

**Workshop**

**IL RIUSO DELLE ACQUE REFLUE : LE OPPORTUNITA' DI IRRIGAZIONE E  
FERTIRRIGAZIONE E LE NUOVE TECNOLOGIE PER LE AZIENDE**

**The use of purified wastewater for  
irrigation: Possible strategies in the  
Capitanata area (Apulia, Italy)**

**MACFRUT**

**9 maggio 2024**

*Veronica MANGANIELLO, PhD.*

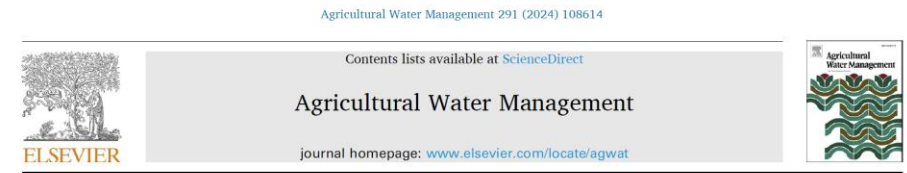
*CREA Centro di ricerca Politiche e Bioeconomia*

1. Lo studio analizza la domanda d'acqua in un'area del Sud Italia focalizzandosi sulle tipologie di agricoltura alla quale possono essere fornite acque reflue trattate per ridurre i prelievi di acque sotterranee.

2. Nel Sud Italia l'irrigazione è praticata, in molte condizioni, combinando prelievi collettivi di acque superficiali e sotterranee e la pressione sulla falda acquifera è molto elevata.

3. Una stima econometrica della domanda irrigua in queste aree definisce se il **rapporto** tra domanda irrigua di falda e di consorzio è **complementare o sostitutivo**.

Manganiello V *et al*, **The use of purified wastewater for irrigation: Possible strategies in the Capitanata area (Apulia, Italy)**, *Agricultural Water Management*, Volume 291, 2024, 108614, ISSN 0378-3774, <https://doi.org/10.1016/j.agwat.2023.108614>.  
(<https://www.sciencedirect.com/science/article/pii/S0378377423004791>)



The use of purified wastewater for irrigation: Possible strategies in the Capitanata area (Apulia, Italy)

Veronica Manganiello<sup>a</sup>, Raffaella Zucaro<sup>a</sup>, Gabriele Dono<sup>b,\*</sup>

<sup>a</sup> CREA Research Centre for Agricultural Policies and Bioeconomy, Via Barberini 36, 00187 Rome, Italy  
<sup>b</sup> University of Tuscia, Via San Camillo de Lellis snc, 01100 Viterbo, Italy

#### ARTICLE INFO

Handling Editor: Z. Xiyang

**Keywords:**  
Water reuse  
Water management  
Irrigation demand  
Crop  
Agriculture water policy  
SIGRIAN  
FADN

#### ABSTRACT

The reuse of purified wastewater can supplement water availability for irrigation and limit withdrawals from groundwater which contribute to deteriorating its quality in many Italian coastal agricultural areas. The regulatory framework defined by EC Reg. 741/2020 specifies the legal and technical conditions, which from 2023 allow this use to be promoted in Italy. However, Italian agriculture is also differentiated in the ways in which farms obtain water for irrigation, and it is advisable to direct the treated wastewater towards the types that will then effectively reduce the use of groundwater. Our study seeks to identify these typologies by examining irrigation conditions in an important agricultural area of Southern Italy. Some districts of this territory are reached by collective irrigation networks of a Consortium that supply all the irrigation water; other areas are connected to those networks, but its supplies are lacking, and the farms also draw on underground aquifers; other areas are not reached by the collective network and groundwater is the only irrigation resource available. An econometric estimate of the irrigation demand in these areas defines whether the relationship between irrigation demand for groundwater and consortium is *complementary* or *substitutive*. This outlines the possible responses to the increase in consortium supplies with the introduction of treated wastewater, identifying the farm types to which those additional water resources can be allocated to reduce withdrawals from aquifers. A Seemingly Unrelated Regression Equations system of two irrigation water demand functions, from Consortium and from farm wells, is estimated with data from the National Information System for the Management of Water Resources in Agriculture (SIGRIAN) and the Farm Accountancy Data Network (FADN). The unitary costs of using each of these two sources are amongst the technical and economic regressors. The results indicate that in the farm type that uses both water sources, consortium and groundwater, there is a *substitution* relationship between these two sources. Also, the irrigation of these farms is the most responsive to current trends in the profitability of the various groups of crops, with the possibility of a further growth in the groundwater use. Supporting irrigation with treated wastewater on these farms would not induce *rebound effects* that increase the groundwater use: a greater irrigation supply of purified and conventional water at lower costs would instead reduce the use this water source.

*Materials: data for econometric estimates*

1. Sistema informativo nazionale per la gestione delle risorse idriche in agricoltura (SIGRIAN)
2. Rete d'informazione contabile agricola (RICA).

*Methods: demand models for irrigation water in the Capitanata area*

SURE: Seemingly Unrelated Regression Equations  
Un sistema di equazioni di regressione apparentemente non correlato di due funzioni di domanda di acqua irrigua, dal Consorzio e dai pozzi agricoli.

V. Manganiello et al.

Agricultural Water Management 291 (2024) 108614

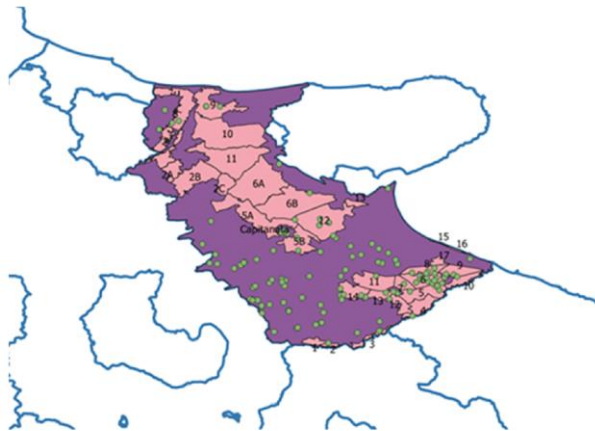


Fig. 1. GIS (Geographical Information System) processing of RICA (FADN) and SIGRIAN data (year 2016). Source: our analysis of SIGRIAN and FADN data.

$$WU_{it} = \alpha_i + \sum_{i=1}^n \beta_i X_i + \sum_{i=1}^n \beta_i X_i^2 + e$$

Manganiello V et al, **The use of purified wastewater for irrigation: Possible strategies in the Capitanata area (Apulia, Italy)**, Agricultural Water Management, Volume 291, 2024, 108614, ISSN 0378-3774, <https://doi.org/10.1016/j.agwat.2023.108614>. (<https://www.sciencedirect.com/science/article/pii/S0378377423004791>)

Table 4  
Elasticities ( $\epsilon$ ) calculated as the average of the elasticities of the single observations in the sample data.

	Gross margins per hectare			Tree crops % on UAA		Consortium and Wells Unitary Water Costs		Farm Utilized Area and Family Labour Units		Net evapo-transpiration t-1	Watering Systems									
	Fruit	Olive-Viney.	Non-irrigated	Fruit	Olive-Viney.	Wells	Consortium	Agric. area	Labor units		Micro				Spray				Sprinkle	
											Summer veg.	Winter veg.	Fruit	Olive-Viney.	Summer veg.	Winter veg.	Fruit	Olive-Viney.	Olive-Viney.	
Consortium water	ONCO		-0.61	1.35				1.05	1.13	-1.84	0.02	0.001		0.19	0.01	0.003		0.02	0.003	
	COWE		-3.24	5.66				6.97		-11.0	0.18				0.11			0.98	0.31	
Wells water	COWE	0.71		0.56	-1.96	-0.35	1.72								0.08			-0.14	0.71	0.13
	ONWE		0.67	0.19										-1.08	-2.05	-0.01				

Source: our estimates from FADN data with EViews12 program

I risultati indicano che nella tipologia aziendale che utilizza entrambe le fonti idriche, consortile e di falda, esiste un rapporto di sostituzione tra queste due fonti. Inoltre, l'irrigazione di queste aziende agricole è la più reattiva alle attuali tendenze della redditività dei vari gruppi di colture, con la possibilità di un ulteriore aumento dell'utilizzo delle acque sotterranee.

Sostenere l'irrigazione con acque reflue trattate in queste aziende agricole non indurrebbe effetti di rimbalzo che aumentino l'utilizzo delle acque sotterranee: una maggiore fornitura per l'irrigazione di acqua trattata e convenzionale a costi inferiori ridurrebbe invece l'utilizzo di questa fonte idrica.



*Grazie*

[veronica.manganiello@crea.gov.it](mailto:veronica.manganiello@crea.gov.it)