

Green or blue water? The importance of soils.

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ABSTRACT

Access to irrigation is a determining factor for agricultural production in semi-arid environments. However, in many countries in the Mediterranean basin, irrigation water demand exceeds the supply of renewable water resources. This study assesses blue (irrigation) water demand and green (precipitation) water use, for crop production in Cyprus over the past 15 years. A program was written, based on the dual crop coefficient approach of FAO Irrigation and Drainage Paper 56, to process daily data from 70 rain gauges and 34 meteorological stations, and compute the soil water balances of 83 different crops growing in 431 Cypriot communities, for the hydrologic years 1994/95-2008/09. The country's main crops are barley, grown for cereals or green fodder, olives, grapes, potatoes, citrus and almonds. Average precipitation over the country ranged between 272 mm in the 2007/08 drought year and 604 mm during the wet 2001/02 year. Agricultural land use peaked in 2002/03, which was the second wet year in a row, with an average precipitation of 561 mm. There is a large uncertainty in the soil data; in the mountains soils are shallow and stony, but large areas have been terraced. Therefore, we ran the program twice: (1) using best estimates based on the 1:250,000 soil map, with soil available water capacities ranging between 40 and 150 mm and (2) with a uniform soil available water capacity of 150 mm.

The first model run quantified green water use to range between 169 Mm³/yr, for the 2007/08 drought year, and 441 Mm³/yr, for the wet 2002/03 year. The harvested crop area for these years was 103,000 and 148,000 ha, respectively. Blue water demand for the 15-year period ranged between 160 and 214 Mm³/yr. The irrigated area covered, on average, 23% of the total crop area but provided 67% of the total production. The good soil water holding capacity of the second model run increased the total green water use to 199 Mm³/yr for 2007/08 and 499 Mm³/yr for 2002/03. Blue water demand for run 2 ranged between 141 Mm³/yr and 192 Mm³/yr. The potential savings of 12% of the average annual irrigation water demand, as indicated by these model runs, emphasizes the importance of soil and water conservation practices.

Keywords: Irrigation water demand, soil water holding capacity, semi-arid, Mediterranean