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Planning agricultural wastewater reuse in southern Italy: The case of Apulia Region

A. Lopez*, M. Vurro

Consiglio Nazionale delle Ricerche, Istituto di Ricerca Sulle Acque, Via F. De Blasio 5, 70123 Bari, Italy
Tel. +39 (080) 5820511; Fax +39 (080) 5313365; email: antonio.lopez@ba.irsa.cnr.it, michele.vurro@ba.irsa.cnr.it

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Abstract

The future of southern Italian regions lays mainly on conservation and recovery of their peculiar environment (i.e., pleasant climate, beautiful nature and historic heritage). Presently, most of such regions have to face major problems related to water shortage for agriculture and, in some cases, even for drinking purposes. In these regions water shortage is a growing problem and wastewater reclamation and reuse, a key options for their sustainable development, has not yet been implemented at large scale. In these regions, the interest for wastewater reuse is particularly addressed to agricultural and landscape irrigation with the aim of both enhancing the local economy, mostly based on agriculture, and saving good quality water resources for drinking purposes. Referring to the Apulia region, it has many analogies with other areas affected by chronic water scarcity, i.e: the rapid development of local economy, the changes in traditional agriculture practices and land use, the groundwater over-exploitation with consequent sea water intrusion, the climate changes. The mix of all these factors, although with a different weight, has been the main cause of the frequent water shortage problems recorded in the region. Although over the last decades these problems have been partially mitigated by the construction of water transport infrastructures and reservoirs, they are still far to be definitely solved. Because of this, finally, regional authorities have defined a water resources protection and management master plan in which the reuse of treated wastewater, not only in agriculture, plays a relevant role [1]. This paper outlines the local environmental conditions and the rationale supporting such a choice.

Keywords: Agricultural wastewater reuse; Wastewater treatment; Water resources management

*Corresponding author.

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1. Introduction

In Italy, an overall annual water inflow around 155 billions m^3 yields only 52 billions m^3 of resources actually utilizable. Because of the geographically uneven rainfalls distribution, in southern regions (e.g., Apulia, Sicily and Sardinia) such figures drastically decrease as rainfalls result much lower than the national average (980 mm/y) [2]. Furthermore, in such regions, only part (15–20%) of these scarce water resources is actually available mainly because of their out of date water distribution systems.

At national level, Apulia, a southern-eastern region extended for about 20,000 km^2 with 800 km of coasts and 4,500,000 inhabitants, owns the smallest amount (136 m^3/capita/y) of potentially available water resources [2]. Nevertheless, the economy of the region, mainly based on two water demanding activities, agriculture and tourism, is ranked as one of the best in the south. This is possible thanks to the Apulian water agency (AQP) that imports water from bordering regions such as Campania, Lucania and Molise. AQP manages the largest European aqueduct, a complex multi-purposes and multi-reservoirs system with 19,635 km of distribution networks. It serves 4,623,349 inhabitants and distributes, net of leakages, 309,416,113 m^3 of drinking water [3].

As for the agricultural sector, although it is served by large irrigation-water distribution consortia, a negative gap of about 700 Mm^3 exists. To fill this gap, it has been estimated that regional farmers have drilled, more or less legally, about 140,000 wells whose extensive exploitation has caused the progressive salinization and depletion of relevant portions of the local aquifers. In order to manage such a situation, regional authorities in addition to drastically restrict water wells drilling have also planned a strategic reuse, in agriculture as well as in industry, of treated municipal wastewater (MWW) [1].

Referring only to the agricultural sector, this paper is aimed at qualitatively describing some features of the Apulia region related to its water resources scarcity, the criteria that have driven the selection of the MWW treatment plants whose effluents have been planned to be reused in agriculture and some information concerning the treatment-scheme of such plants.

2. Planning agricultural wastewater reuse in Apulia

2.1. Environmental drivers

As shown in Fig. 1, Apulia is the Italian region with the lowest rainfall average value (i.e. about 660 mm) [2]. Furthermore because of its orography and its hydro- geological subsoil features, its average runoff coefficient value (0.23) is also the lowest. This value has been calculated, by a model designed for evaluating groundwater recharge through a soil-water balance, taking into account inflows (rainfall, irrigation) and outflows (plant evapotranspiration, surface run-off) [4].

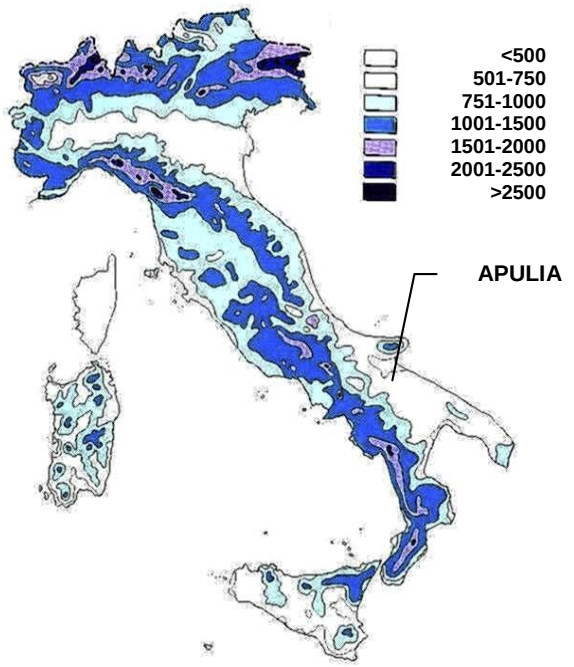

Fig. 1. Rainfalls distribution in Italy: average values (mm) in the period 1950–2000.