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IMPACT OF HYDRAULIC STRUCTURES AND WATER USE ON SOLIDS IN WATER IN THE ANDEAN ARGENTINIAN PIEDMONT: CASE STUDIES OF TUNUYAN AND MENDOZA RIVER VALLEYS

ABSTRACT: LAVIE É., LAGANIER R., MORÁBITO J.A., SALATINO S.E., MEDINA DE DIAS R., MIRALLES S. & HERNÁNDEZ R., *Impact of hydraulic structures and water use on solids in water in the Andean Argentinian piedmont: case studies of Tunuyán and Mendoza river valleys.* (IT ISSN 0391-9838, 2013).

The province of Mendoza has a tradition of irrigation inherited from the Incas, from pre-Columbian times. It contains 36,000 ha irrigated and distributed in oases located on the banks of snow-glacial water-regime rivers from the Andes Mountains. After several years of monitoring the quality of irrigation water in two of the largest basins (Mendoza and Tunuyán rivers; latitude 32°30'S, 33°50'S and longitude 67°50'W, 69°30'W, respectively), this survey seeks to evaluate the quantitative and qualitative variations of dissolved (TDS) and suspended (TSS) solids in water flows. The study takes place in a context of decreasing water availability over short and long temporal scales (future scenarios of climate variability). Methodologically, the historical records of 12 strategically-selected sampling points (6 in each basin) were studied. The results show that the rivers and irrigation canals exhibit a good physical quality (turbidity and salinity) of the natural water used for irrigation. However, the combination of (i) a possible quantitative decrease in supply, (ii) an inadequate maintenance of the hydraulic structures due to regulation (clear water), and (iii) the negative impact of anthropogenic pollution (occasional industrial, domestic, and agricultural wastes, etc.) requires permanent monitoring in order to encourage effective decisions designed to preserve both the quantity and quality of the water for agriculture.

KEY WORDS: Solids, TDS, TSS, Water quality, Irrigation, Mendoza, Argentina.

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The authors wish to thank Noelia Ortiz and Victor Burgos from the National Institute of Water of Mendoza for their donation of GIS shapes, M. Mara for the translation, the reviewers for their suggestions, and Carol Robins for English editing.

INTRODUCTION

The Cuyo, a wide depression of the Argentinian Andean piedmont, contains half-a-dozen oases characterised by urban (cities of Mendoza and San Juan; fig. 1), industrial (oil zones of Malargüe and Mendoza), and mostly agricultural uses. Most of the oases are organised into specialised areas, each containing a horticultural sector, fruit and olive trees, and vineyards. They are all located in semi-arid to arid lands and have been developed by the diversion of the Andean rivers for (mainly) gravitational and drip irrigation (Ponte & Cirvini, 1998; Chambouleyron & *alii*, 2002).

However, the topography (oasis sited at high altitude or on an alluvial fan in the valley bottom), water supply, and population (villages or cities) are quite different from one oasis to another, implying adaptations in terms of the choice of agricultural crops and land use. Changes have already been observed empirically, such as the development of stone fruit (especially peach trees) from the East Oasis to the Valle de Uco Oasis due to soil salinisation in the 1990s (Chambouleyron & *alii*, 2002). Although water managers were able to anticipate the drastic decrease in the water supply which occurred in 2008, and improved water distribution in the whole catchment, the risk of groundwater contamination is still not really taken into consideration. Nevertheless, in the last 10 years, pumping restrictions have been imposed in the most saline and exploited areas, downstream of the Mendoza and East Oases.

Following several years of monitoring the irrigation-water quality in two catchments (Mendoza and Tunuyán rivers), this paper focuses on (i) the upstream-downstream and temporal changes in solid discharges (both dissolved