

## Visit of Egyptian authorities to CITA-Zaragoza

### Summary of Priority Lines of the “Irrigation, Agronomy and the Environment” Research Group

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## Research Group “Irrigation, Agronomy and the Environment”



<http://www.cita-aragon.es>



<http://www.eead.csic.es>

Unidad de Suelos y Riegos  
Centro de Investigación y Tecnología  
Agroalimentaria, Diputación General de Aragón

Grupo de Riego, Agronomía y Medio Ambiente  
Departamento de Suelo y Agua, Estación  
Experimental de Aula Dei, CSIC

Zaragoza (Spain)

July 2011

## General objective

Generate scientific and technological information in the “soil-water-crop-atmosphere” interface leading to more competitive, efficient and sustainable agricultural systems, with emphasis on **irrigation, agronomy and the environment**, and with a research-applied focus.

## Personnel – Total

Year 2011

Permanent researchers	12
Temporary researchers	4
Technicians	19
Students	18
<b>TOTAL</b>	<b>53</b>

Largest group in Spain working on irrigation and the environment

## Indicators 2006-2010

	Nº
SCI publications	105
Non-SCI publications	61
Books/book chapters	32
Congresses with proceedings	95
Public and private funding	3.9 M €
Personnel contracts	8*
PhD scholarships	10,2*
PhD and MSc thesis, Postgraduates	47
PhD and postgraduate courses	93
Dissemination activities	77

\*Average/year

**Education and dissemination  
are two key strategies in our Group**

## **Priority lines**

- 1- Sustainable use of water and soil resources**
- 2- Environmental impact of agricultural activities**
- 3- Crop agronomy**

**Line 1 of 3**

## **Sustainable use of water and soil resources**

- 1- Evapotranspiration and crop water requirements**
- 2- Diagnosis/improvement of on-farm irrigation systems and irrigation conveyance networks**
- 3- Diagnosis/support to collective irrigation management (Water Users Associations)**
- 4- Soil morphology, mapping and evaluation**

Line 2 of 3

## **Environmental impact of agricultural activities**

- 1- Environmental impact of irrigation: soils**
- 2- Environmental impact of irrigation: waters**
- 3- Analysis of relevant habitats in agricultural areas**

Line 3 of 3

## **Crop agronomy**

- 1- Crop responses to abiotic stresses**
- 2- Optimization of water use**
- 3- Optimization of nitrogen fertilization**
- 4- Use of pig slurry as fertilizer**
- 5- Agronomic applications of remote sensing techniques**

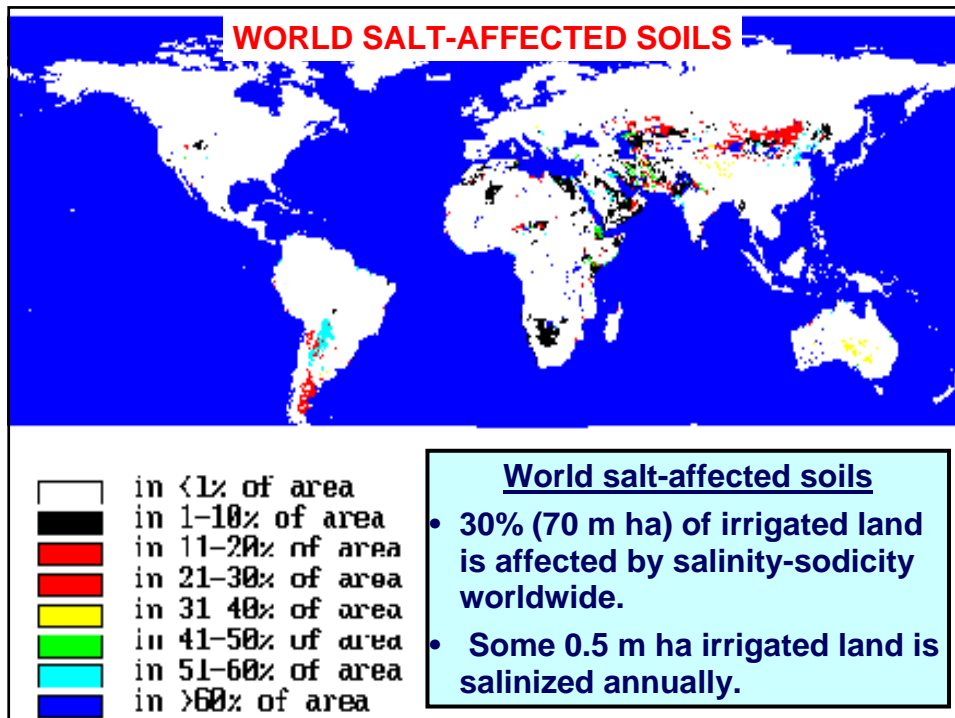
## **Three examples of works performed in our Group**

- 1- Monitoring of soil salinity.**
- 2- Impact of irrigation modernization on water conservation.**
- 3- Water quality studies at the source (irrigation) and sink (drainage) levels.**

### **-Example 1-**

**Soil salinity: a world threat in arid and semiarid areas**





### Some examples of soil/water salinization

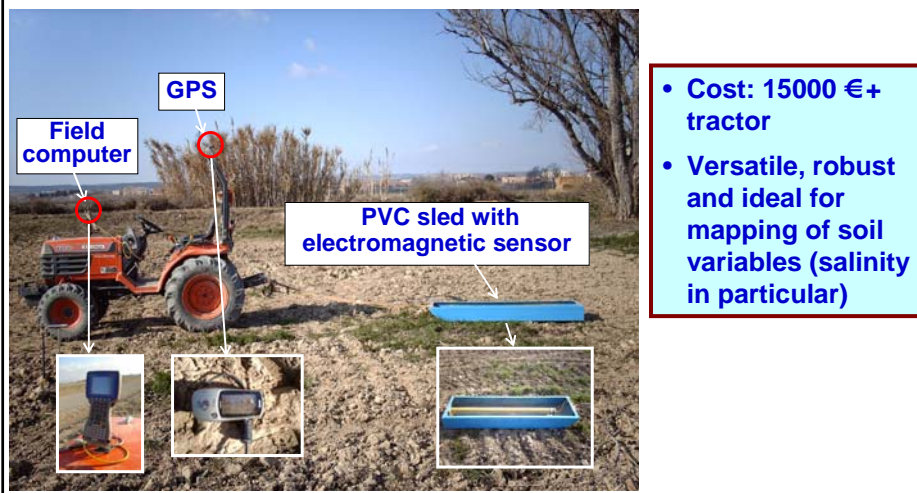
(D. Hillel. Soil salinity: historical and contemporary perspectives. *Int. Salinity Forum, Riverside (CA), 2005. Abstracts: 235-240*)

- 1- Mesopotamia (Tigris and Euphrates rivers). 2000 bc.
- 2- India and Pakistan-Punjab region.
- 3- The Aral sea disaster (central Asia).
- 4- Egypt, after the construction of the Aswan dam in the late nineties.**
- 5- Dead sea. Its surface has decreased by 60% and its salinity has increased due to the diversion of the incoming Jordan and Yarmouk rivers.
- 6- Central valley of California (USA). The Kesterson reservoir disaster. The Selenium disaster.
- 7- Salton sea (south California). Endorreic depression receiving the saline drainage flows (3.6 dS/m) of Imperial valley irrigated agriculture.
- 8- Australia- Increased dryland saline seeps due to native clearing.

## How to monitor soil salinity? Remote sensing techniques

### Electromagnetic sensor vehicle

#### Design, development and applications of a mobile, georeferenced electromagnetic sensor for measuring soil salinity and other soil variables of interest in precision agriculture

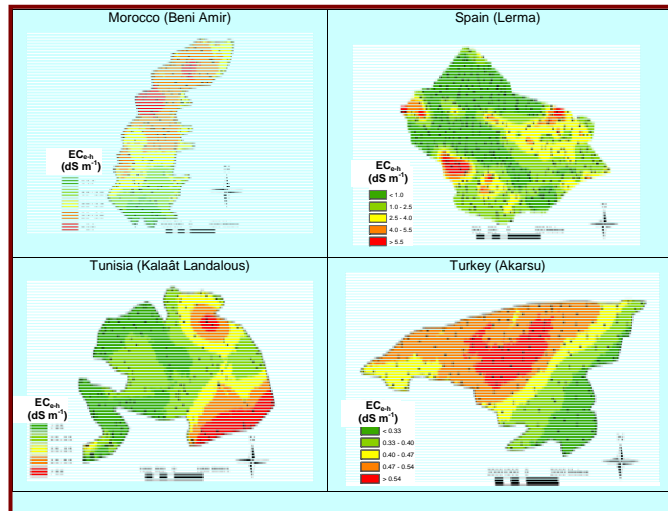




## Development of soil salinity maps based on sensor readings (ECa) and ECa-ECe calibrations

The Inco-EU Qualiwater project (2005-2010): ECe maps obtained in four irrigation districts in Morocco, Spain, Tunisia and Turkey.

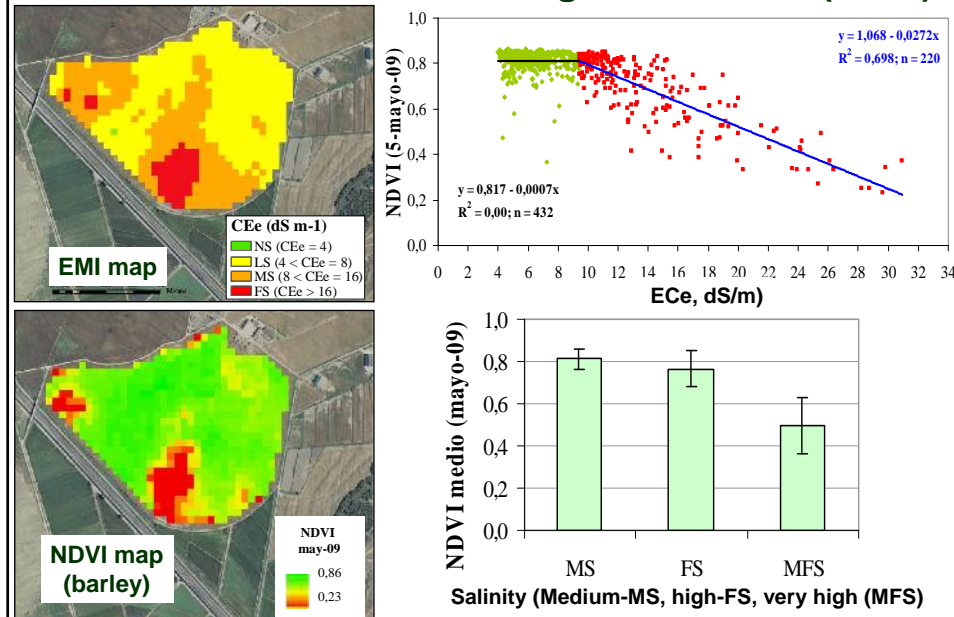
Black points: ECa lectures



How to monitor soil salinity?  
Remote sensing techniques

Landsat images

## Soil salinity monitoring with Landsat images using the Normalized Difference Vegetation index (NDVI)

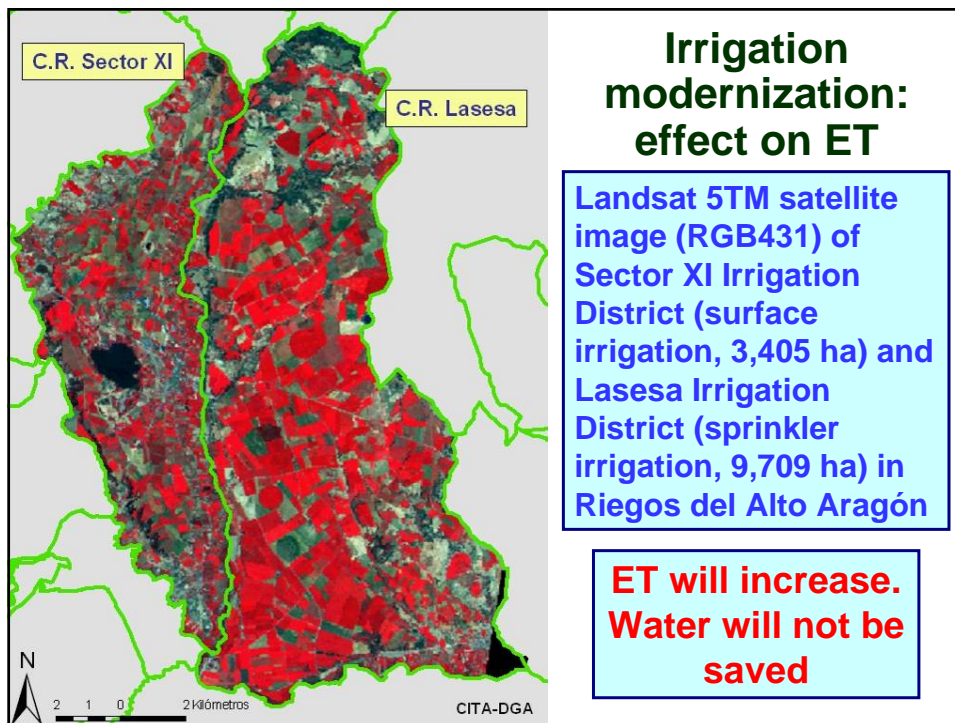


### -Example 2-

Impact of irrigation modernization on water conservation (quantity and quality)

**Irrigation modernization is a key strategy within the Spanish Hydrological Plan (potential savings of 3000 hm<sup>3</sup>/year)**

**Will it save water?**

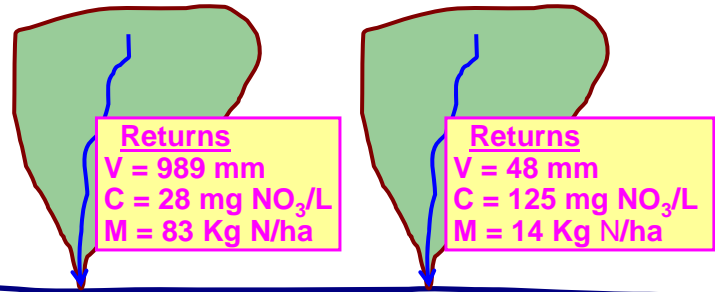


Irrigation modernization is a key strategy within the Spanish Hydrological Plan

Will it conserve water quality?

**Irrigation modernization will conserve river water quality**

<b>Actual scenario</b> Flood-irrigated La Violada district	<b>Modernized scenario</b> Sprinkler-irrigated D-IX Monegros district
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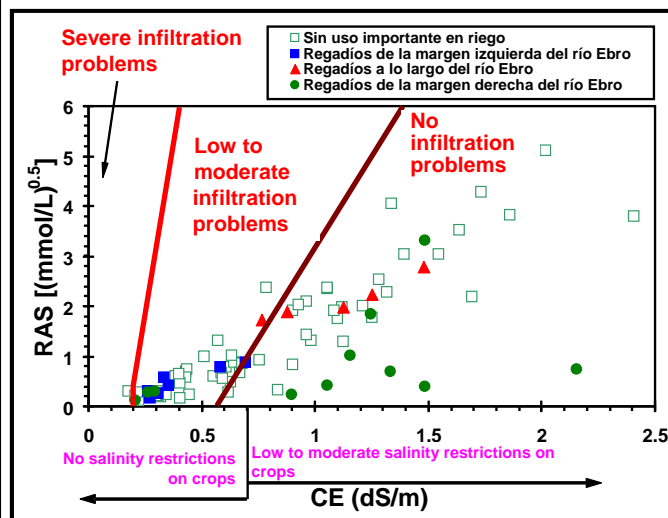
<b>RIVER</b>		
V = 10.000 mm C = 5 mg NO <sub>3</sub> /L M = 150 Kg N/ha	V = 10.989 mm M = 233 Kg N/ha C = 7.1 mg NO <sub>3</sub> /L (+42%)	V = 10.048 mm M = 164 Kg N/ha C = 5.4 mg NO <sub>3</sub> /L (+8%)

### -Example 3-

## Water quality studies at the source (irrigation) and sink (drainage) levels

### Irrigation water quality

## Characterization of the Ebro River Basin surface waters



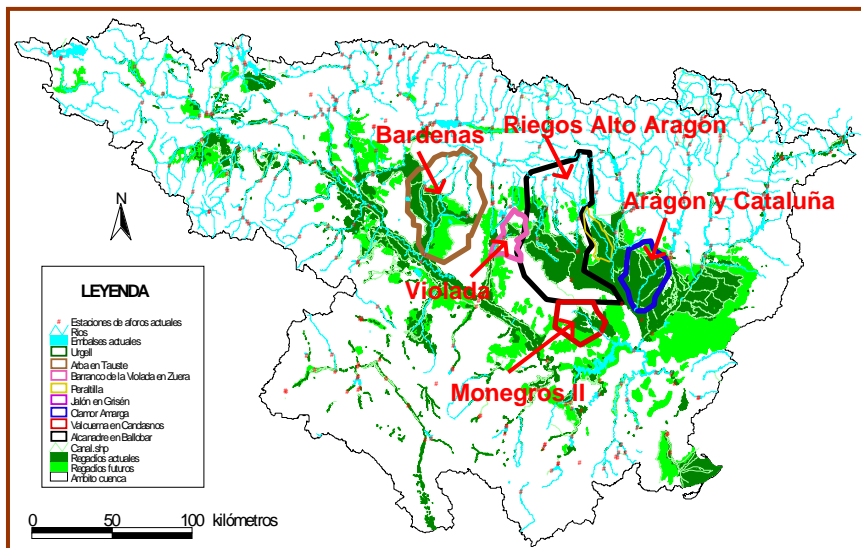
- Leaching requirements (LR) of crops must be added to irrigation requirements.
- LR depend on irrigation water quality and salinity tolerance of crops.

### -Example 3-

Water quality studies at the source (irrigation) and sink (drainage) levels

Drainage water quality

### Monitoring Network of Irrigated Areas in the Ebro River Basin (ReCorEbro) (CHE-CITA agreements)



## Dissemination activities

- Training
- Technical and extension publications
- Professional software

## Development of an irrigation programming service in Aragón

- Advice on crop water requirements for the main crops in Aragón

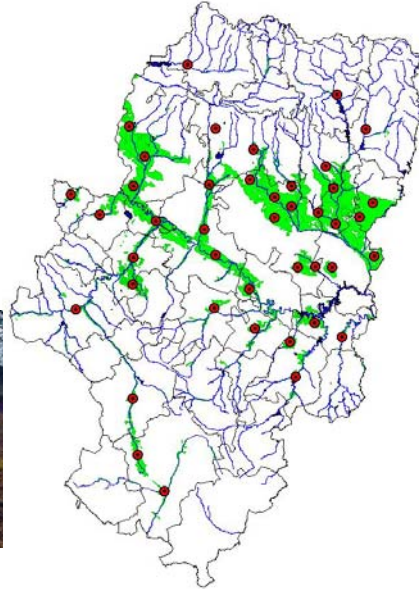
The screenshot shows the website for the 'Oficina del Regante' (Irrigator Office) under the 'GOBIERNO DE ARAGON' (Government of Aragón). The header includes the Sirasa logo and a search bar. A navigation menu lists various services: Inicio, Condominios, Datos Meteorológicos, Predicción Meteorológica, Necesidades Hídricas, Programas de Gestión, Eficiencia energética, Costos de Cultivo, Publicaciones, Formación, Boletín del Regante, Legislación y subvenciones, Noticias, Área de Intercambio, Presentaciones, and Jornadas de Regadío. Below the menu is a large image of an irrigation canal. Three news items are displayed:

- VI CURSO DE FORMACIÓN PARA PERSONAL DE MANTENIMIENTO Y GESTORES DE COMUNIDADES DE REGANTES**  
Muchas de las Comunidades de Regantes de Aragón han modernizado su sistema de riego mediante instalaciones colectivas de captación, bombeo y distribución del agua a través de redes a presión. Por esta razón es necesario conseguir que los responsables de la gestión y el mantenimiento de estas instalaciones tengan L...  
[ver más]
- DISPONIBLE LA DESCARGA DE LAS PONENCIAS DE LAS JORNADAS DE REGADÍO. X ANIVERSARIO DE SIRASA**  
Ya están disponibles las ponencias y los audios de las tres jornadas de regadío que se realizaron durante los meses de octubre y noviembre en Zaragoza. Para acceder al fichero, hay que dirigirse al menú "Presentaciones Jornadas de Regadío", desde donde se puede descargar un archivo con las presentaciones de...  
[ver más]
- MARZO. JORNADAS DE "LA EFICIENCIA ENERGÉTICA EN COMUNIDADES DE REGANTES. INSTALACIONES DE ALTA Y BAJA TENSIÓN. CONTRATACIÓN DEL SUMINISTRO ELÉCTRICO"**  
A lo largo del mes de marzo la Oficina del Regante va a realizar una serie de jornadas dirigidas a distintas Comunidades de Regantes y entidades. El día 10 DE MARZO, de 2011 a las 9:45 h, en las instalaciones de la Comunidad General de Regantes del Canal de Aragón y Cataluña. El día 15 O...  
[ver más]

At the bottom, there are three buttons: 'Datos Meteorológicos', 'Centro de Interpretación del regadío y la agricultura', and 'Mejillón Cebra'.

## Network of agrometeorological stations in Aragón

SIAR network with 43 agrometeorological stations in the main irrigated areas of Aragón (collaboration of MAPA and DGA).



## Major impacts of our works

### 1- On Ebro River Basin Authority

- ReCorEbro monitoring network.
- Salinity and nitrate tendencies of major rivers
- Appraisal of irrigation modernization on water conservation.

### 2- On Aragon Ministry of Agriculture

- Network of agrometeorological stations.
- Irrigation programming service web page

### 3- On Water User Associations

- Ador software for the management of irrigation districts
- Evaluation and improvement of irrigation systems



**Research Group  
“Irrigation, Agronomy and the Environment”**

**Many thanks and  
our warm  
welcome to  
Zaragoza**