



**Sustainable Water  
Integrated Management (SWIM) -  
Support Mechanism**



Project funded by  
the European Union

*Water is too precious to waste*

## **TWO DAYS TRAINING ON THE OPERATION AND MANAGEMENT OF WWTPS**

9-10 September, Murcia

### **Introduction**

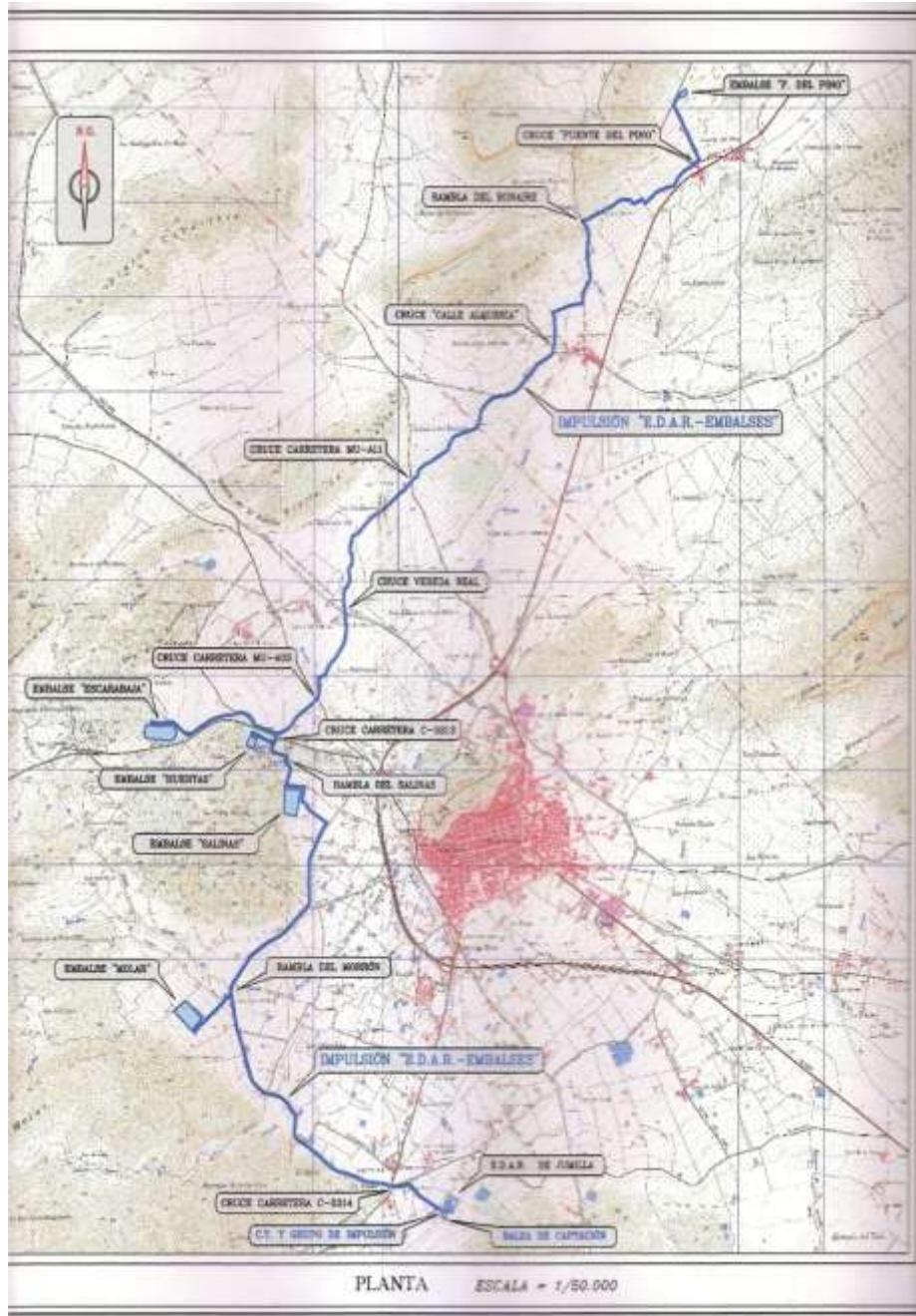
*Presented by: Dr. Emilio Nicolas Nicolas*

# **WASTEWATER TREATMENT AND REUSE IN SEMIARID ENVIRONMENTS: A PRACTICAL VIEW**

## **CASE STUDIES ON RECLAIMED WATER USE IN AGRICULTURE.**

Dr. Emilio Nicolás Nicolás  
Staff Research

Department of irrigation (CEBAS-CSIC)



Crops	% Surface
Pear	45
Peach	32
Grapes	2
Apricot	12
Olive	5
Almond	1
Plum	3

•967 irrigators

• Irrigation surface = 1329 Ha

# PROJECT JUSTIFICATION

## Situation of Miraflores Irrigation Community

- 967 members
- Irrigated surface 1329 Ha

Resource type	Volume (m <sup>3</sup> /year)
Water needs	<b>7.765.000</b>
Subterranean water	3.851.288
WWTP Jumilla	1.500.000
<b>Total volume</b>	<b>5.351.288</b>

Crops	% surface
Pear	45
Peach	32
Grapes	2
Apricot	12
Olives	5
Almond	1
Plum	3

**With this use of treated wastewater from the Jumilla WWTP, the Miraflores irrigation community will increase from 3600 m<sup>3</sup>/ha to 4900 m<sup>3</sup>/ha per year.**

# OBJECTIVES

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**Carry out periodic monitoring of the different sources of water use for irrigation, analyzing and evaluating various physical-chemical and microbiological parameters**

**Analyze the results and evaluate the agronomic viability of the water for the crops of the Miraflores I.C. And possible effects on filters. Recommendations for water treatment and irrigation equipment.**

**Carry out a health report defining the agronomic suitability of the reclaimed wastewater from the Jumilla WWTP according to RD 1620/2007.**

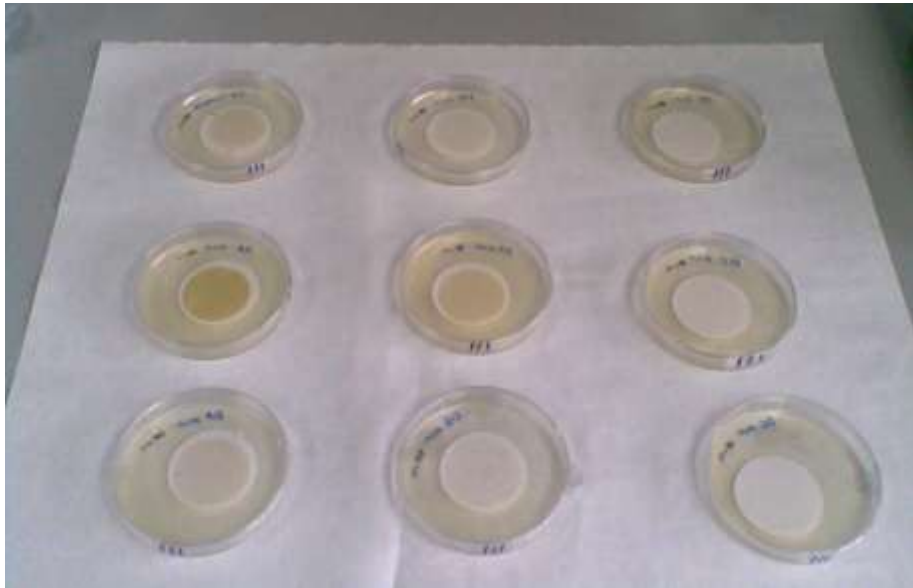
# METHODOLOGY

## Agronomic evaluation of the quality of treated wastewater

Every two weeks, physical-chemical and microbiological analysis of water from Jumilla WWTP (AOAC, 1996)

At the beginning and end of the study period, physical-chemical analysis of well water of the Miraflores I.C.

Water quality was studied after mixing treated wastewater with well water, in proportions 1:1 and 1:3.





# METHODOLOGY

## Physical-chemical analysis

Suspended materail, disolved solids and turbidity

Electrical conductivity, sulphates, sodium, chloride, boron, calcium, magnesium, iron and manganese.

pH and disolved oxygen

Heavy metals(cadmium, zinc, nickel and mercury).

Nitrates, phosphates and bicarbonates.



## Microbiological analysis

Fecal coliforms

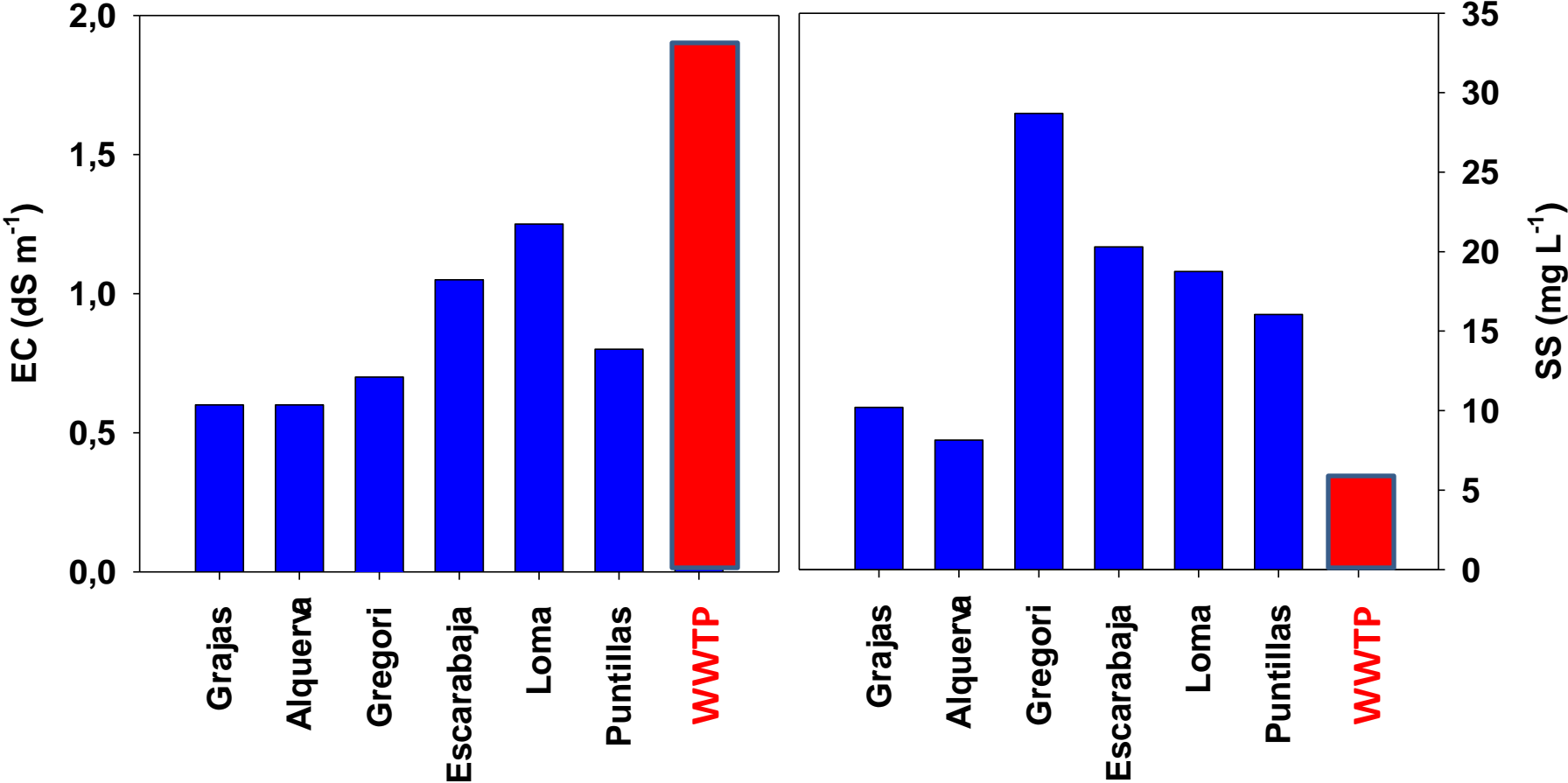
Total coliforms

Intestinal nematodes



# RESULTS

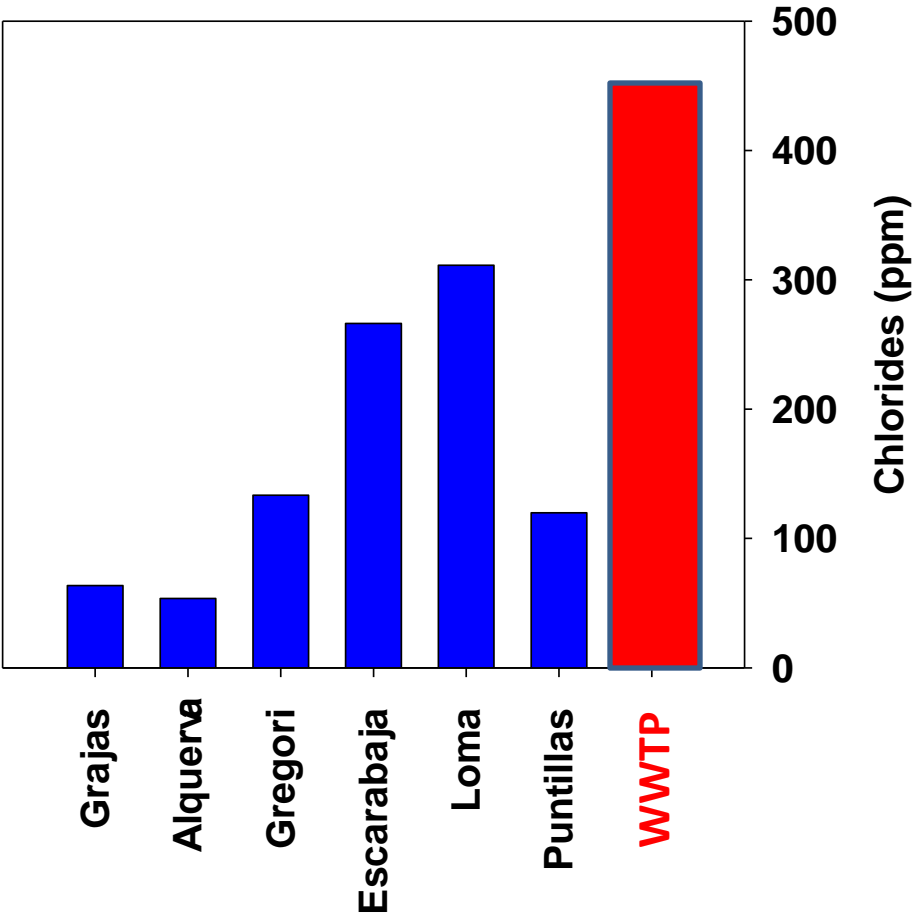
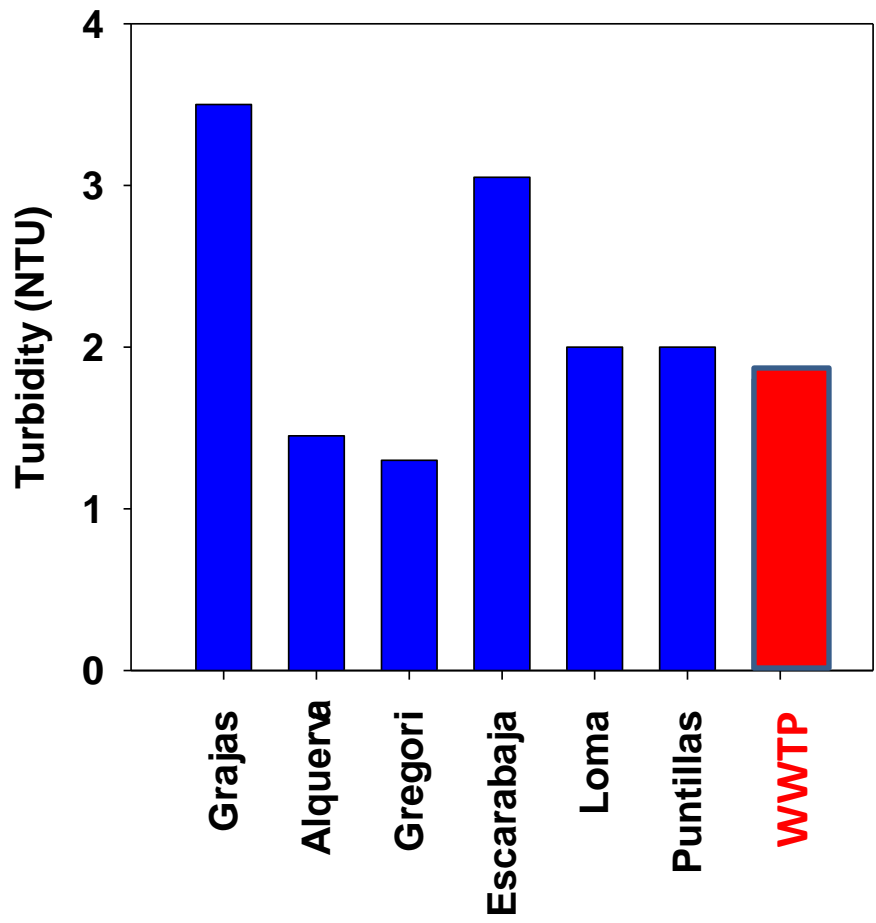
*Underground water from the six wells of Miraflores I.C.*





# RESULTS

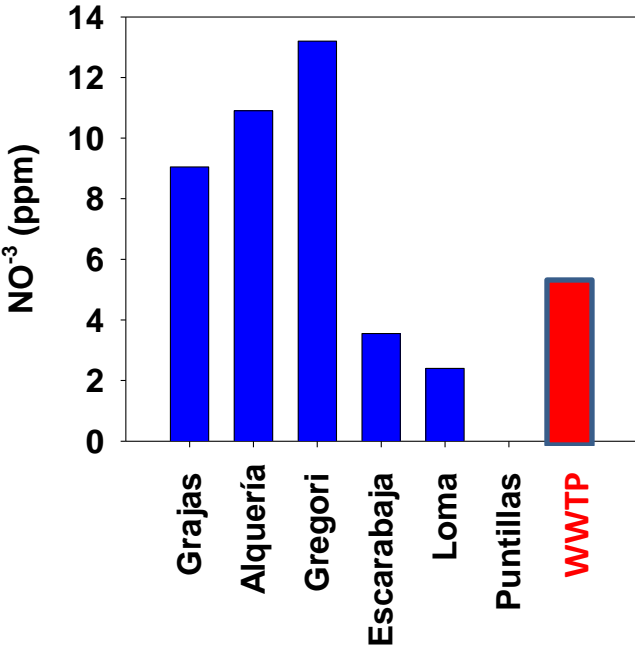
Underground water from the six wells of Miraflores I.C.



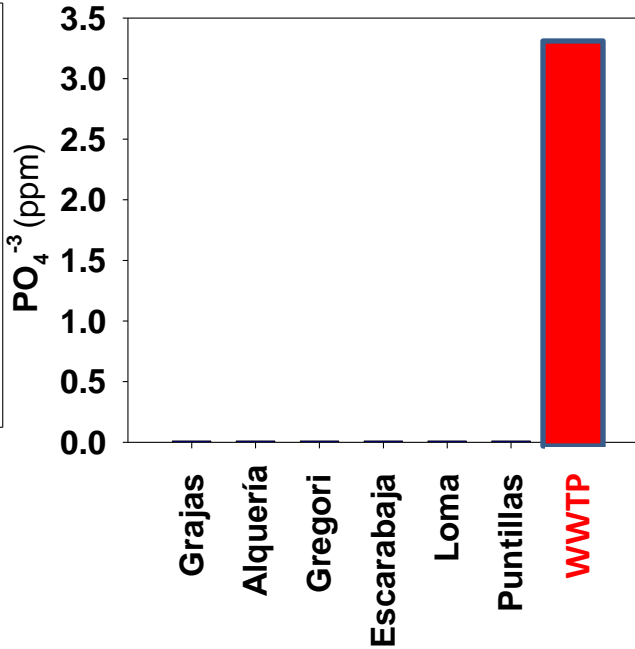
# RESULTS

Underground water from the six wells of Miraflores I.C.

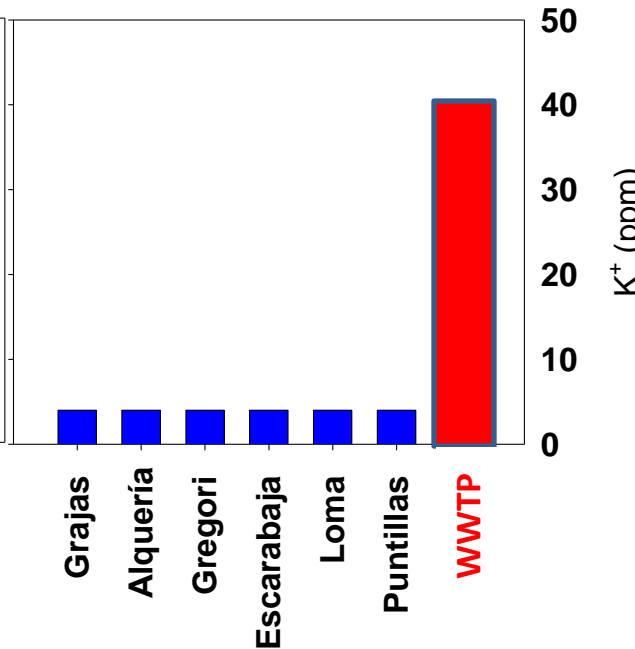
### Nitrogen



### Phosphorous

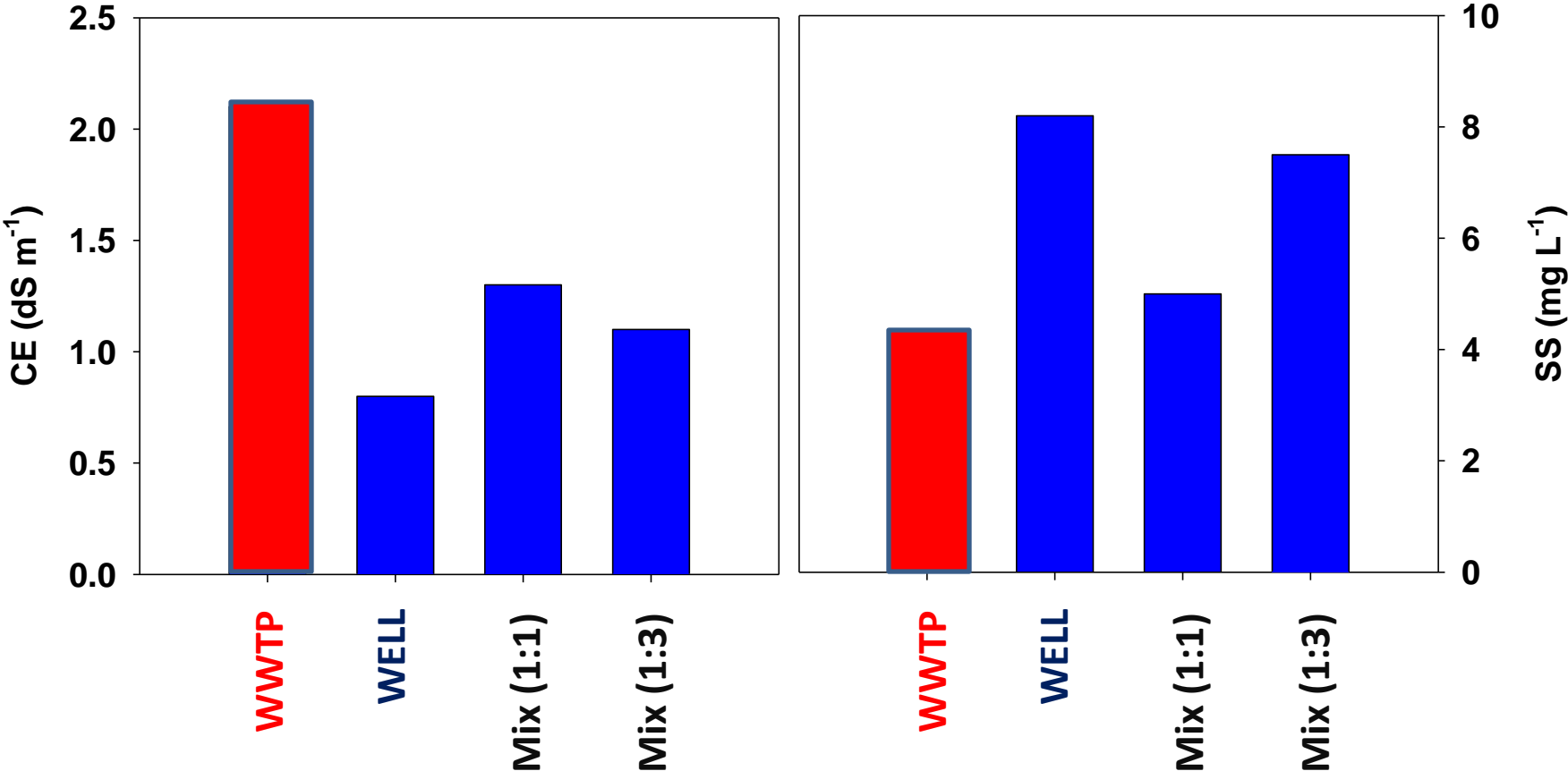


### Potassium



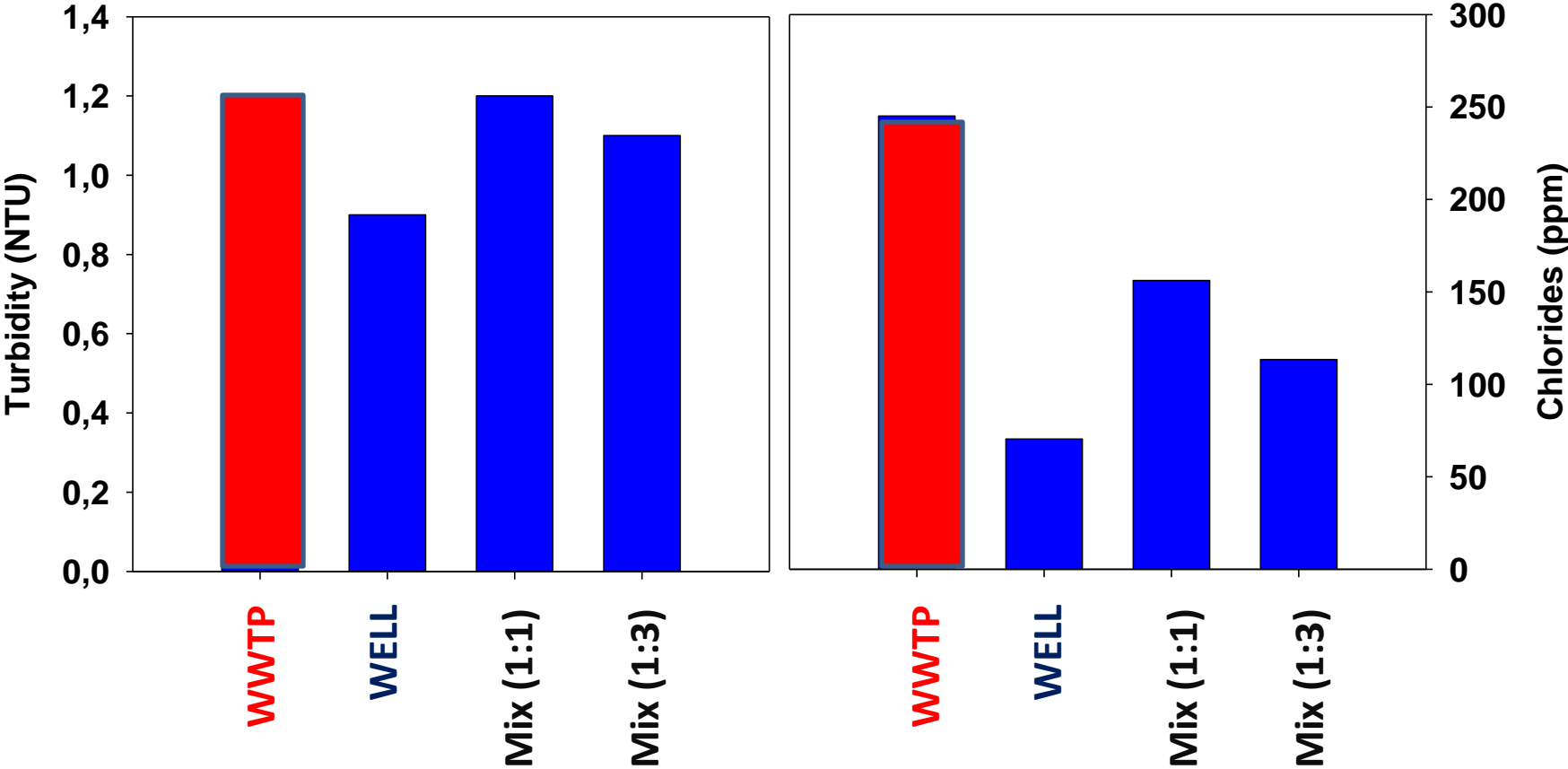
# RESULTS

## Mixed well and reclaimed wastewater



# RESULTADOS

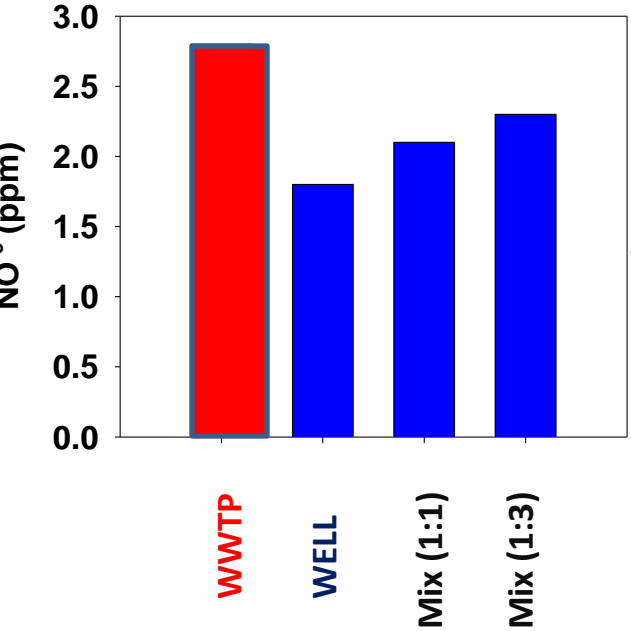
## Mixed well and reclaimed wastewater



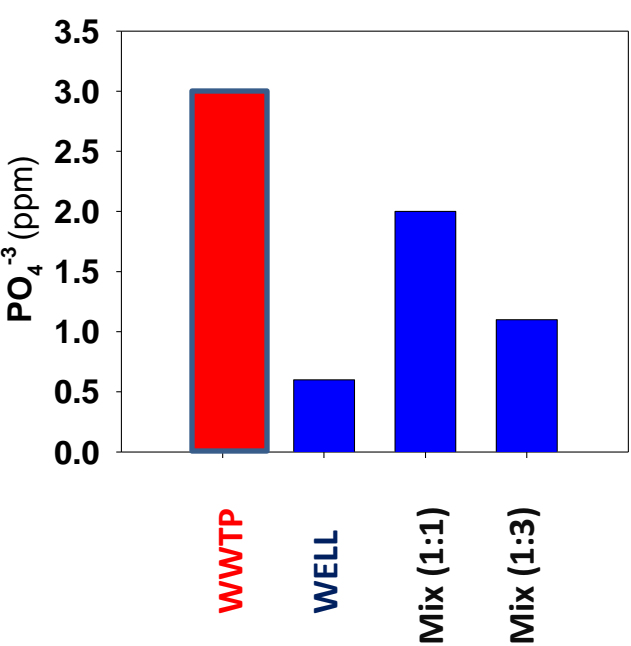
# RESULTADOS

## Mixed well and reclaimed wastewater

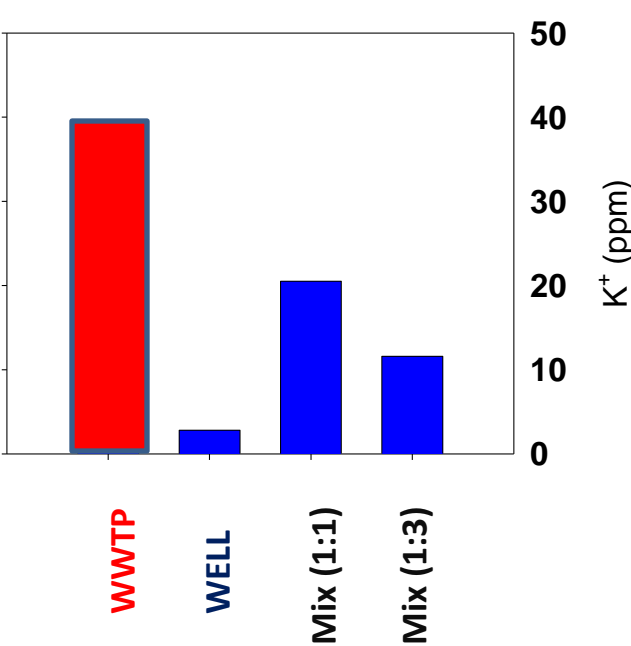
### Nitrogen



### Phosphorous



### Potassium



# CONCLUSIONS

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**The treated wastewater has no adverse effects in the filters system in direct application.**

**The treated wastewater complies with the requirements of the regulations for irrigation of fruit crops of Miraflores I.C.**

**Important nutrient supply and risk of eutrophication.**

**No heavy metals and moderate risk of salinity**

**Need for higher level of training of farmers**

**Recommendation of continuous monitoring of treated wastewater in the installation of the Miraflores I.C.**





ETSIA

Escuela Técnica Superior de Ingeniería Agronómica



# Miraflores Irrigation Community

Feasibility study of using treated water from the Jumilla WWTP in the Miraflores Irrigation Community



Universidad Politécnica de Cartagena



# CSIC





# **Management and control of treated wastewater from the Jumilla WWTP in the Miraflores I.C.**

## **Training courses in agricultural use of treated wastewater for members of Miraflores I.C.**

- **Continuous measurement probes (pH, electrical conductivity and turbidity) to analyze and interpret water quality.**
- **This information goes to a head programmer to close the valve, when water conditions are deficient and do not comply with the requirements of RD 1620/2007 section 2.1.**

Control 1

### STEP 1- WATER SAMPLING

YES

### STEP 2 - ANALYSIS

pH, EC, Turbidity

Each hour. Valve open for five minutes and then continuous analysis for five minutes

NOT above limits

conformity

SI above limits

No conformity

Is it in the Miraflores irrigation period?

Flow more than 100 m<sup>3</sup>/h

NO

Escarabaja reservoir

1. Close valve 400 mm
2. 20 min-Step 1
3. 20 min-Step 1

conformity

No conformity

Manual measurements

NOT over limits  
YES over limits

Escarabaja

No conformity



Untreated water



EDAR JUMILLA

WWTP

Regeneration station

Control 1

DISTRIBUTION

II

Control 2

Embalse Escarabaja

USER 1

USER 2

USER 3

USER 4



III-3  
C



III-4  
C

Authorized discharge organization

Authorized (re)use organization

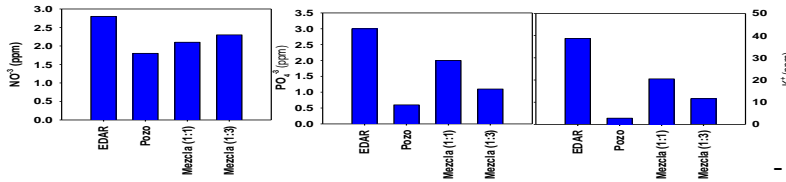
Treated wastewater user



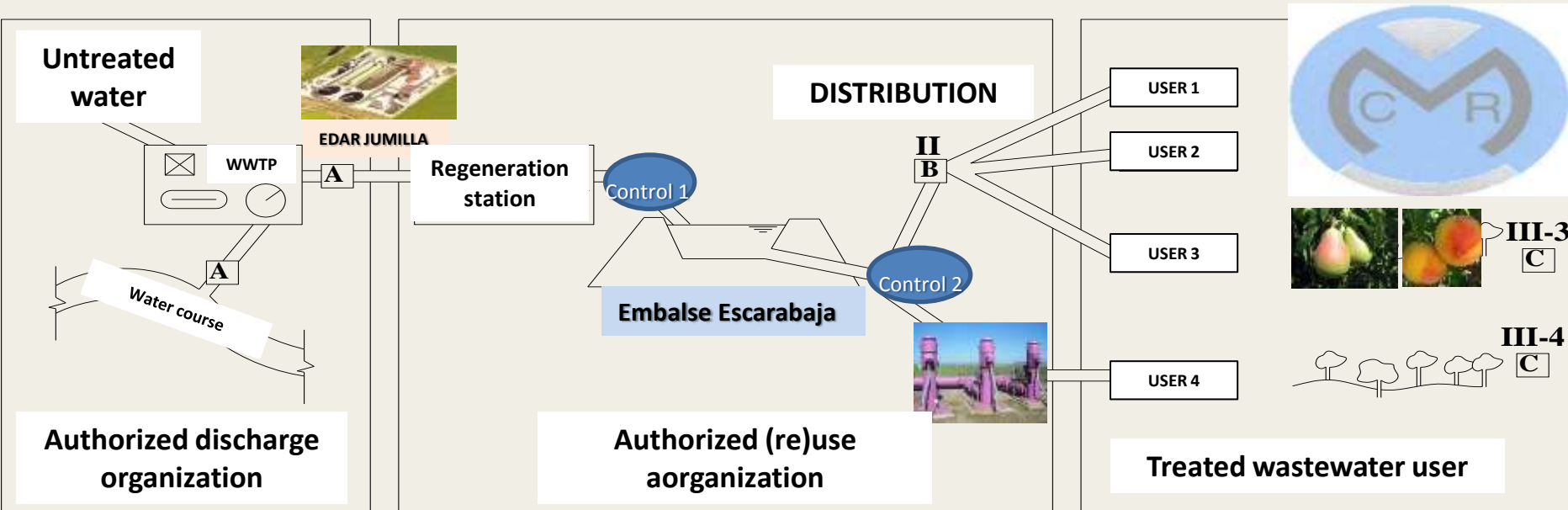
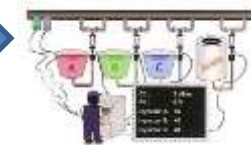


- Measurements four times per day : Nitrates, phosphates, potassium, EC, turbidity and pH

- Data interpretation



- Transfer of information to irrigators



مع خالص شكري  
وامتناني

Thank you  
for your attention

Merci pour  
votre attention



*For additional information please contact:  
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Website: [www.swim-sm.eu](http://www.swim-sm.eu)*