REDUCING THE ENERGY DEMAND IN THE IRRIGATION WATER SUPPY. EXPERIENCES FROM SOUTHERN EUROPE

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With the aim of improving the efficiency in the use of the water, many irrigation districts in arid and semiarid regions like Southern Spain have carried out modernization processes where the traditional open channels were replaced by modern pressurised networks. This change has implied significant reductions in water demand but an inversely proportional increment in energy requirements and total water costs. In average, modernized areas require 2 $kW.ha^{-1}$ of power with energy demand estimated in 0.41 $kWh.m^{-3}$ but this value can be much higher where water is diverted from deep aquifers or supplied to steep areas with large differences in elevation from the water source to the point of supply (hydrant). Consequently, energy represents an important percentage of the total water costs (around 40%) and nowadays water use in agriculture and energy efficiency cannot be considered independently. Thus, in pressurized systems energy is now becoming a major factor as important as others such as water availability, rainfall or evapotranspiration.

To the energy dependence of the irrigation sector, energy saving measures have been developed which involves: network sectoring (that consists in grouping hydrants with similar energy requirements and the organization of farmers in irrigation turns); critical points detection and control (they are hydrants with special energy requirements, usually caused by their distance from the pumping station and/or their elevation); optimum pumping station design and management; on-farm irrigation systems design and optimum irrigation scheduling. The joint use of these methodologies may lead to energy savings in the range of 20-30%.

Finally, the potential of photovoltaic energy in the irrigation sector is discussed and experiences of water supply with renewable energy resources are presented.