



# *The agronomic ways to the sustainable use of water*



***The agronomic ways  
to the sustainable use of water  
to harvest more food  
with less water***

# what does environmental sustainability ask from the Agronomy ?

- scientific and technical innovations for protecting water resources



1. accurate determination of crop evapotranspiration (ET)



## 2. performances of the irrigation systems



### 3. efficiency of water used (WUE) by the cropping systems



# the concept of the water use efficiency (WUE)

Global dry matter yield  
[ kg m<sup>-2</sup> ]

$$WUE \text{ (kg m}^{-3}\text{)} = \text{yield} / \text{water used (ET)}$$

Marketable crop yield  
[kg m<sup>-2</sup>]





# a review: values of Water Use Efficiency

Wheat		WUE [kg m <sup>-3</sup> ]	
Syria	<u>0.50-2.50</u>	Oweis, 1997	
Morocco	<u>0.11-1.15</u>	Corbeels et al. 1998	
Morocco	0.32-1.06	Mrabet, 2002	
Israel	0.60-1.60	Amir et al., 1991	
Italy	1.02-1.20	Van Hoorn et al., 1993	
Italy	1.08-1.59	Katerji et al., 2005	
Turkey	1.33-1.45	Sezen and Yazar, 1996	
Barley			
Italy	1.46-2.78	Katerji et al., 2006	

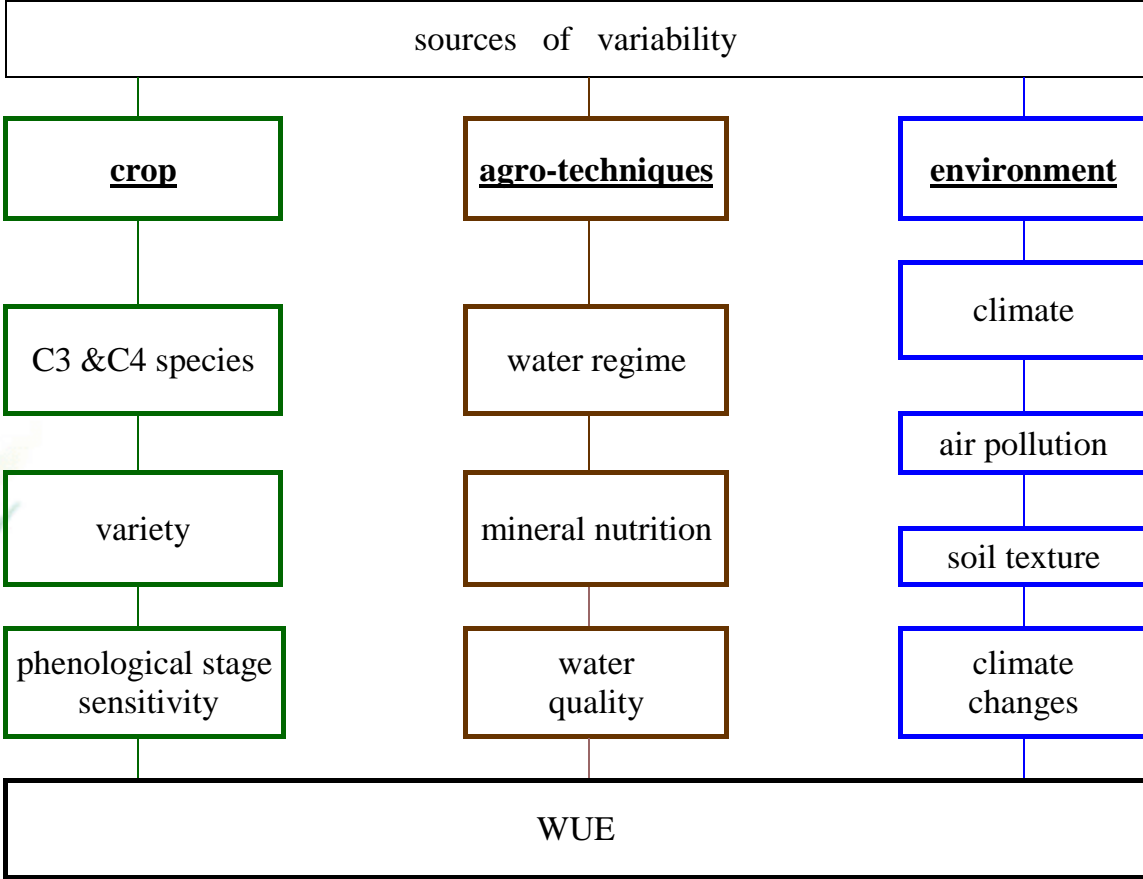


# a review: values of Water Use Efficiency

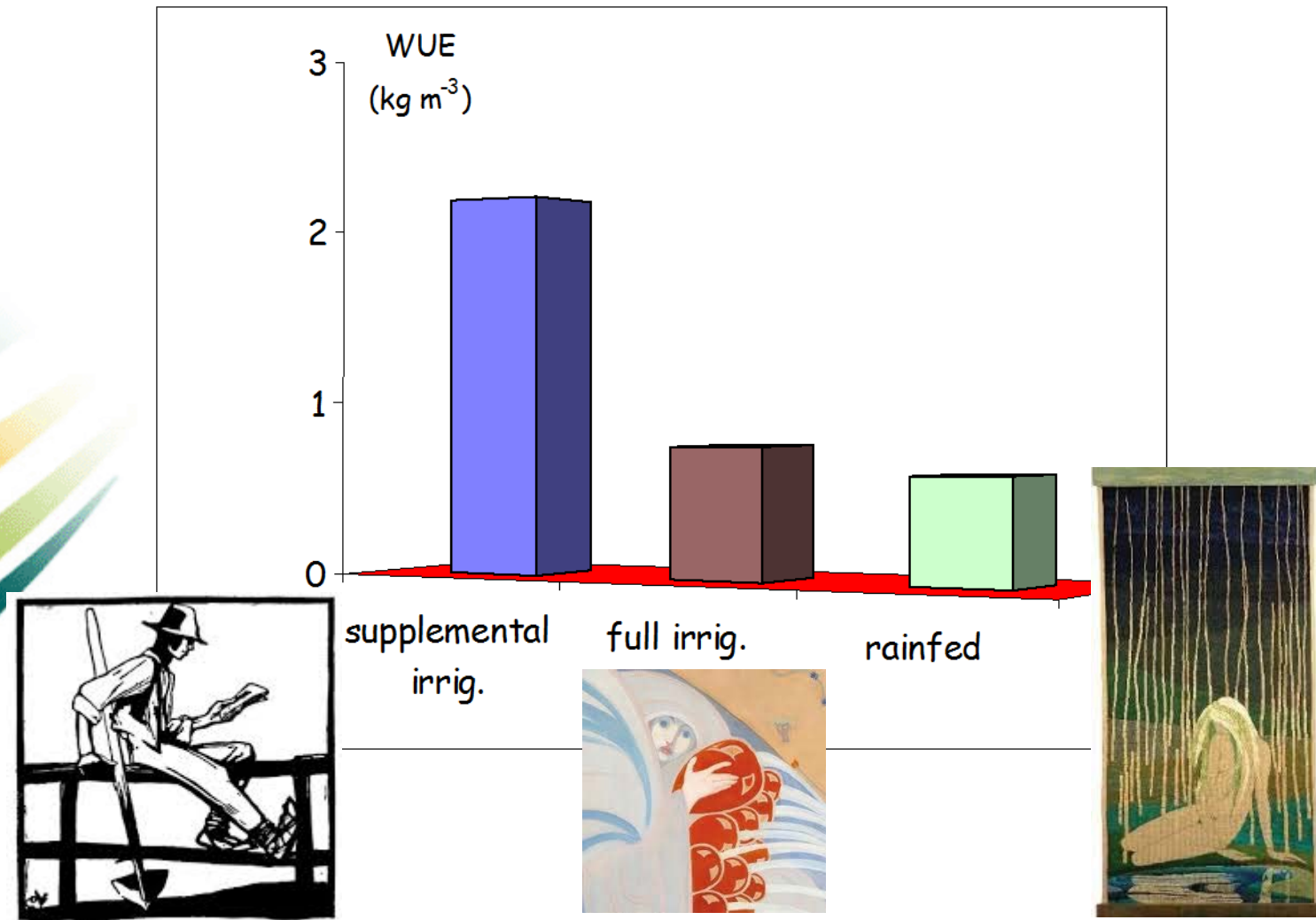
Corn		WUE [kg m <sup>-3</sup> ]	
Turkey	1.65-2.15		Dagdelen et al., 2006
Turkey	<u>0.22</u> -1.25		Gencoglan and Yazar, 1999
Italy	1.35- 1.80		Ben Nouna et al., 2000
Italy	0.82 -1.17		Katerji et al., 1996
Lebanon	1.36-1.89		Karam et al., 1998
France	1.60		Marty et al., 1975
Spain	1.50- <u>2.16</u>		Fernandez et al., 1996
Grain sorghum			
Italy	0.67-1.59		Mastrorilli et al., 1995

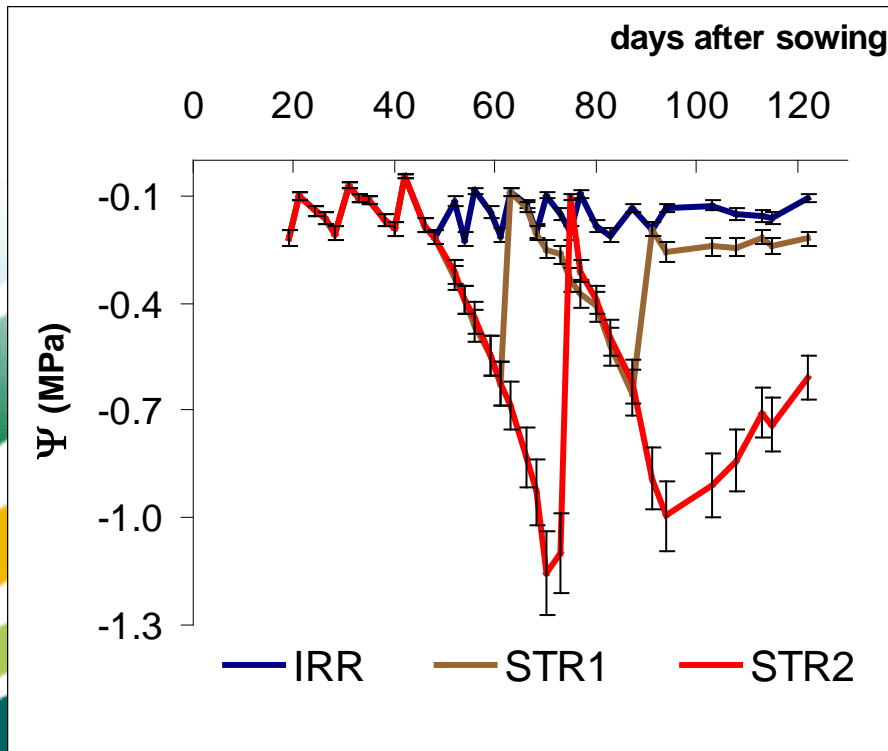
# why does WUE\* vary? efficiency

\*WUE = water use

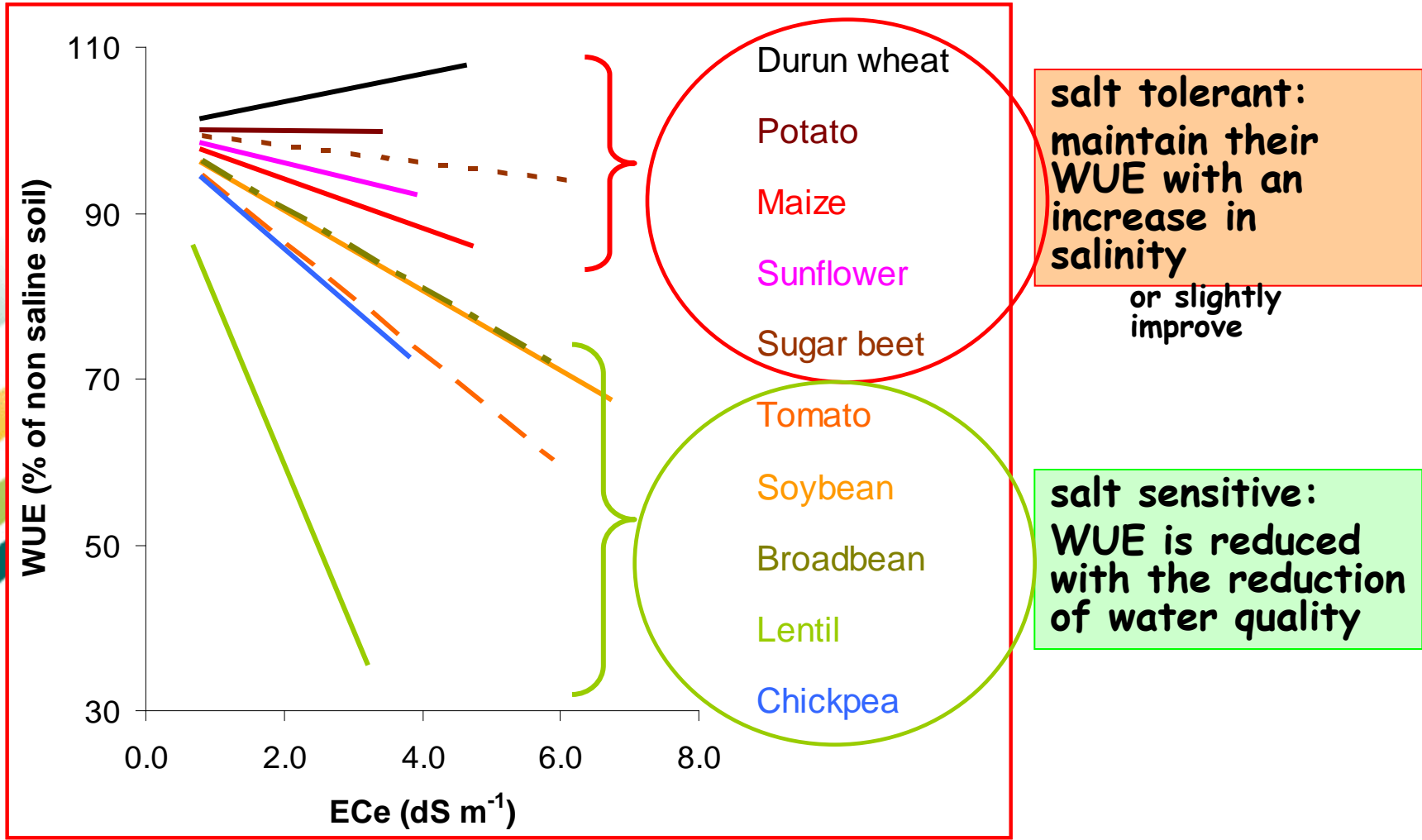


# 1. Agro-techniques factors water regime





# 1. Agro-techniques factors water quality



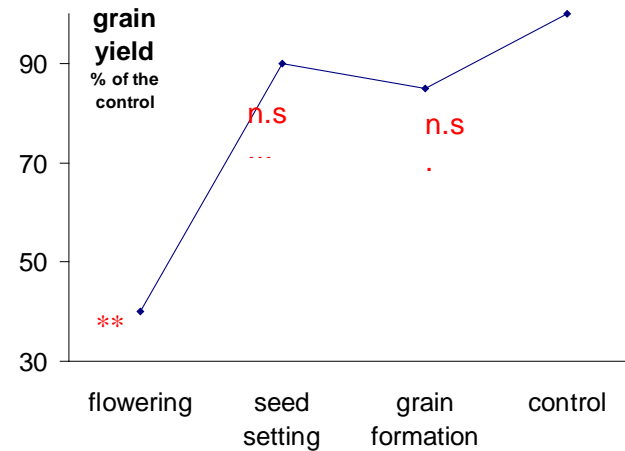
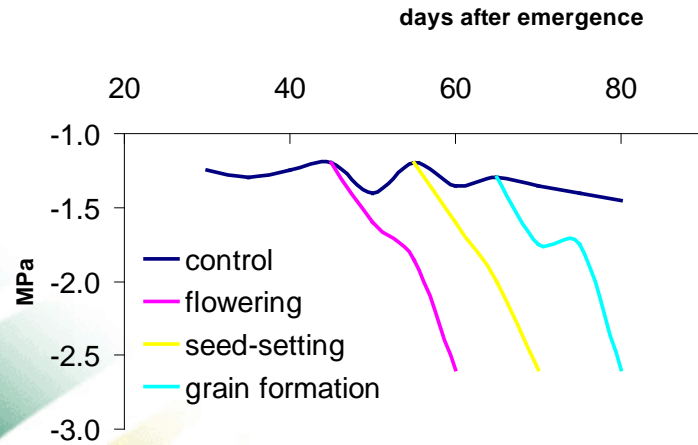
**salt tolerant:**  
maintain their  
WUE with an  
increase in  
salinity

or slightly  
improve

**salt sensitive:**  
WUE is reduced  
with the reduction  
of water quality

# 2. Plant factors stages

# drought sensitivity of growth

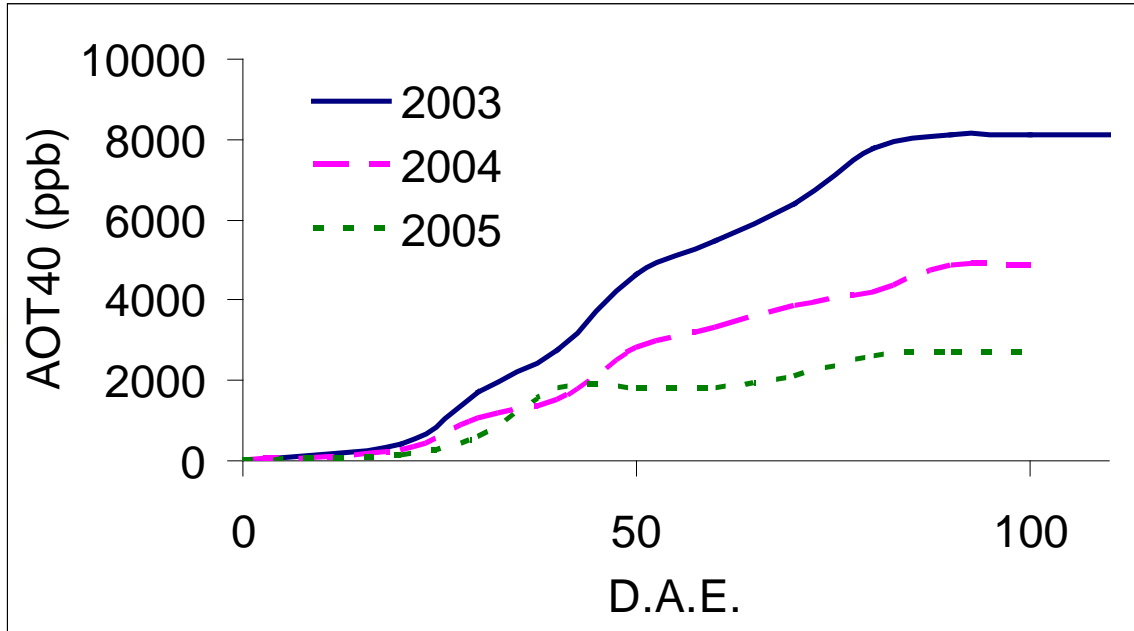


	WUE <sup>b</sup>	WUE <sup>a</sup>
FLOWERING	2.64	0.67
SEED-SETTING	4.01	1.59
SEED RIPENING	4.51	1.41
<b>control</b>	<b>4.85</b>	<b>1.51</b>

irrigation scheduling

corresponding to the regulated drought irrigation (RDI)

**A case study on O<sub>3</sub> in Mediterranean region**

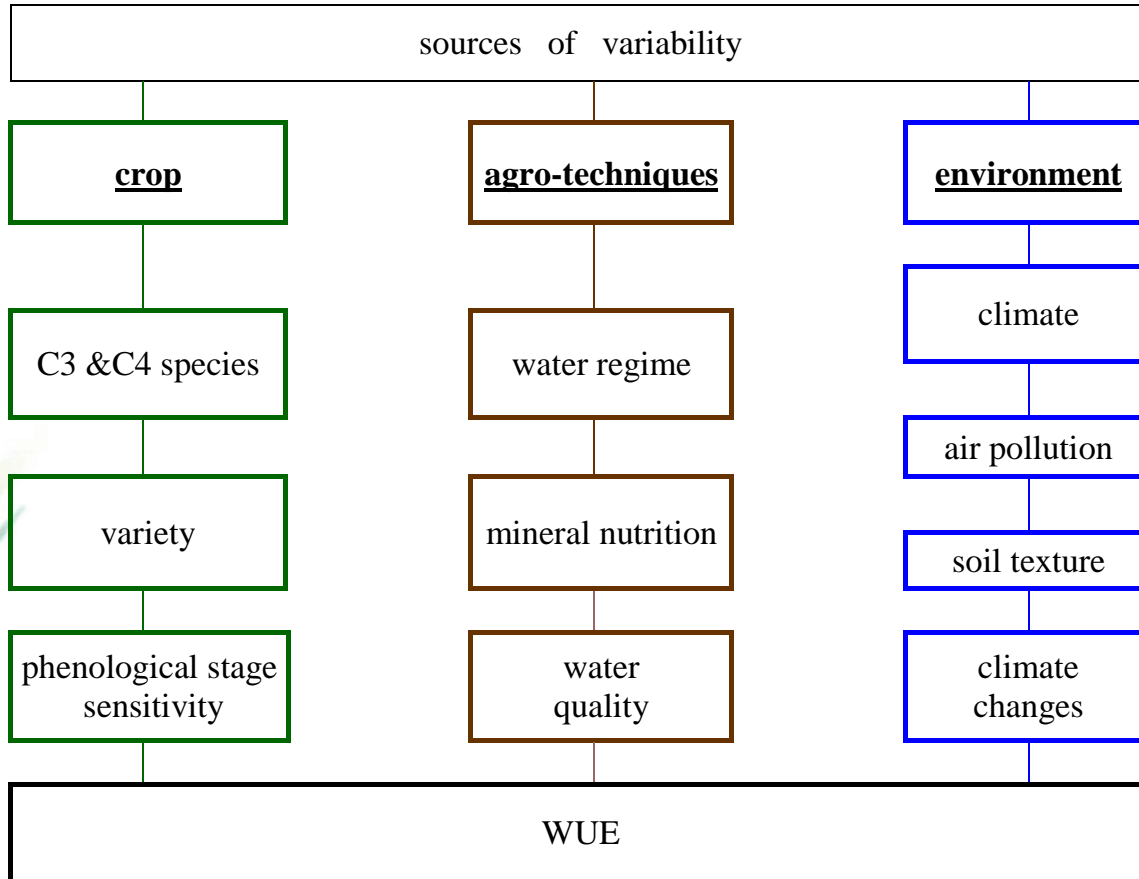




### A case study on $O_3$ in Mediterranean region on soybean

	well watered		stressed	
	AOT = 0	AOT = 10000	AOT = 10000	AOT = 0
$\Sigma ET$ ( $m^3 m^{-2}$ )	0.38	0.28	0.27	0.28
Grain yield ( $kg m^{-2}$ )	0.28	0.15	0.18	0.19
WUE ( $kg m^{-3}$ )	0.74	0.53	0.68	0.67





# WUE is easy to quantify

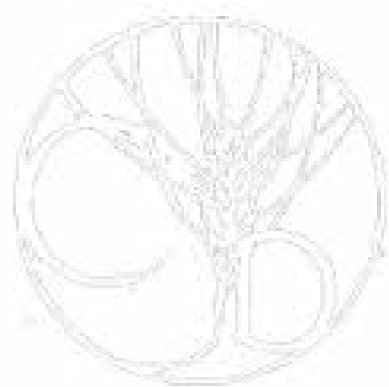


- it should be retained as a complex indicator, because of its intrinsic variability
- if the sources of such variability are known and taken in the right consideration, the concept of WUE can represent a sound agronomic tool for
  - valorising the water in agriculture
  - harvesting more yield per drop





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- crop eco-physiology
- cropping system model



agro-  
ecology  
+  
ICT