

Drainage Dynamics and Irrigation Management in the Algerri-Balaguer Irrigation District (Lleida, NE Spain)

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Wastewater tells us a lot of things...

ESTUPEFACIENTES ESTUDIO

Lleida, entre las ciudades europeas con más ketamina y cocaína en sus aguas residuales

SEGRE | LLEIDA Actualizada 23/03/2023 a las 08:57

Un informe del Observatorio Europeo de las Drogas la sitúa en el puesto 6 y 8, respectivamente, de todas donde ha analizado rastros de estos estupefacientes || En el cannabis es la decimonovena

AGUAS RESIDUALES

Barcelona es la ciudad europea que más ketamina consume; Tarragona, segunda en cocaína



La Vanguardia

23/03/2023 13:43 | Actualizado a 23/03/2023 19:15

What's drainage and why does it matter?

Drainage is the removal of excess water and salts from land to maintain soil quality. If irrigation is not well managed, excess drainage with nutrients and salts can occur.

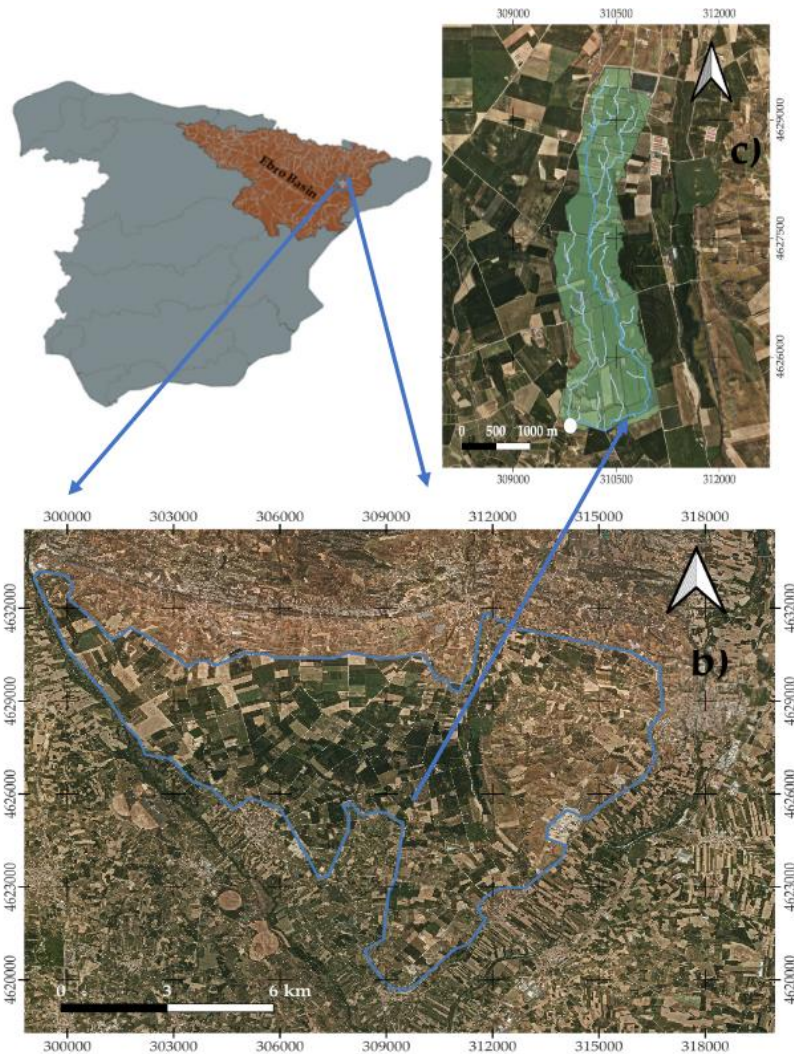
In agriculture, drainage explains a lot about the water and nutrient management.

Objectives of this study:

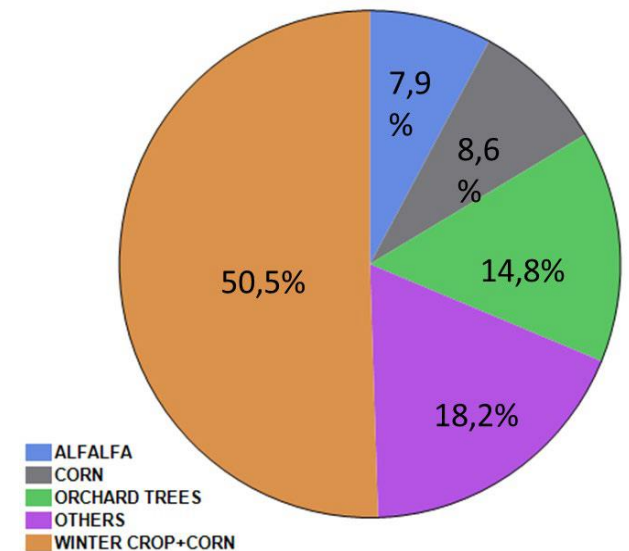
- Quantify the amount of irrigation water lost through drainage in a sub-basin of the Algerri-Balaguer irrigation district and establish its irrigation efficiency.
- Estimate the water balance variables using in situ data and compare the obtained ET with the TSEB ET at sub-basin scale.



Study area: Algerri-Balaguer irrigation district



- 6500 ha irrigated
- Modernized irrigation and drainage network
- Average water use of 600 mm
- Average rainfall (2000-2021) 378 mm/year
- Average ET_0 (2000-2021) 1072 mm/year



🔍 Studied sub-basin



- 419 ha irrigated
- Study period October 2019-October 2020
- Soils with depths from 0.4-1.2 m and an impervious layer (lutite or cemented gravel)
- Main crop corn, followed by alfalfa and barley
- 40 fields monitored in the hydrant during all the season
- Drainage network ends up in a monitored outlet (white dot)

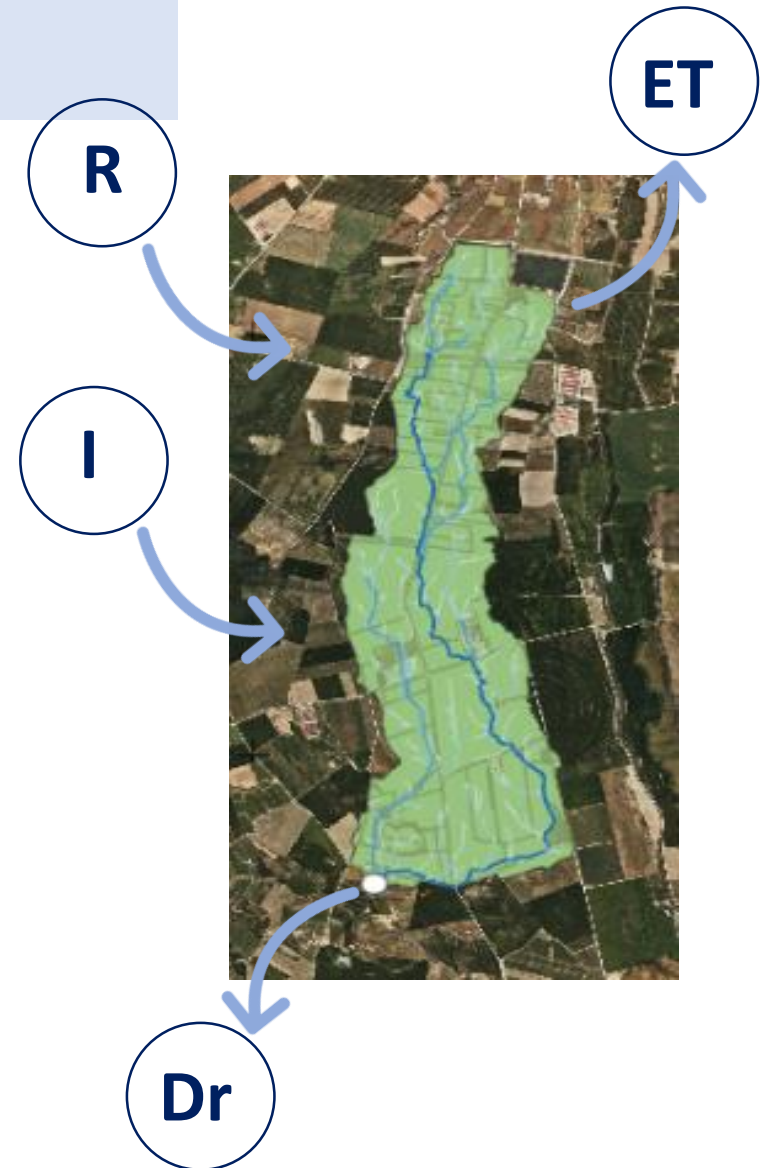


Methodology: water balance

Estimation of the different water balance components during the study period

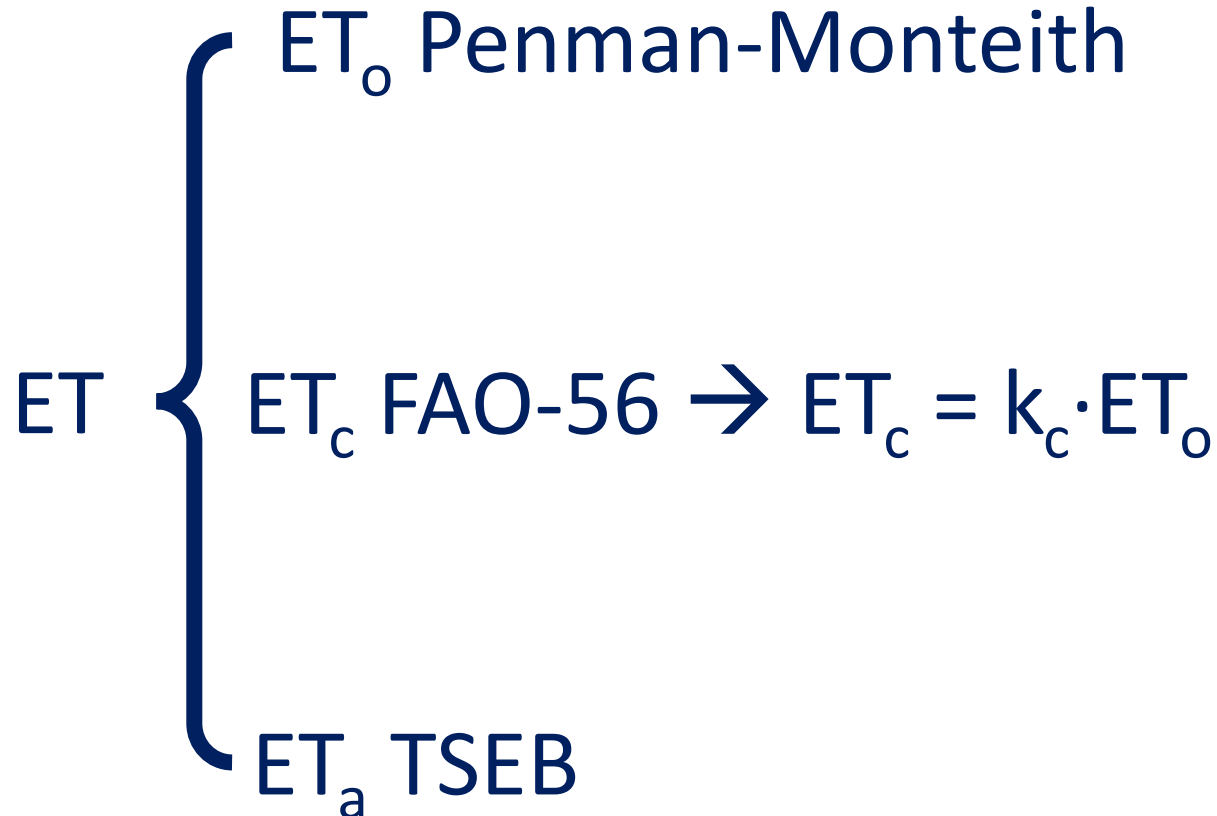
$$ET_{aB} = I + R - Dr$$

- Irrigation (**I**) of the 40 monitored hydrants (one per field)
- Total rainfall (**R**) in the basin with data obtained from agrometeorological station of Albesa (SMC network)
- Drainage (**Dr**) obtained by hourly monitoring in the outlet with a **Hydros21** (water level sensor, Meter Group, Pullman, USA)
 - Rainfall runoff (**RO**) that reaches the outlet
 - Deep Percolation of irrigation and rain episodes (**DP**)
- Actual evapotranspiration (**ET_{aB}**) obtained of the closure of the balance



Irrigation efficiency and ET comparsion

$$\text{Irrigation Efficiency (IE)} = \frac{\text{Irrigation} - \text{Irrigation drainage}}{\text{Irrigation}} \cdot 100$$





Irrigation and rainfall drainage water discrimination

- The **HEC-HMS** model (US Army Corps of Engineers) was used to assess the fraction of drainage that comes from rainfall. It models the rainfall runoff in a specific sub-basin.
 - In this study, as a first modelling attempt, we have considered that the **runoff** as well as the **baseflow** of the drainage water came only from rainfall.
 - In this case, the difference between the total drained water and these two elements is the water coming from **irrigation**.

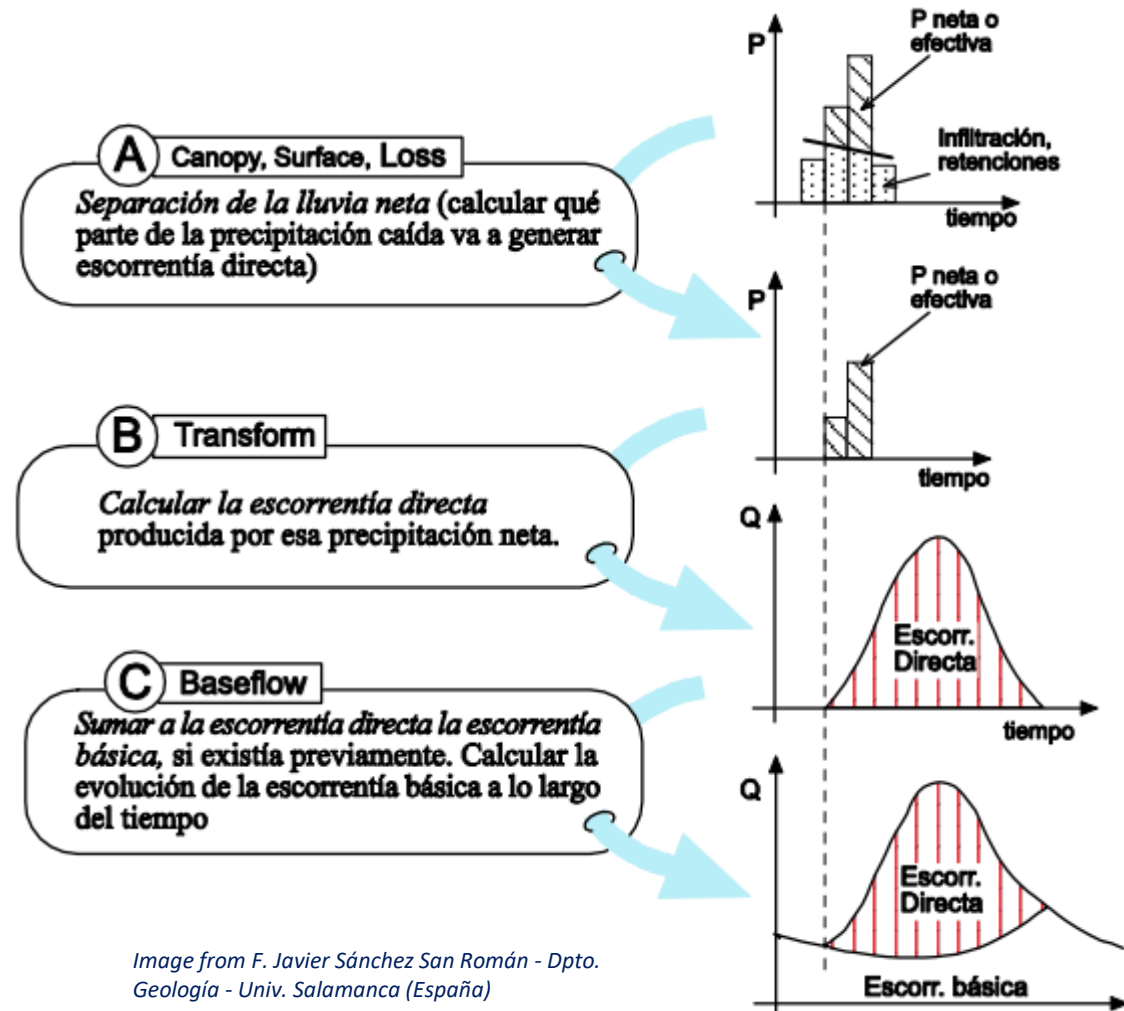


Image from F. Javier Sánchez San Román - Dpto. Geología - Univ. Salamanca (España)

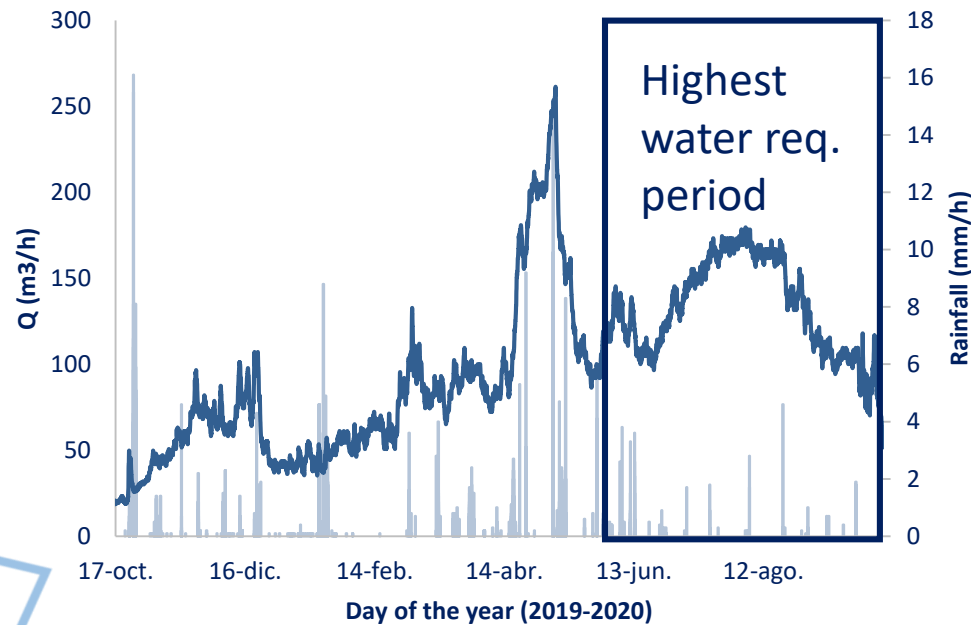
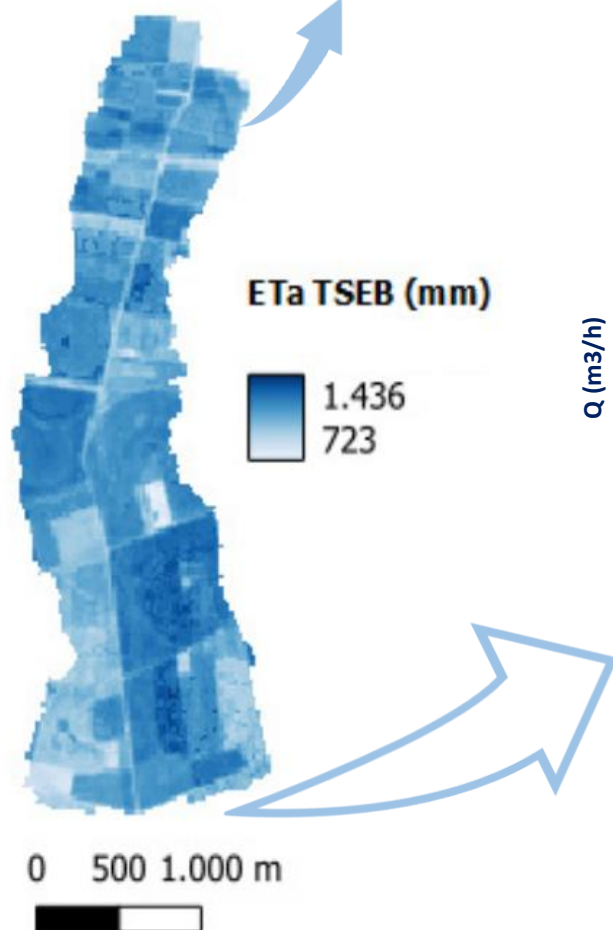


Results: water balance and irrigation efficiency

Rainfall
533 mm

Irrigation
614 mm

Evapotranspiration
942 mm



Drainage water discharge 203 mm

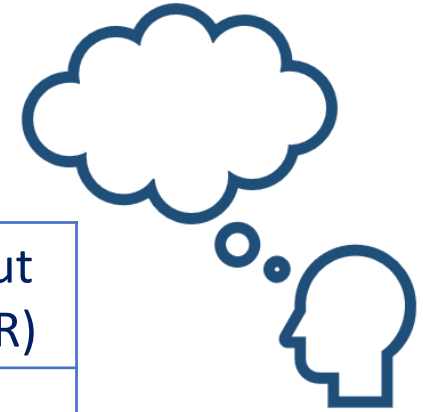
Average irrigation
614 mm

18% of water input lost to drainage

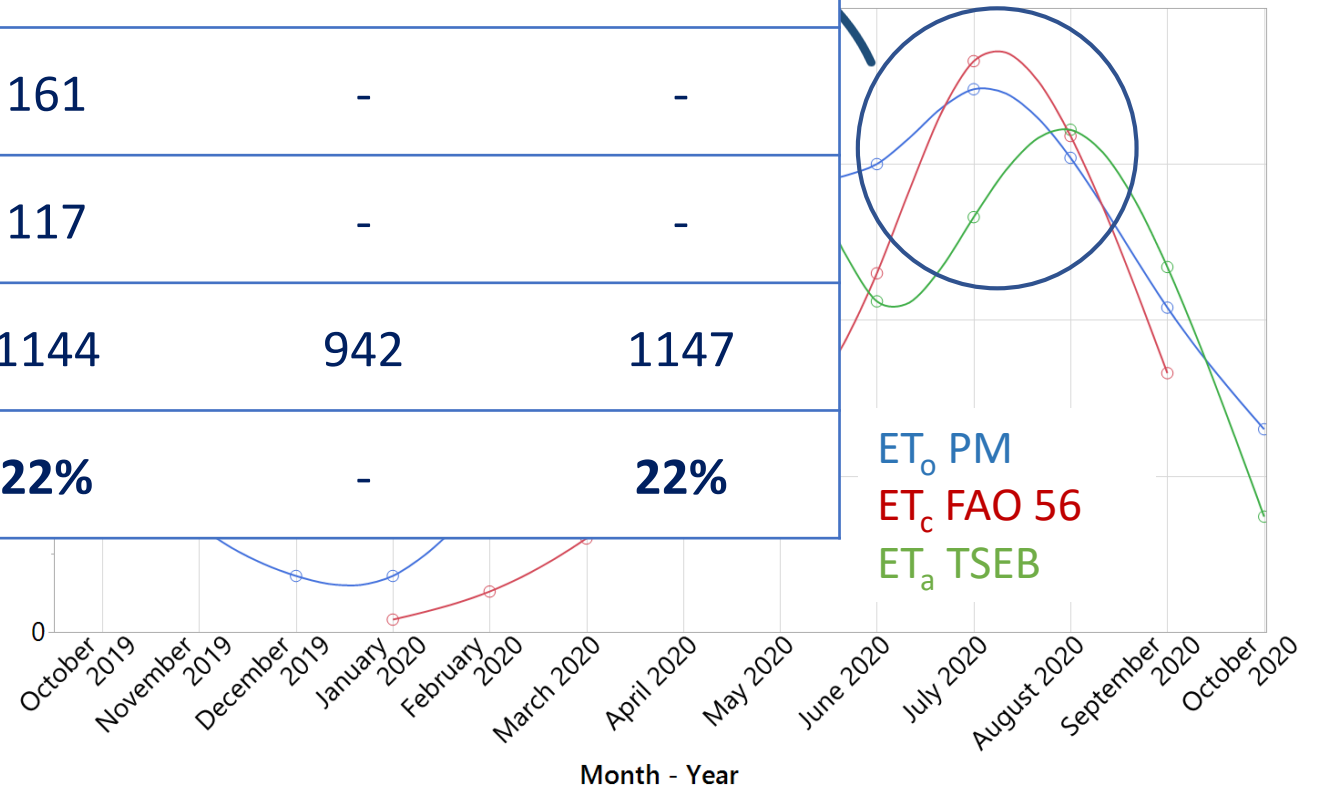
From that, a **57%** corresponded to irrigation water



Evapotranspiration comparison



Month	ET _o	ET _c FAO 56	ET _a TSEB	ET balance	Total input water (I+R)
July	174	183	133	-	-
August	152	159	161	-	-
September	104	83	117	-	-
Total (mm)	1110	702	1144	942	1147
% difference	18.6%	-25%	22%	-	22%



Conclusions

- Water lost through drainage was accounted on **203 mm** , or **18% of the water applied**.
- At least, more than a **50%** of this water **corresponds to irrigation water**. Further research will be made by performing isotope measurements to better discriminate the irrigation and rainfall water in the drainage.
- The ET-TSEB fits well with the ET from the water balance, and with a **high fit** with the irrigation requirements estimated with ET FAO-56 **during the highest water necessity period** (July-August-September).
- We need to **look at the drainage** of irrigated areas in order to understand how water is being used and its behaviour in the environment.



Article

Understanding Drainage Dynamics and Irrigation Management in a Semi-Arid Mediterranean Basin

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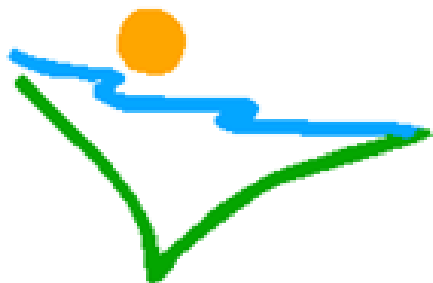


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