Customization of digital tools to local conditions
The case of water footprint estimation of the south-western Cypriot vineyards

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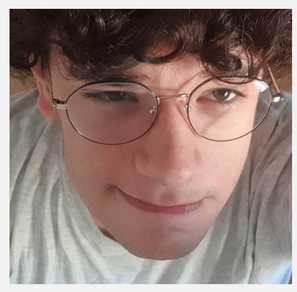
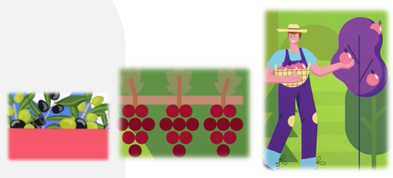


CypruSaves

How accurate and scientifically sound are the digital tools offered to farmers for water and field management?

CypruSaves project developed a unique web GIS based platform for Water Footprint estimation

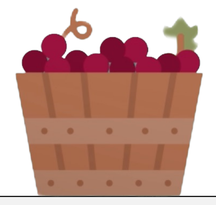
For 14 vine varieties
Xynisteri
Maratheftiko
Sauvignon Blanc
Shiraz
Mavro
Queen
Promara
Semillon
Cabernet Franc
Mattaro
Vertami
Giannoudi
Cabernet Sauvignon
Moschato Alexandrias



The CypruSaves digital tool can be conformed to any crop and any location

HOW?

CypruSaves uses:
- data from a **network of meteorological stations** and **soil sensors**
- **local crops growth coefficients Kc** derived after studying local growing conditions and crops particularities in the specific agricultural environment



BACKGROUND and AIM: With this study we aimed to developed customized tools for water management based on a

Locality and Specificity

basis and offer to farmers and processing plants an easy-to-use app, adapted to the specific cultivation conditions and the particularities of the area and crop type.

MATERIALS AND METHODS

THE PILOT AREA: The Cypriot pilot area is in the districts of Limassol and Paphos, in the south-western part of Cyprus. The pilot case includes **70 vineyards** which supply grapes to a local winery with mean annual production of 128.000 wine bottles. **Fourteen vine varieties** are cultivated in these areas.

Figure 1. The pilot area in Cyprus

It is indicative that in the calculation of the Actual Evapotranspiration ET_c for determining crop irrigation needs, the widely used equation $ET_c=ET_0 \times K_c$ **has a deviation of 17% of the real ET_c values** (Rana and Katerji, 2008), because the usually used K_c factor (crop coefficient) is a default number provided by FAO. This deviation, when is translated in irrigation water amounts, could have tremendous consequences at farm level.

Estimation

The app developed estimates the three Water Footprint components (Hoekstra *et al*, 2017):

$$WF_{total} = WF_{green} + WF_{blue} + WF_{grey} \quad (1)$$

WF_{green}, is calculated as the total volume of crop evapotranspiration (ETc) of a reporting period: $WF_{green} = \sum ETc$ (2).

Crop evapotranspiration is determined by: $ETc = Kc \cdot ETo$ (3), where ET_0 is the evapotranspiration of reference and Kc is the crop coefficient, affected by the different growth stages.

The customization of the tool concerns the definition of ET_0 and Kc parameters of Eq. 3.

(a) For ET_0, climatic data is collected by a network of meteorological stations and is applied on the FAO Penman-Monteith equation.

(b) For Kc, the tool uses customized values defined for all the 14 varieties according to the length of the different growing periods in the pilot area, data collected by local observations, reports of local agronomists and farmers.

CypruSaves tool estimates also the Grey Water Footprint as the sum of two contributions: (a) the direct and the indirect WF_{grey}.

The direct WF_{grey} is the virtual water needed to dilute fertilizers and treatments applied at the field, while the indirect is the volume needed to dilute the emission of pollutants in water during all the processes involved in the product life cycle, except the use of fertilizers and treatments.

RESULTS

For the first time a digital tool calculates all Water Footprint components:
The Green, The Blue, The Grey

The use of customized values for Crop Growing Coefficient (Kc) for each vine variety increases specificity and outcomes' reliability.

Vine growing stages	Xynisteri	Kc
March 15 to April 15	Budburst	0,3
April 15- April 30	budburst+early shooting	0,45
May	Early shoot and leaf growth	0,6
June 1-15	flowering	0,7
June 16 to August 10	budbusrt closure-Fruit set	0,7
August 11-August 31	Veraison	0,7
SEPTEMBER	maturity harvest	0,65
October		0,6
November		0,35

Visualized results for the Water Footprint of the cultivation and consultancy on water sustainable use

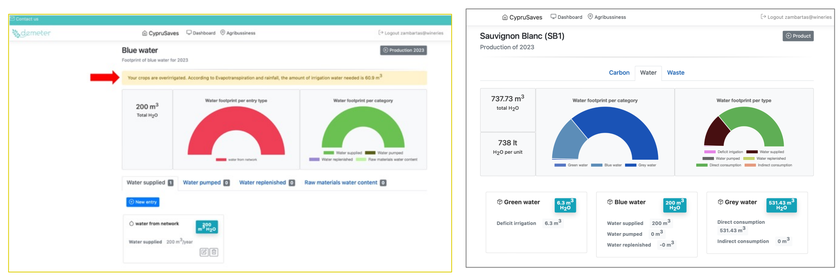


Figure 2. CypruSaves app output. Visualization of cultivation Water Footprint.

For the first time a customized and tailored-made digital tool for Water Management adjusted to vine cultivation at south-western Cyprus

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