlı, Kütahya, Türkiye. Institutional records for the 2012–2025 period were used to analyse irrigated crop pattern, irrigation water delivery, crop-based irrigation water productivity, and water economic productivity. The results showed that active irrigation use remained very limited compared with the 325 ha net command area. The actually irrigated area ranged from 4.5 to 26.8 ha, corresponding to irrigation ratios of approximately 1.4%–8.2%. In contrast, irrigation water delivery per irrigated area was relatively high in several years, indicating intensive water use over the limited area actually irrigated. Crop-based physical water productivity varied considerably among crops. Tomato showed the highest values, followed by sugar beet and potato, whereas alfalfa produced lower physical water productivity despite its important share in irrigation water use. Scheme-level water economic productivity ranged from 0.30 to 1.45 US$ m^{-3}, mainly depending on crop pattern, production value, and the extent of active irrigation use. The findings indicate that water productivity in small municipality-operated open-canal schemes is shaped not only by water delivery, but also by parcel fragmentation, crop selection, canal operation, and institutional management conditions. Short-term improvements should focus on canal maintenance, flow measurement, crop-pattern guidance, and technical support, while long-term modernization should consider land consolidation followed by a closed piped irrigation network.

Keywords: *Agricultural water productivity; irrigation water use; water economic productivity; open-canal irrigation; municipality-operated irrigation scheme*