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# Nitrate, phosphate, sediment and dissolved solids concentration and yield from an irrigated watershed in Navarre (Spain)

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The surface of irrigated land has considerably increased in recent years and this pattern is expected to continue in order to cope with the food demand of a growing population. Irrigation has many advantages such as increased productivity, higher diversity of crops or more reliable harvests. However, irrigated agriculture imposes severe pressure on the environment.
In this study, the environmental impact of irrigated agriculture on water quality was assessed in Landazuria (479.5 ha, Navarre, Spain), a watershed with 53% of irrigated agricultural land. Precipitation and discharge were measured at 10-min intervals and compound daily water samples were collected during the years 2007–2016, and analysed for nitrate ($NO_3-$), phosphate (PO43−), sediment and total dissolved solids (TDS) concentrations. Daily loads were computed from average daily discharge and daily concentrations. Typical agricultural management (including crop surfaces, irrigation and fertilization rates) was obtained from inquiries to farmers.
Concentration and yield of the analysed variables presented a high degree of variation, both intra- and inter-annual. Median concentration for the entire study period were 185, <0.05, 31 and 2284 mg L-1 for $NO_3-$, PO43−, sediment and TDS, respectively. $NO_3-$-N and PO43−-P yields averaged 74 and 0.04 kg $ha^{-1}$ $year^{-1}$, respectively. Sediment yield was extremely variable, averaging 360 kg $ha^{-1}$ $year^{-1}$, with 44% of the total measured load recorded in a few days. TDS concentration presented a significant decreasing trend since available salts were being washed out, while TDS yield averaged 1.8 Mg $ha^{-1}$ $year^{-1}$. The results obtained in this study were contextualized through the review of other irrigated areas in semi-arid regions.
Long-term monitoring of irrigated areas is required to understand pollution processes in these agroecosystems and to adequately characterize the environmental impact of current agricultural practices on water quality, in order to implement, and adequately assess, measures to reduce agricultural pollution.