

# MAR to MAR-k€t

**INDUSTRIES “MAR WATER DEPENDENT” AT  
LOS ARENALES AQUIFER, BEFORE AND NOW  
2016 Feb.**

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a- Industrial scenario and improvements

b- *“Industry-state of the aquifer” dependence*

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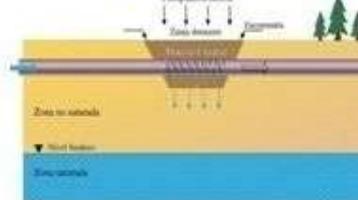
## 3- New Pan-European Network on Managed Aquifer Recharge (MAR)

related projects



# MAR FACILITIES AT LOS ARENALES (MARSOL demo site)

- Los Arenales Water body: 2,400 km<sup>2</sup> , 96 villages in Valladolid, Segovia & Ávila. 46,000 inhabitants
- Example of agroindustrial area with efficiency improvements in water and energy thanks to MAR tech
- Success linked to the supply guarantee without climate dependence
- High quality production



## Carracillo District:

- Since 2003
- Channel 40.7 km
- 3 infiltration ponds
- 1 RBF
- 2 artificial wetlands

## Santiuste basin:

- Since 2002
- MAR Channel 27 km
- 5 infiltration ponds
- 3 artificial wetlands
- 1 RBF
- 3 infiltration wells



## Alcazarén area:

- Since 2012
- 1 RBF > SAT-MAR
- Channel 5.5 km

# B- RELATIONS: INDUSTRY-STATE OF THE AQUIFER



- Irrigation: **3,500 ha out of 7,586**
- 713 comuners
- Mean annual aquifer extraction: 8 hm<sup>3</sup>/year
- Effect of MAR: **314.3 m<sup>3</sup>/ ha out of 1,318 m<sup>3</sup>/ ha** average
- 23,8%** irrigation water comes from MAR

**Safe yield vs  
Water mining**

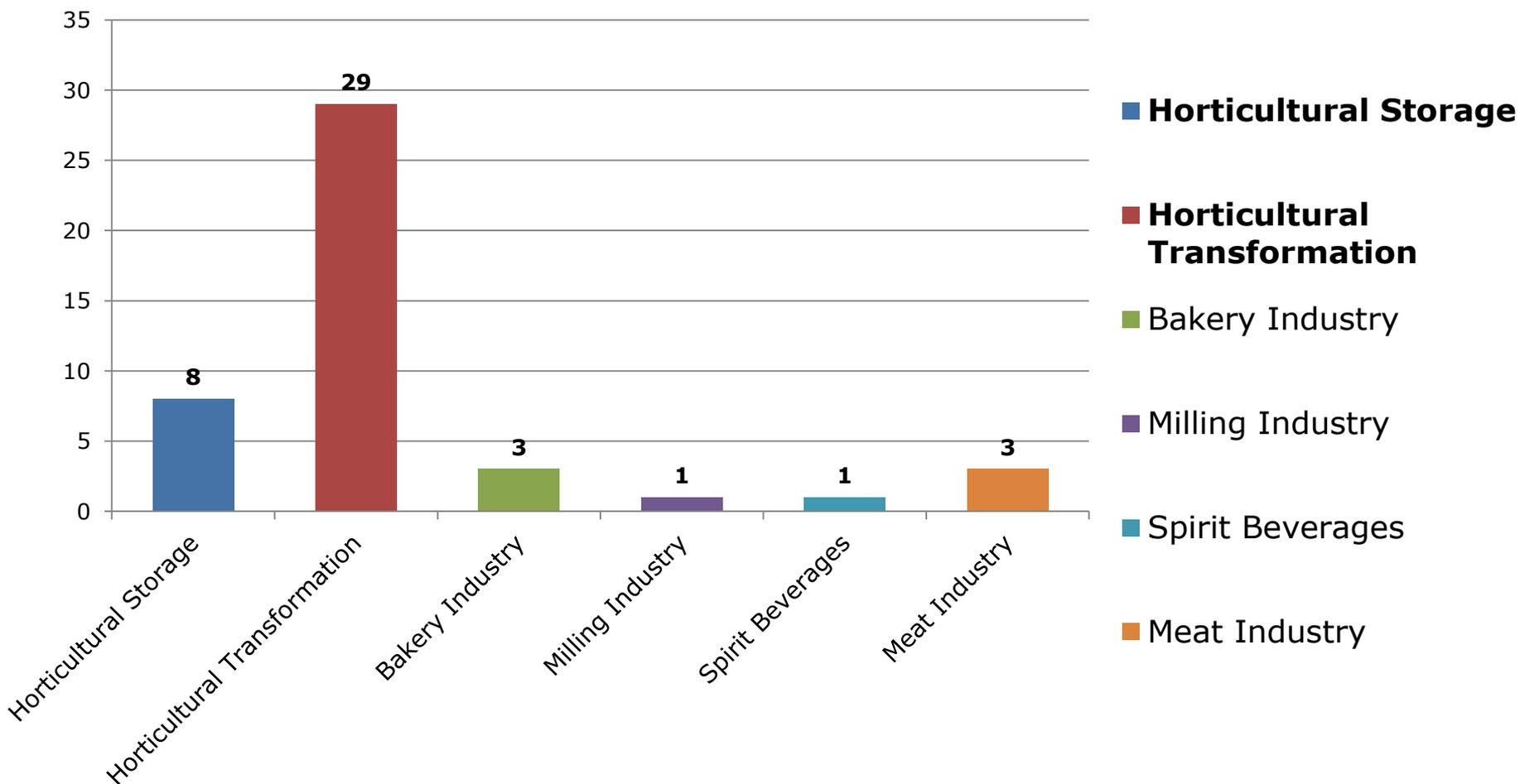


# AGROINDUSTRY AT EL CARRACILLO

## EL CARRACILLO. VEGETABLES PACKING AND EXPORTATION

➤ **Horticultural industries stand out** with a turnover of about **45 M€**

### Agroindustry in Carracillo District

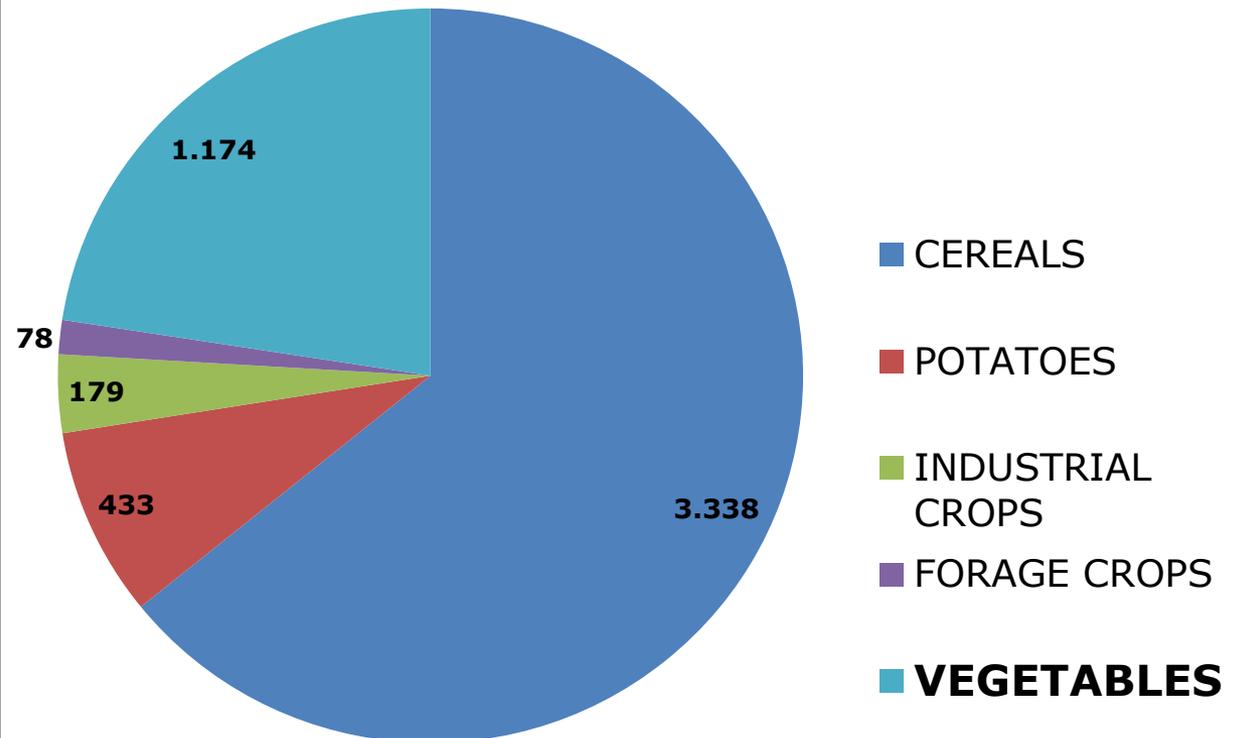


# AGRICULTURE AT EL CARRACILLO

- **3,500 hectares** are irrigated in 11 municipalities
- Carracillo district ranks up in the Spanish agriculture for its production of **horticultural products** (**80%** of vegetable production of Segovia and **30%** of Castilla y León)
- First producer in Spain of **strawberry mother plants**:  
About 600 hectares produce 60 M units.

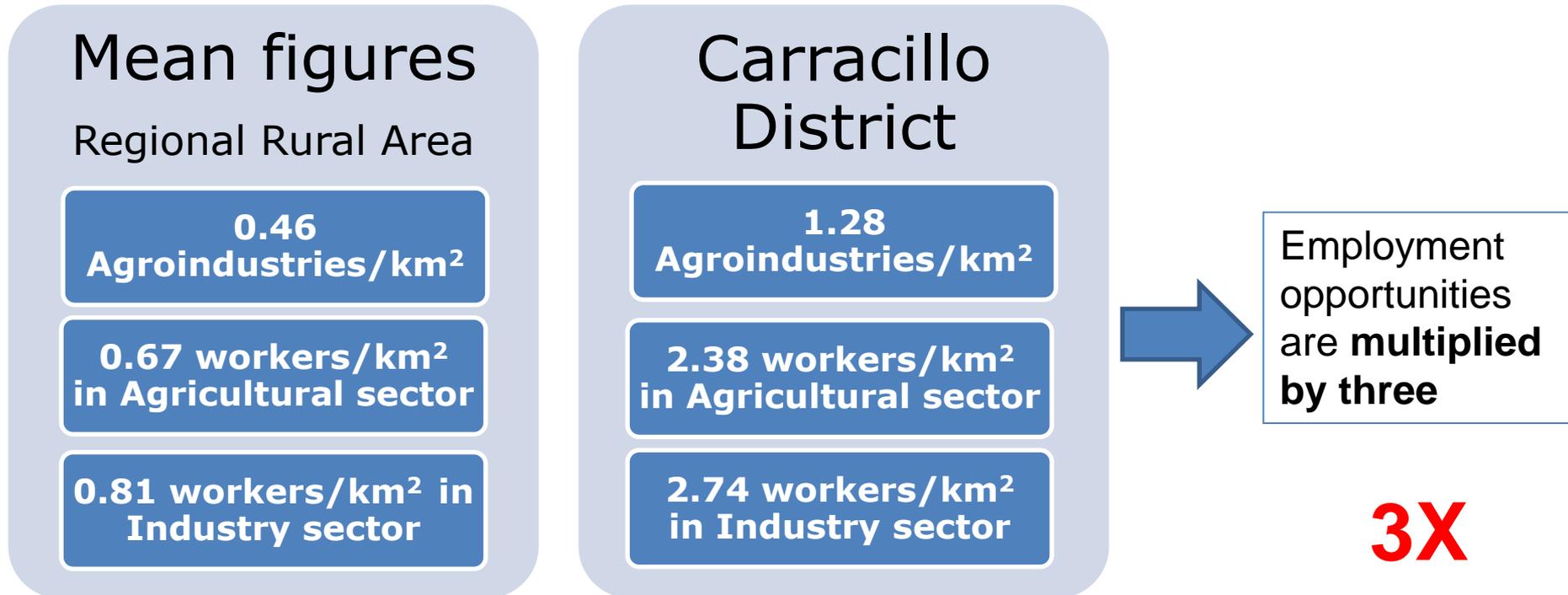


**Carracillo´s Crop Distribution (ha)**



# MAR ROLE IN CARRACILLO: BOOSTING THE RURAL DEVELOPMENT

➤ Irrigated agriculture plays a “vital” role in rural **employment**:

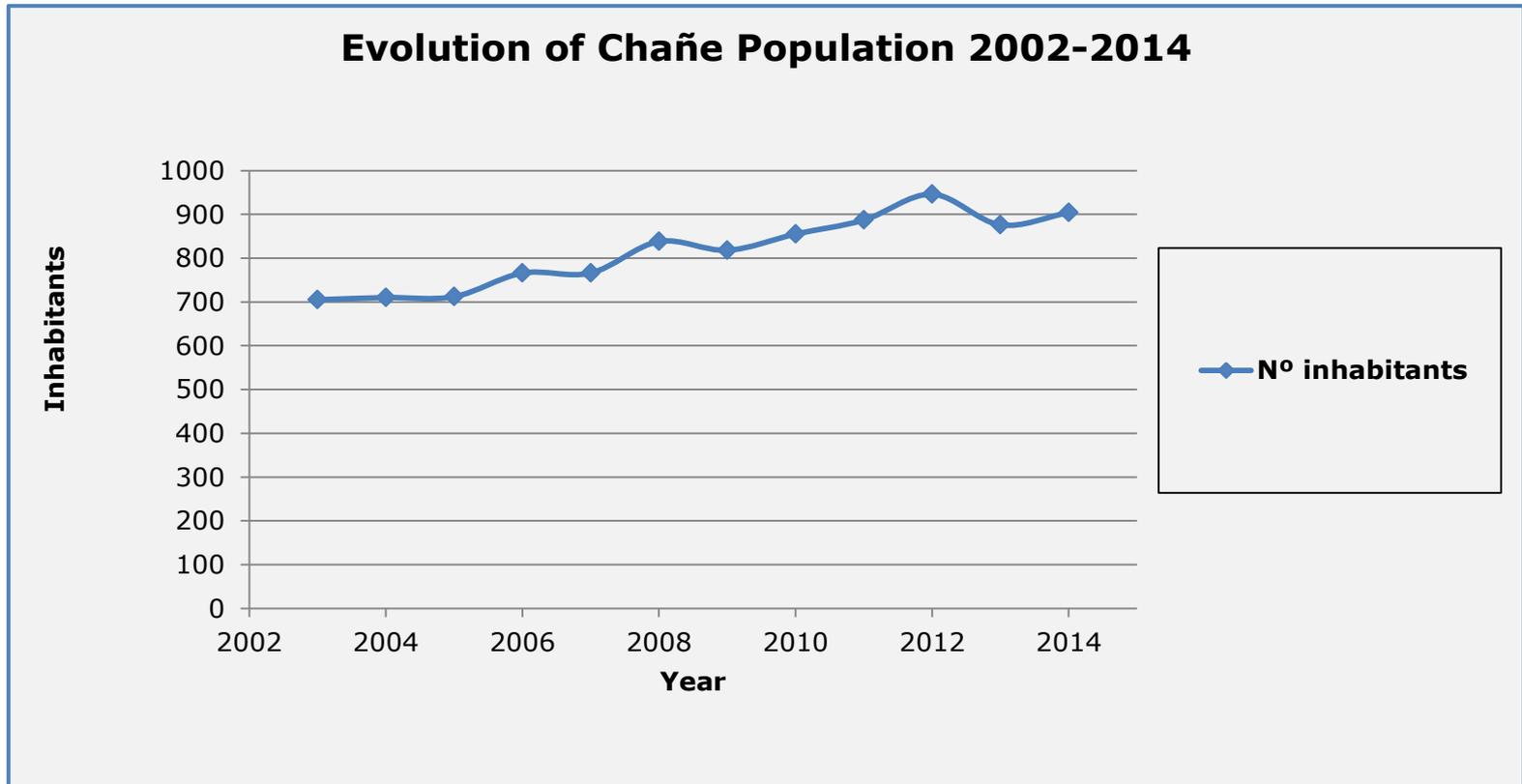


Source: Itacyl, 2015

➤ **Strawberry** and **vegetables** industries generate about **700 direct jobs** and **3,000 indirect jobs**

## MAR ROLE IN CARRACILLO RURAL DEVELOPMENT (2)

- High employment rates contribute to the attachment of population in rural areas.
  - Since 2000 the population in the region has increased by an **average of 6%**.
- *Examples with considerable increases; e.g. since MAR began the municipality of Chañe's population has increased up to **28%***



# MAR BENEFITS FOR THE AGRICULTURE

- MAR increases water availability allowing the transformation of dry lands into irrigated lands, leading to **greater productions**:

	Crop Yield (kg/ha)	
	Rainfed	Irrigated
Potato	28,472	48,431
Garlic	5,649	11,058
Sweet melon	7,978	26,478
Wheat	2,977	4,610
Barley	2,446	3,654
Oats	1,906	3,413
Rye	1,789	3,272

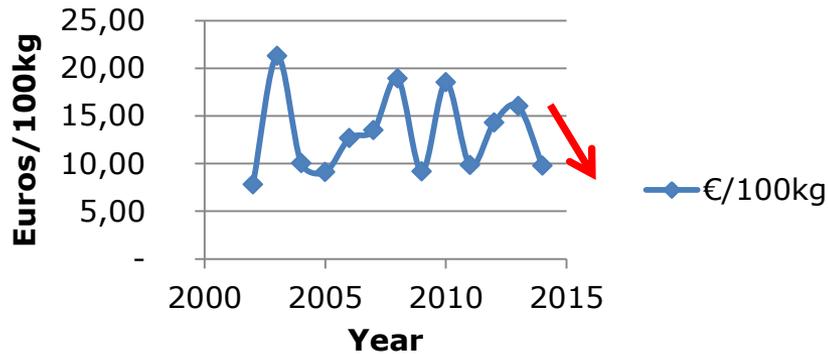
Source: Junta de Castilla y león, 2014

**2-3 x**

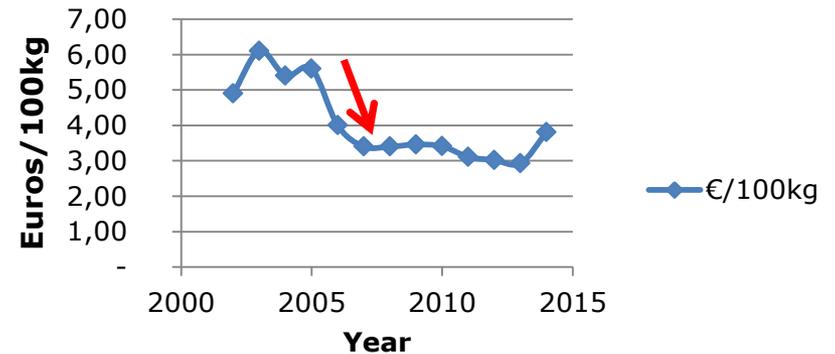
- Yields per hectare get **duplicated** in most cases, and even **tripled** as for **sweet melon**.

# AGRICULTURE IN “LOS ARENALES” ... opss

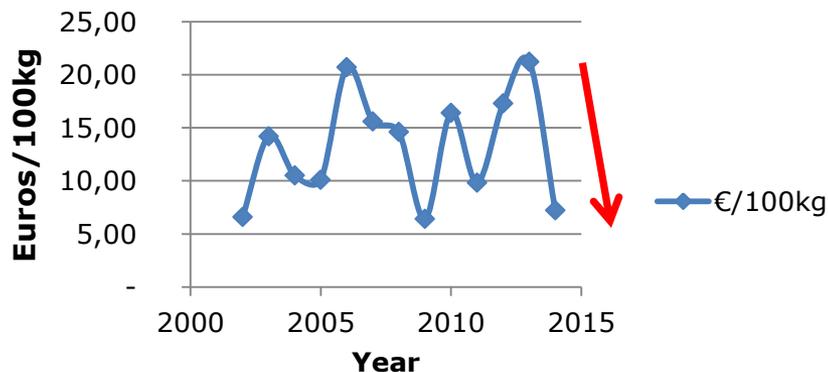
## Price paid to growers evolution: Carrot



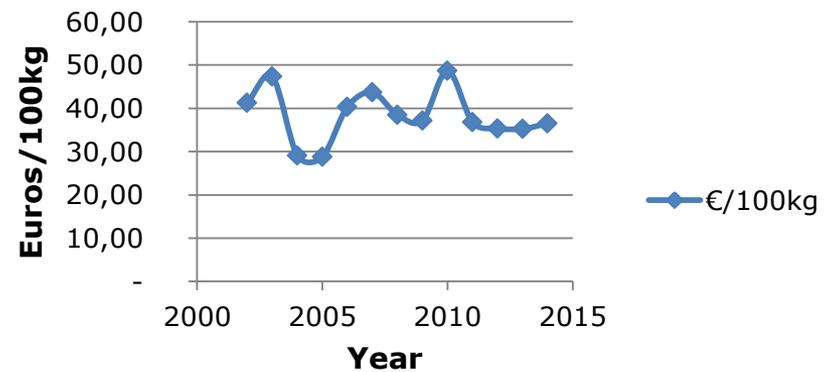
## Price paid to growers evolution: Sugar beet



## Price paid to growers evolution: Potatoe



## Price paid to growers evolution: Leek



# C-ENERGY CONSUMPTION SAVINGS BY MAR

**Pumping energy consumption depends on:**

- Energy efficiency of the system

- Depth of the water table



**MAR**

- Height of the application

- Water pressure required

- Maximum water flow volume demand and frequency

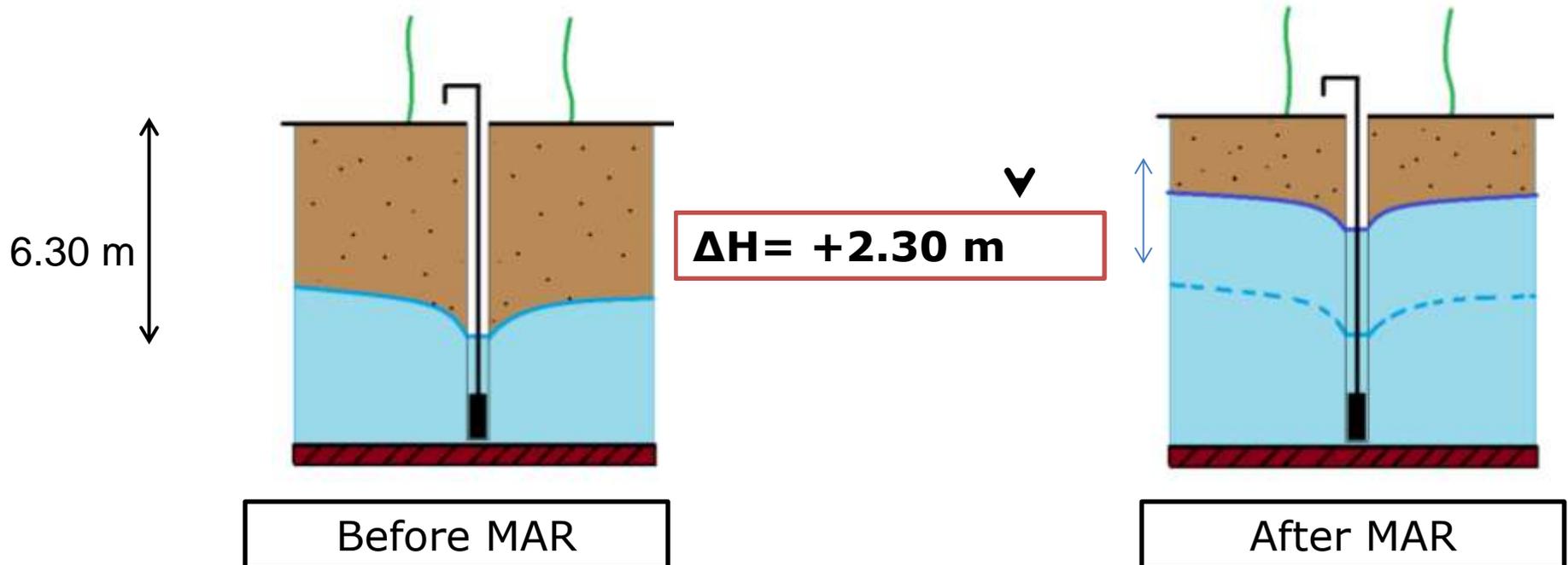
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# Energy Efficiency at “Los Arenales”

How is MAR improving the EE?

## Example for El Carracillo District (pilot scale)

- Number of wells: 314
- Mean output water flow volume : 9,957 m<sup>3</sup> per well and year
- Mean water table depth before MAR: 6.30 m
- Mean water table depth after MAR: 4.00 m



.../...

What does a 2.30 m water table raise represents in energetic terms?

314 wells –  $Q \approx 9957 \text{ m}^3/\text{year}$  and well -  $\Delta H = +2,30 \text{ m}$

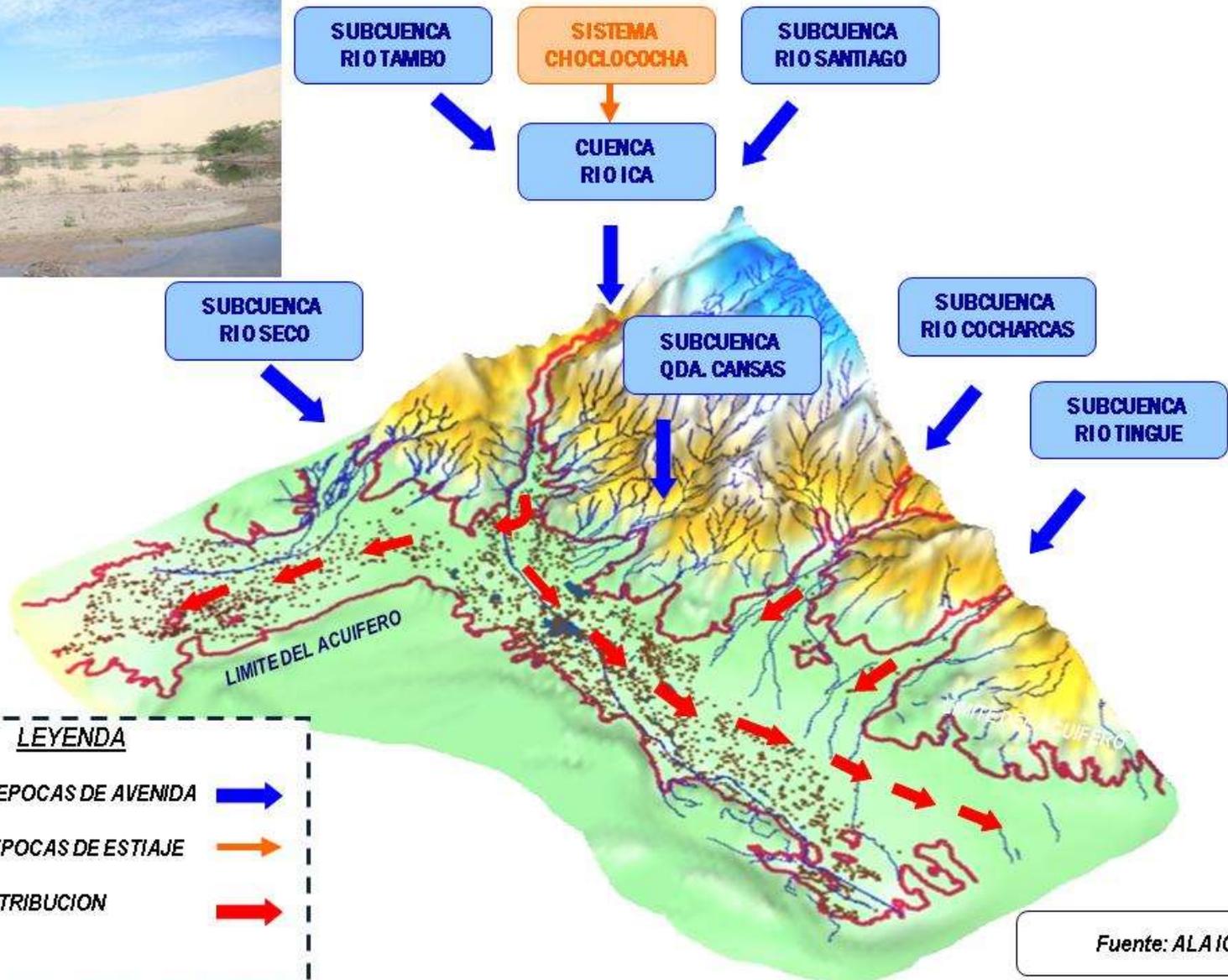
	Before MAR	After MAR	MAR savings
Energy consumption (kWh)	76,430	48,430	-28,000 kWh
Energy cost (€/year)	8,180	5,180	-3,000 €



## 2- AN IMPLEMENTATION EXAMPLE IN PERU



# RECARGA DEL ACUIFERO DE ICA - VILLACURI



# Mapa de Proyectos Más agua para los valles de Ica, Villacuri y Lanchas



## LA TECNOLOGÍA DETRÁS DE LAS OBRAS



Source: ANA



# 3- NEW MAR RELATED PROJECTS' PAN-EUROPEAN NETWORK



## ISMAR 10 PAN-EUROPEAN NETWORK



+Saphani

# Review: MAR & agroindustry in Arenales aquifer (C y L, Spain)

## Industrial scenario and improvements to date

From \* to \*\*\*\*\*

1. **AGRO-INDUSTRY** \*\*\*\*\*
2. **WATER SUPPLY INDUSTRY** \*\*
3. **WASTE WATER TREATMENT PLANTS (SAT-MAR)** \*\*\*
4. **DESALINATIONS AGENTS** \*\*
5. **BOTTLED COMPANIES** \*
6. **GOLF COURSES** -
7. **PUBLIC ADMINISTRATION BRANCHES** ?
8. **BALNEARIES & SPAS (SALLUS PER AQUAM)** \*\*\*
9. **HOTELS AND TOURIST FACILITIES (MARKET UPTAKE)** \*



# CONCLUSIONS



- The **Agro-industry** development at **Los Arenales** aquifer is **closely related to MAR** (the aquifer was declared provisionally over-exploited in 1995)
  - MAR has positive effects on job creation and economic growth
  - MAR plays a vital role in avoiding rural depopulation
  - MAR improves yields and productions, balancing the lower prices
- **Improvements in water irrigation** systems enhance the efficiency, the environmental conditions, time disponibility, and, in short, **better economic results**
- **MAR techniques provide savings in energy consumption (36%)** enhancing the energy efficiency and raising farmer's incomes
- It is recommended an **energy audit** to provide a significant improvement in energy efficiency and savings
- **Ica city** is a good example of MtoM with a single constraint: **“excess of future”**
- **A new network of MAR related projects** has been established and the **interchange of info** is ensured from now on