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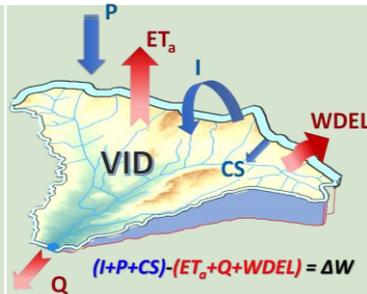
INTRODUCTION

There is a need to analyze the effect of the modernization process through the use of actual, detailed data from the same irrigation district.

The Violada Irrigation District (VID; 5234 ha, widely studied since the 1980s), with 92% of the surface modernized in 2008-09 from gravity to pressurized irrigation, offers an ideal scenario to evaluate the environmental implications of irrigation modernization.

MATERIAL AND METOHODS

1. The Water Balance in the VID, to characterize the main water flows and their concentrations in salts and N.
2. The Soil Water Balance, to determine water consumption (ET_a) for the main crops (corn, alfalfa and cereal).
3. Farmers surveys to establish fertilization and cropping practices.



CONCLUSIONS

The modernization of the irrigation system caused a decrease in the flow restored to the basin (Q), reduced the irrigation water depletion (I) and preserved water quality globally, since modernization leaves more water available for further uses and reduces the irrigation return flows and the pollutant loads associated to them.

Additionally, it was inferred that the salt and nitrogen loads emitted from the VID depend mainly on the irrigation system, and secondly, in regard to nitrogen only, on the prevailing crops.

ACKNOWLEDGEMENTS

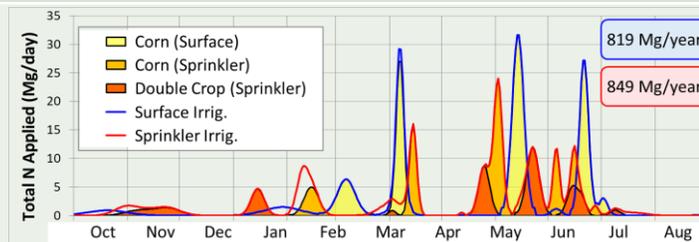
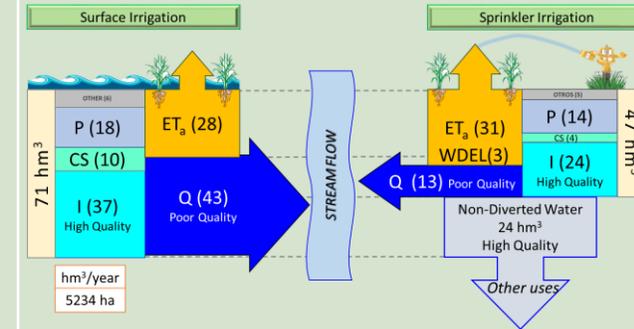
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RESULTS AND DISCUSION

Comparing periods with similar crop patterns, dominated by corn, the modernization reduced the water abstraction for irrigation (I), decreased irrigation return flows (Q) and increased the consumptive use by the crops (ET_a + WDEL).

Altogether, the modernization spared 24 hm^3 of non-diverted high quality water available for other uses in the basin and reduced the return flows by 70% (with slightly better quality until 2013) leading to an overall better quality of the available resources.

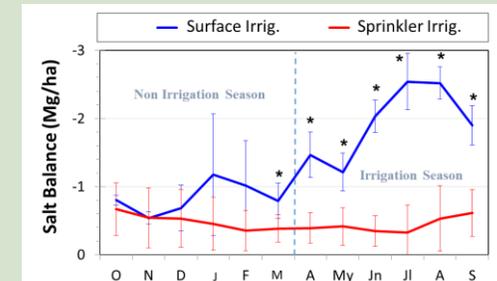


- The irrigation and fertilization management were changed considerably.

Modernization allows for lower dose- higher frequency-irrigation, increasing crop yields and leading to lower fertilization doses, as it reduced fertilizer losses. Corn (the main crop in VID) showed the highest decrease in nitrogen fertilization per unit area. Nevertheless, the total nitrogen inputs to the system slightly increased due to the introduction of double crops. Thus, water use efficiency and the nitrogen use efficiency in corn were increased.

The introduction of swine farming in VID after this work is altering the nutrient balance in the area.

The salt and nitrogen loads exported decreased after modernization, due to the reduced irrigation return flows. Under surface irrigation, the salts leaching was mainly produced during the irrigation season while under sprinkler irrigation, it took place all the year round, avoiding the higher salt loads to the water bodies during the period of lower flow, when their environmental impact would be higher.



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