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Groundwater protection using land use changes modelling in the Guadiana river basin

M. Garnier and M. Vurro

Water Research Institute, National Research Council, Bari, Italy (monica.garnier@ba.irsa.cnr.it/0039 80 5313365)

The need to support the food requirement of an always growing population, caused agriculture to become more and more intensive. This, in turn, caused an always greater use of agrochemicals that are, in many cases, responsible for surface and groundwater pollution.
The problems of groundwater pollution from agricultural nitrates are dealt with, in this paper, with reference to a sub-basin of river Guadiana basin, in southern Portugal, where olive groves and winter wheat are the most common crops.
Many reservoirs were recently built in the area to solve problems related to water availability from one year to another. The resulting greater water availability is causing a shift towards modern intensive agriculture and consequently, the possibility of water quality deterioration.
Some BMP scenarios, aimed at reducing the impacts of agriculture on groundwater have been adjusted and their effect in terms of leached NO3 have been estimated using the simulation model GLEAMS. Besides, the irrigation water consumption referred to each scenario was calculated.
Successively, leached nitrates and the water consumption from the whole area, with reference to each scenario were merged within a unique synthetic index that summarizes the suitability of that scenario at reducing both nitrate leaching and water consumption.
Among the most interesting conclusions is the fact that modern intensive olive grove not always results to be responsible for a higher NO3 leaching in comparison to the traditional one and could, for this reason, be considered in itself a way to perform a sustainable agriculture.
The simulation results, considered in relative terms, can be used as a rough estimation of the consequences of each BMP scenario in comparison to the others, in advance of any later model validation. From this point of view, the proposed methodology reveals to be a particularly valuable tool, in comparison to other methods used to tackle similar problems, mainly in situations of field data scarcity like those met, with reference to some of the developing Countries.