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USO DEL AGUA EN SECUENCIAS DE CULTIVOS AGRÍCOLAS DEL CENTRO - SUR DE CÓRDOBA (ARGENTINA)[1]

Horacio Videla Mensegue

Thesis abstract

Agricultural systems with a single annual crop, and in some cases monoculture, such as those in the region South-Central of Cordoba - SCC (Argentina), often underutilize usually rainwater available for grain production. In the region SCC took place in several scientific studies to assess the efficiency of water use for traditional crops (maize and soybeans, primarily). However, the degree of utilization of rainwater crop sequences remains unknown. The aim of this thesis was to evaluate, by using a simulation model, the sequences of typical agricultural crops SCC region and determine the best combination of intensification, diversity, and temporal ordering of the sequence of crops in order to achieve the best use of rainwater.

We adapted, calibrated and corroborated simulation model Soil Water Balance (SWB) to simulate crop sequences over a period of 50 years to two environmental conditions in the SCC (Laboulaye and Rio Cuarto). Crop sequences include combining simulated crops wheat (W) (*Triticum aestivum* L.), soybean (S) (*Glycine max* [L.] Merr.) and maize (M) (*Zea mays* L.). Sequences simulated crops (S-S, S-M, W/S-M, W/S-S, W/M-M, W/M-S, and W/S) was quantified with the index of intensification (ISS), diversity index (ID), grasses proportion (PG) and maize proportion (PM). The degree of utilization of rainwater for each crop sequence was assessed by the Water Productivity (WP), which is the result of water capture (C_{water}) (water consumption and rainfall relationship during the time period extends the sequence) and the WUE (relationship between grain yield and water consumption of the sequence).

The change in the temporal ordering of soybean and maize crops (i.e. first soybean or second soybean) showed differences in water use, grain yield, and the WUE. Maize was more sensitive than soybean the temporal ordering primarily affecting of water consumption and grain yield. Soybean was shown to be more sensitive to temporal order in Río Cuarto while than maize it was in Laboulaye. The increase in intensification improved use rain water (> WP) to an optimum point is increased above an ISS > 1.5 yr-1 is reduced. In addition, the WP is directly related to the PG and, especially, the PM. Sequences with greater WP in both study sites were W/M-M and W/S-M. The most common sequence of crops in the SCC (S-S) region is the lower C_{water}, WUE and WP showed. In the long term, the sequences have higher WP in the environmental conditions of the region are the SCC including three crops every two years and are a major component of grasses, and especially maize, (PG ≥ 1 between wheat and maize). How to increase this WP is increasing the intensity of the sequence and the proportion of grasses and maize tending to improve C_{water} and WUE. Finally, it should be noted that current farming systems in the SCC region, which have a high proportion of soybean,

[1] Videla Mensegue, H. 2014. Uso del agua en secuencias de cultivos agrícolas del Centro - Sur de Córdoba (Argentina). Tesis de Maestría. Universidad Nacional de Río Cuarto. Argentina.

have a degree of water utilization very low compared to other sequences of alternative crops. Being the most critical factor the high degree of underutilization of rain (> 50 %). The tasks performed in adaptation, parameterization, calibration, and corroboration of SWB provide an input to future research undertaken with simulation models. Additionally, adaptation on SWB allowed to successfully simulated crop sequences.