CONFERENCE

IRRIGATION

QUELLES STRATÉGIES POUR ÉCONOMISER L'EAU ?
WHAT STRATEGIES FOR WATER SAVINGS ?

REGARDS CROISÉS EUROPÉENS

SHARING EUROPEAN VIEWS

13 - 14

nov. 2019

MONTPELLIER

FRANCE

irstea LA SCIENCE AU CŒUR DE L'ENVIRONNEMENT

L'Europe s'engage en Occitanie — UNION EUROPÉENNE — La Région Occitanie Pyrénées · Méditerranée

PROJET COFINANCÉ PAR LE FONDS EUROPÉEN AGRICOLE POUR LE DÉVELOPPEMENT RURAL
L'EUROPE INVESTIT DANS LES ZONES RURALES

Liberté • Égalité • Fraternité — RÉPUBLIQUE FRANÇAISE

Réseau Rural Français 2014 - 2020

MUSE — MONTPELLIER UNIVERSITY OF EXCELLENCE — KEY INITIATIVE WATERS

INVESTISSEMENTS D'AVENIR

G-eau Gestion de l'Eau, Acteurs, Usages

Montpellier SupAgro

AFEID Association Française pour l'Eau, l'Irrigation et le Drainage

AIRMF Association des Irrigants des Régions Méditerranéennes Françaises

agricultures & territoires — CHAMBRE D'AGRICULTURE OCCITANIE

agricultures & territoires — CHAMBRE D'AGRICULTURE PROVENCE-ALPES-CÔTE D'AZUR

AQUA VALLEY

Water saving on a gravity-flow irrigation district Challenges and issues on Lis Valley, Portugal

José M. Gonçalves[1], Susana Ferreira[1], Rui Eugénio[2], Manuel Nunes[1], Henrique Damásio[2], Isabel Ferreira[3]

[1] Instituto Politécnico de Coimbra, Escola Superior Agrária, Coimbra, Portugal

[2] Water Users Association of Lis Valley, Quinta do Picoto, Leiria, Portugal

[3] Instituto Superior de Agronomia, Universidade de Lisboa, Portugal

PDR 2020 PROGRAMA DE DESENVOLVIMENTO RURAL 2014-2020

PORTUGAL 2020

UNIÃO EUROPEIA
Fundo Europeu Agrícola de Desenvolvimento Rural
A Europa Investe nas Zonas Rurais

Water savings context

- Society is urging water savings by irrigated agriculture, through the decrease of water consumption
- Sustainable agricultural production with less water requires adaptation through a change of technology and practices compatible with the farmers’ technical know-how and farms economics
- Collective irrigation districts play a decisive role in Portuguese agriculture sustainability, being this adaptation a major priority

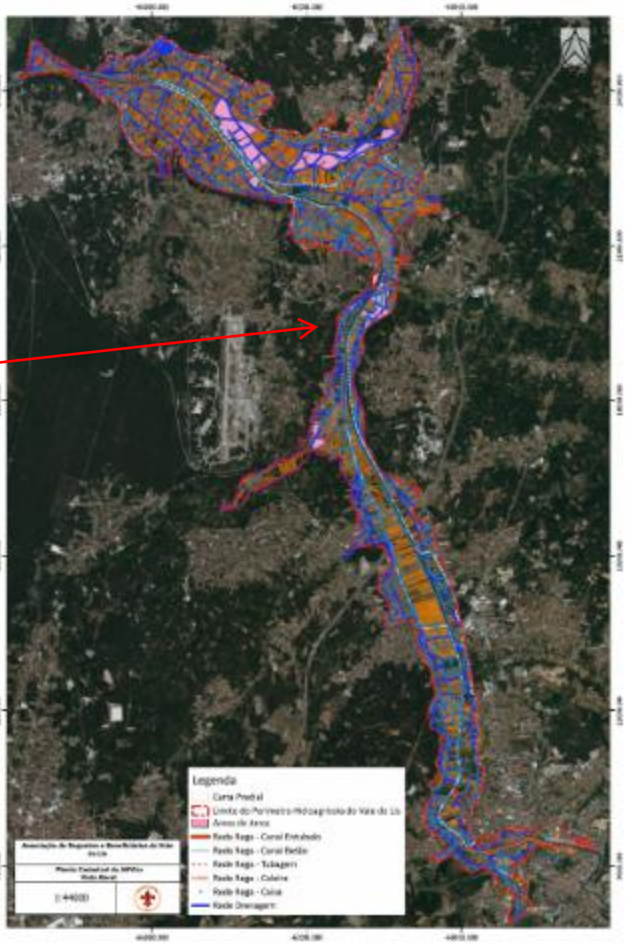
Irrigation water savings issues

- How to water saving: reduction of consumptive use, water losses or water wastage; increase water productivity, or land productivity?
- How to manage the nexus of food-water-energy?
- How to guarantee the irrigation socio-economic sustainability?
- How to balance the equity of environmental and economic impacts on a collective irrigation district?

Gravity-fed irrigation district supplied by surface water runoff

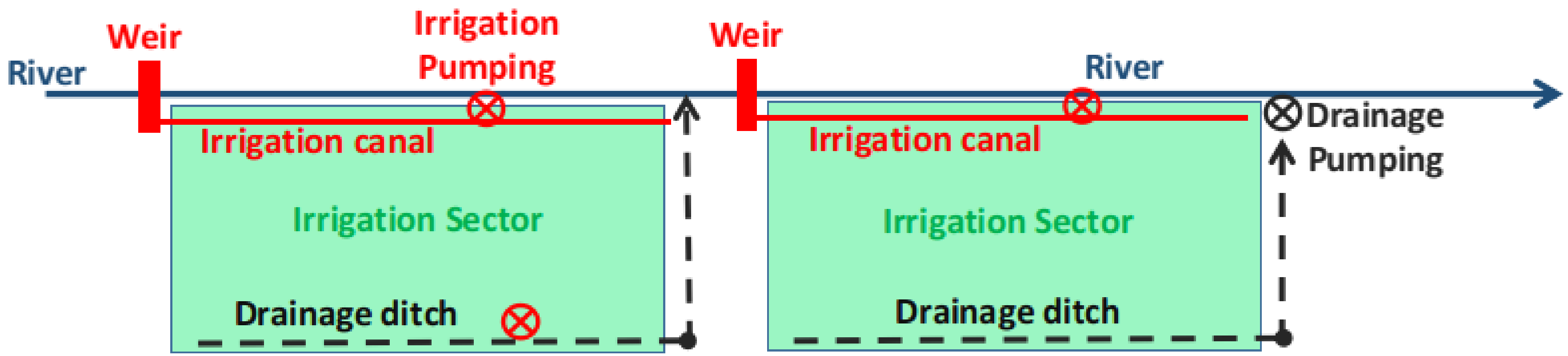
- Gravity-fed conveyance systems supplied by surface water runoff, without upstream reservoirs, do not control the water available for irrigation, implying frequent periods of water scarcity
- They require specific water management practices, to optimize the equity of water distribution to the all irrigation district during the scarcity periods
- To cope with the risks of lack of irrigation water, the management priorities are focused on off- and on-farm irrigation water saving and the downstream water reuse (namely by pumping from ditches), or a more effective use of soil water or groundwater by capilarity rising

Lis Valley - a gravity-fed irrigation district



Lis Valley - a gravity-fed irrigation district

Scheme of hydraulic system, showing the supply and drainage of two sequencial irrigation sectors



Lis Valley Water Management Operational Group
(Agricultural European Innovation Partnership EIP-AGRI)

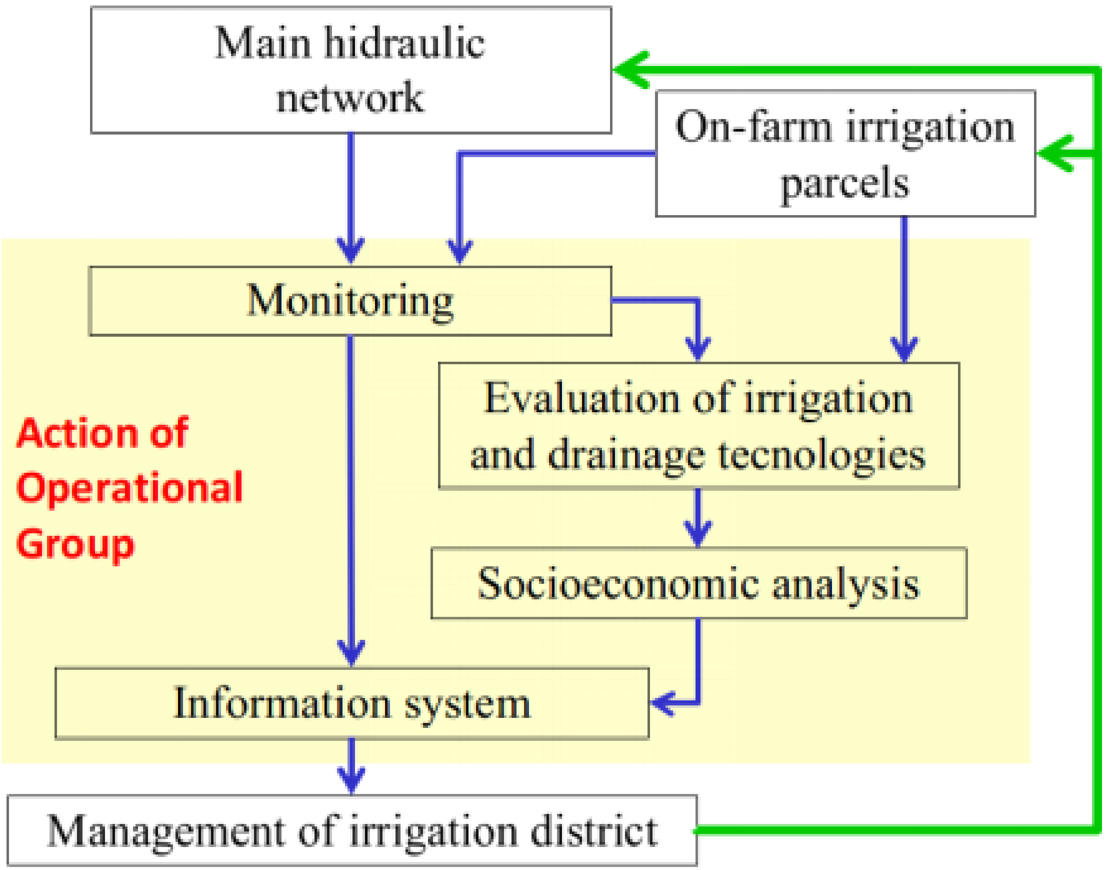
Objectives:

- Water savings and water productivity improvement
- Improve the performance of collective distribution system
- Reduce pumping energy use and costs
- Reduce and control sanitary risks due to water quality
- Improve farms economic competitivity

Partners:

- Water Users Association, Research Centers, Regional Department of Ministry of Agriculture, Farmers

Metodologies



Results - Allocation and demand (2018)

Irrigated area and crops per Sector

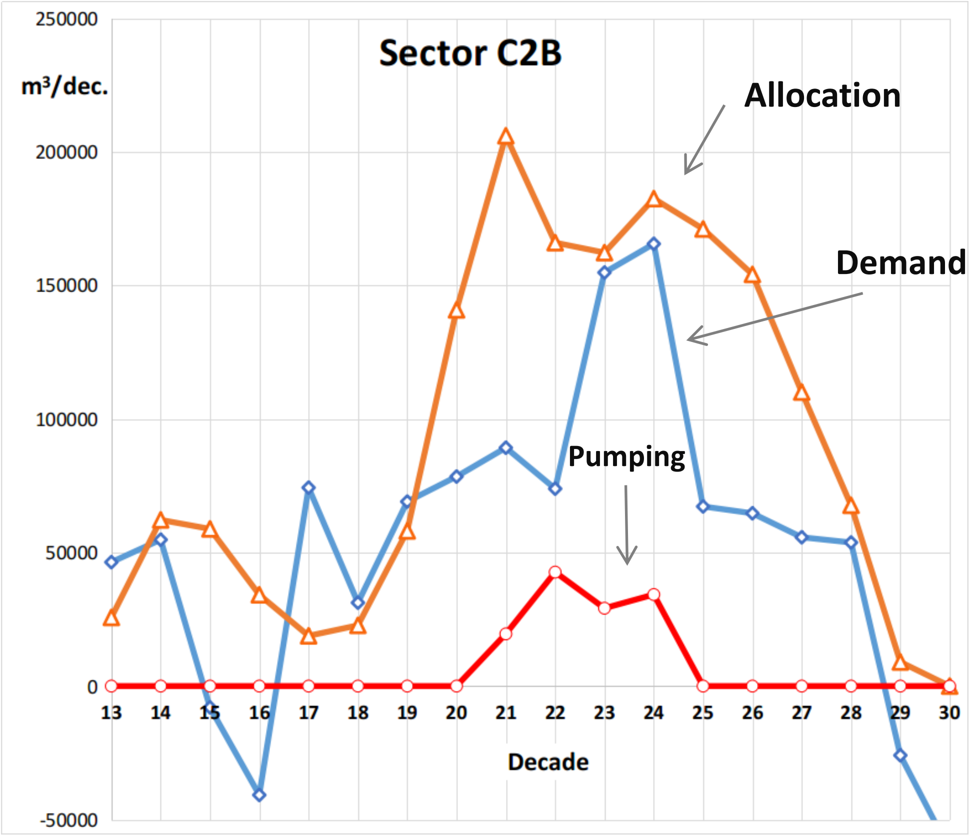
SMC	C1A	C1B	C2A	C2B	C4	C5	C7	Total
Blocs	III	III, IIs	IV	V	II	II	I	
Total area, ha	175,6	104,4	189,7	286,2	418,4	207,6	257,1	1639
Irrigated area, ha	114,2	82,8	159,5	214,7	292,8	166,1	205,7	1236
Irrigated area, %	65	80	85	75	70	80	80	75
Maize	20%	18%	43%	33%	61%	60%	9%	38,4%
Pastures	48%	30%	7%	24%	29%	10%	77%	32,6%
Horticulture	5%	13%	14%	11%	4%	0	0	6,0%
Rice	0	5%	0	15%	5%	30%	1%	8,3%
Vineyard	20%	13%	15%	15%	0	0	0	7,3%
Fruits	6%	19%	20%	0	0	0	10%	6,1%

Meteorological data and Sector average crop coefficients

Month	May			June			July			August			September			October		
Decade	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
ET0, mm[1]	35,4	41,6	31,6	25,5	44,7	37,9	37,0	38,6	43,9	37,0	76,3	82,0	35,8	35,4	33,9	34,8	21,3	19,8
P, mm[1]	0,0	0,5	26,0	38,9	1,8	17,6	1,7	0,1	0,1	0,7	0,3	0,7	0,9	0,0	0,1	0,0	27,4	42,9
Kc[1] (C1A)	0,62	0,65	0,74	0,81	0,83	0,85	0,89	0,91	0,91	0,91	0,91	0,91	0,87	0,83	0,77	0,72	0,71	0,71
Kc (C1B)	0,61	0,64	0,72	0,79	0,83	0,85	0,89	0,90	0,90	0,90	0,90	0,90	0,87	0,84	0,77	0,72	0,70	0,70
Kc (C2A)	0,43	0,47	0,58	0,69	0,75	0,79	0,88	0,92	0,92	0,92	0,92	0,92	0,86	0,81	0,68	0,61	0,58	0,58
Kc (C2B)	0,61	0,63	0,71	0,78	0,81	0,85	0,92	0,95	0,95	0,95	0,95	0,95	0,90	0,85	0,77	0,72	0,72	0,72
Kc (C4)	0,53	0,53	0,59	0,66	0,72	0,78	0,91	0,97	0,97	0,97	0,97	0,97	0,91	0,84	0,72	0,66	0,66	0,66
Kc (C5)	0,57	0,57	0,63	0,69	0,75	0,81	0,93	0,99	0,99	0,99	0,99	0,99	0,93	0,87	0,75	0,69	0,69	0,69
Kc (C7)	0,79	0,80	0,82	0,84	0,86	0,87	0,89	0,90	0,90	0,90	0,90	0,90	0,89	0,88	0,85	0,83	0,82	0,82

[1]Decade data of Leiria, 2018, from www.ipma.pt; counts of the decades from the beginning of the year; ET0=reference evapotranspiration; P=precipitation; Kc=crop coefficient.

Allocation (TIA) and demand (NID) of one hydraulic sector



ETc = ET0 x Kc

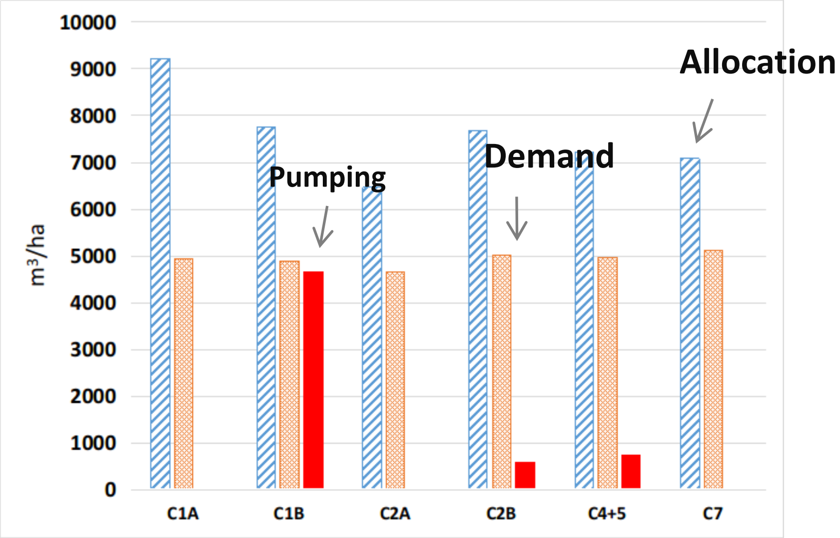
NID = ETc - P, if ETc > P;

TIA= GIA + PIA

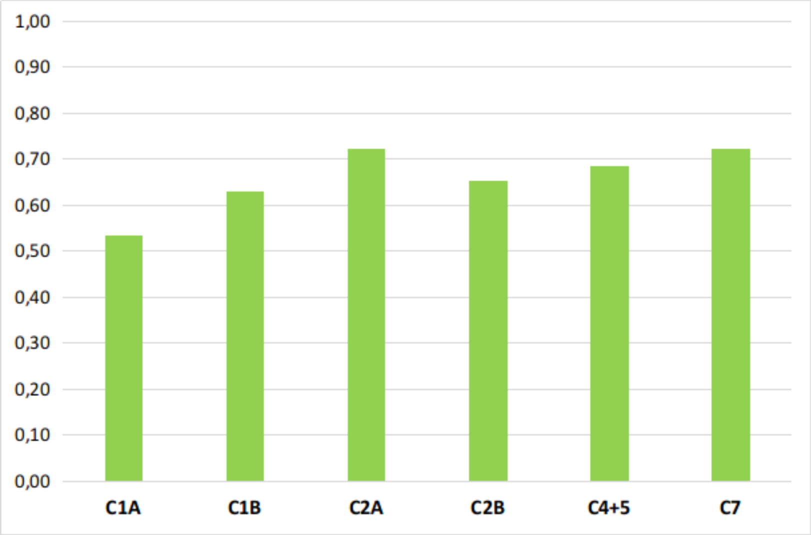
GIE = NID / TIA

Results - Allocation and demand (2018)

Total allocation (gravity, GIA, + pumping, (PIA) and demand (NID) per hydraulic sector



Global Irrigation Efficiency (GIE)



- Gross applied depths of Sectors: 6470 to 9220 m^3/ha
- Major constraints (labor and water losses) on supply due to the precariousness of network
- Global Efficiency varied between 53% e 72% (average 67 %); higher results related with reuse of water drainage by pumping, implying increased cost for energy consumption

Conclusions - Improvements and innovations challenges

- Improve the quality of hydraulic infrastructures to reduce water losses, and better water flow control, to enhance water management
- Improve district water management through the implementation of operational plans based on better estimation of on-farm irrigation demand, using monitoring systems, automatic weather stations combined with soil moisture devices or crop remote sensing
- Improve the on-farm irrigation systems, reducing labour and water losses, and increasing the distribution uniformity
- Improving the reuse of excess flow at the downstream end of irrigated fields, or from drainage ditches, with a better control of water quality.

Water saving on a gravity--flow irrigation district Challenges and issues on Lis Valley, Portugal

José M. Gonçalves[1], Susana Ferreira[1], Rui Eugénio[2], Manuel Nunes[1], Henrique Damásio[2], Isabel Ferreira[3]

[1] *Instituto Politécnico de Coimbra, Escola Superior Agrária, Coimbra, Portugal*

[2] *Water Users Association of Lis Valley, Quinta do Picoto, Leiria, Portugal*

[3] *Instituto Superior de Agronomia, Universidade de Lisboa, Portugal*

PDR 2020 PROGRAMA DE DESENVOLVIMENTO RURAL 2014·2020

PORTUGAL 2020

UNIÃO EUROPEIA
Fundo Europeu Agrícola de Desenvolvimento Rural
A Europa Investe nas Zonas Rurais