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Water-Energy balance in pressure irrigation systems

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Modernization of irrigation schemes, generally understood as transformation of surface irrigation systems into pressure –sprinkler and trickle- irrigation systems, aims at, among others, improving irrigation efficiency and reduction of operation and maintenance efforts made by the irrigators. Automation techniques become easier after modernization, and operation management plays an important role in energy efficiency issues. Modern systems use to include elevated water reservoirs with enough capacity to irrigate during peak water demand period about 16 to 48 h. However, pressure irrigation systems, in contrast, carry a serious energy cost. Energy requirements depend on decisions taken on management strategies during the operation phase, which are conditioned by previous decisions taken on the design project of the different elements which compose the irrigation system. Most of the countries where irrigation activity is significant bear in mind that modernization irrigation must play a key role in the agricultural infrastructure policies.
The objective of this study is to characterize and estimate the mean and variation of the energy consumed by common types of irrigation systems according to their management possibilities. Also is an objective to estimate the fraction of the water reservoirs available along the irrigation campaign for storing the energy from renewable sources during their availability periods.
Simulation taking into account all elements comprising the irrigation system has been used to estimate the energy requirements of typical irrigation systems of several crop production systems. The simulation of various types of irrigation systems and management strategies, in the framework imposed by particular cropping systems, would help to develop criteria for improving the energy balance in relation to the irrigation water supply productivity and new opportunities in the renewable energy field.