Spatial Variation in the Water Footprint of Corn under Rainfed and Irrigated Conditions in Northeastern Argentina

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Abstract

The water footprint of a crop shows the volume of evapotranspired water required to produce a given yield. The water footprint splits up into the green water footprint, which is the volume of rainwater consumed, and the blue water footprint, which refers to the volume of surface and ground water applied through irrigation. It is expressed as a water volume per unit of product. The project consists in calculating the green and blue water footprint value for corn in central and northeastern provinces of Argentina under three conditions: 1) rainfed farming, 2) irrigated agriculture, and 3) optimum irrigation and soil fertility conditions. Internationally accepted methodology and the AquaCrop model were used to simulate ETc and crop yield. Once the model was calibrated, crop production was modeled for a twenty-year period (1990-2010) for 10 meteorological stations located in Argentina's corn producing region. The following aspects were taken into consideration: climate, soils in each location, planting density, harvest index, water table depth and furrow irrigation. Simulated yield values were compared with those registered by local institutions. It was observed that by applying irrigation and increasing fertility the water footprint is reduced, and this is due to the increase in yield. The green water footprint represents 92% of the combined sum (green plus blue). The calculated mean water footprint (green plus blue) is 803 L kg^{-1} for rainfed farming, 602 L kg^{-1} for irrigated agriculture; and 488 L kg^{-1} for production under optimum irrigation and soil fertility conditions. The paper suggests a potential target value of the water footprint which producers could reach with proper water management and fertilization practices.

Keywords: AquaCrop, evapotranspiration, irrigation, rainfed