Irrigation efficiency and water saving: scale and rebound effects

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Abstract

Irrigation water conservation may be approached at different scales with different objectives. Irrigation efficiency can be improved by various engineering solutions that reduce water use, but do not necessarily reduce consumption. Drip irrigation or site-specific variable rate irrigation are such solutions. Moreover, system performance is affected by the degree of reuse of return flows, which depends on the system's hydraulic arrangement and the performance of the irrigation units. An increment of unit irrigation performance will have more effect on system performance efficiency if the units are arranged in parallel than if they are in series. Therefore, engineering solutions for water conservation at farm level do not necessarily imply basin-scale water saving. That is, policies favouring on-farm irrigation performance may not result on the expected increase of water availability at basin scale. Paradoxically, the introduction of irrigation systems that apply water more uniformly may actually increase evapotranspiration and therefore catchment depletion. This is one face of the so called "rebound effect". Moreover, if land is not a limiting factor, an improvement on irrigation efficiency may provoke expansion of the irrigated area using "water savings". Under farming strategies aiming to maximising benefit, farmers will search for additional water resources, likely leading to a vicious circle in which irrigated land expands while water resources may become overexploited. This is the second face of the "rebound effect". We advocate firm water governance based on rigorous water accounting and evapotranspiration management as effective instruments to control the depletion of the basin. The presentation will also review beneficial effects of irrigation efficiency other than water savings.

Keywords: water conservation, irrigation efficiency, rebound effect

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