Reference Crop Evapotranspiration (ETo) for Irrigation Equipments design in Uruguay

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Abstract

During the last decade, national irrigation systems have expanded to summer field crops and grass, in adition to intensive traditionally irrigated crops. The maximum reference crop evapotranspiration (ETo) is the starting point for their design. Nowadays the value widely used among designers, is the maximum monthly averaged ETo, usually January. This could lead to under-sized equipments which could generate water-deficits during the critical growth stages. The maximum ETo is not a single value as would be the absolute maximum, it varies according to the period considered (daily, weekly, decadic, monthly) and the probability of non-exceedence. In this study daily ETo time series, between 28 and 35 years, recorded in January at the five experimental stations of National Institute of Agricultural Research (INIA) were analyzed. Daily ETo values with 80% probability of non-exeedence were significantly higher than those calculated based on decadic or monthly data. The latter two were quite similar, ranging from 0.1 to 0.3 mm d-1 in the different experimental stations. The aim of this paper is to recommend ETo values to design irrigation systems in Uruguay allowing maximum productive response. The maximum yield does not necessarily correspond with the maximum economic return. Thus is necessary to continue research to evaluate the productive response to different maximum irrigation doses for the different design flows. As a result, a map of Uruguay with ETo isolines based on decadic data with 80% probability of non-exeedence is presented. The equipments designed with this method meet the crop water requirements with a 80% non-exceedence probability (four over five yeas), irrigating 20 hours a day. However, if watering times are increased to 24 hours a day the historical maximum of crop water requirements is covered, except in Salto and Tacuarembó, in which crop demand is covered with a 96 and 97% non-exceedence probability respectively.

Keywords: atmospheric demand, design flow, probability of occurrence, ETo isolines