

Dealing with variability in water availability: the case of the Verde Grande River basin, Brazil

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Abstract This paper presents a water resources management strategy developed by the Brazilian National Water Agency (ANA) to cope with the conflicts between water users in the Verde Grande River basin, located at the southern border of the Brazilian semi-arid region. The basin is dominated by water-demanding fruit irrigation agriculture, which has grown significantly and without adequate water use control, over the last 30 years. The current water demand for irrigation exceeds water availability (understood as a 95% percentile of the flow duration curve) in a ratio of three to one, meaning that downstream water users are experiencing more frequent water shortages than upstream ones. The management strategy implemented in 2008 has the objective of equalizing risk for all water users and consists of a set of rules designed to restrict water withdrawals according to current river water level (indicative of water availability) and water demand. Under that rule, larger farmers have proportionally larger reductions in water use, preserving small subsistence irrigators. Moreover, dry season streamflow is forecasted at strategic points by the end of every rainy season, providing evaluation of shortage risk. Thus, water users are informed about the forecasts and corresponding restrictions well in advance, allowing for anticipated planning of irrigated areas and practices. In order to enforce restriction rules, water meters were installed in all larger water users and inefficient farmers were obligated to improve their irrigation systems' performance. Finally, increases in irrigated area are only allowed in the case of annual crops and during months of higher water availability (November to June). The strategy differs from conventional approaches based only on water use priority and has been successful in dealing with natural variability of water availability, allowing more water to be used in wet years and managing risk in an isonomic manner during dry years.

Key words water resources management; variability; water rights enforcement