Irrigated and variable planting corn field assessment with aquacrop model in Córdoba, Argentina

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Summary

Crop models are suitable tools for studying spatial variability and analyzing those factors that are determinants of the productive performance within a field. The AquaCrop V4.0 model, which uses crop cover (CC) as a central parameter to represent the plant growth and development, was used to estimate productivity and infer the determinants of performance differences in a field of corn (*Zea mays* L.) crop planted at variable rates in Cordoba, Argentina. The CC data were obtained through digital photographs to represent the crop evolution during the crop cycle from 04/10/2013 (seeding) to 24/04/2014 (harvest). Moreover, in 6 sectors of the field determined according to planting density and distance from the head of irrigation, biomass and water content of the soil was recorded periodically and also the corn yield at harvest. AquaCrop was applied under two modalities: potential and actual. While the potential rate allowed to validate a water productivity (WP*) characteristic for corn of 34.4 g m^{-2} and set the total irrigation requirement to remove water stress (between 411 and 433 mm), under real conditions the irrigation of water was adjusted with a particular efficiency value for each sector in the field. Statistical analysis of the relationship between observed and estimated values with AquaCrop yielded very acceptable results in the case of CC and dry matter production (Coefficient of determination, Efficiency Nash-Sutcliffe model and Willmott index >0.81). Productivity to the north of the field was markedly lower than in the south. Looking for establishing in a comprehensive manner consistent relationships between observed and estimated values of CC, dry matter, soil water content and grain yield, irrigation simulation of AquaCrop should consider an application efficiency of 40% in the north sectors of the field and over 60% in the south.

Key words: precision agriculture; water productivity; cover crop; irrigation