CSIC
Consejo Superior de Investigaciones Científicas

# IRRIGATION MANAGEMENT UNDER FUTURE CLIMATE SCENARIOS

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*Tunis, 12 December 22022*

Regional gathering
Tunis, 12 – 16 December 2022

ITALIAN AGENCY FOR DEVELOPMENT COOPERATION

## Physical drivers of climate change

[$CO_2$]


Temperature

Precipitation

Climate extremes

Extreme weather events


## Impacts on production systems

Direct

Phenology

Water availability

Soil

Photosynthetic efficiency

Indirect

Pest and diseases

Invasive species

## Casacading socio-economic impacts

Farmer livelihoods

Food supply

Dietary habits

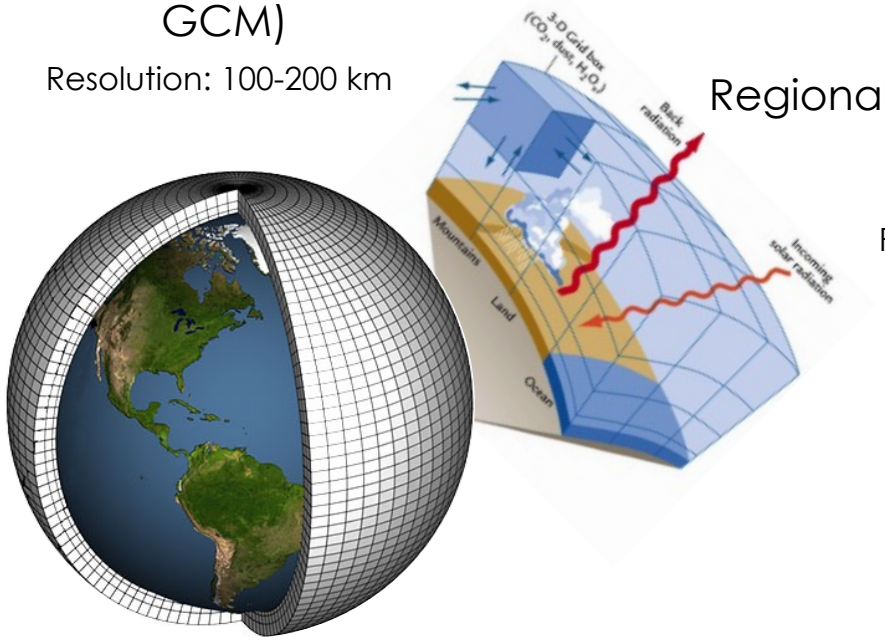
Adaptado de: Arvis et al. (2020)

# WHAT ARE THE EXPECTED CHANGES IN CLIMATE?

# EXPECTED CHANGES IN CLIMATE

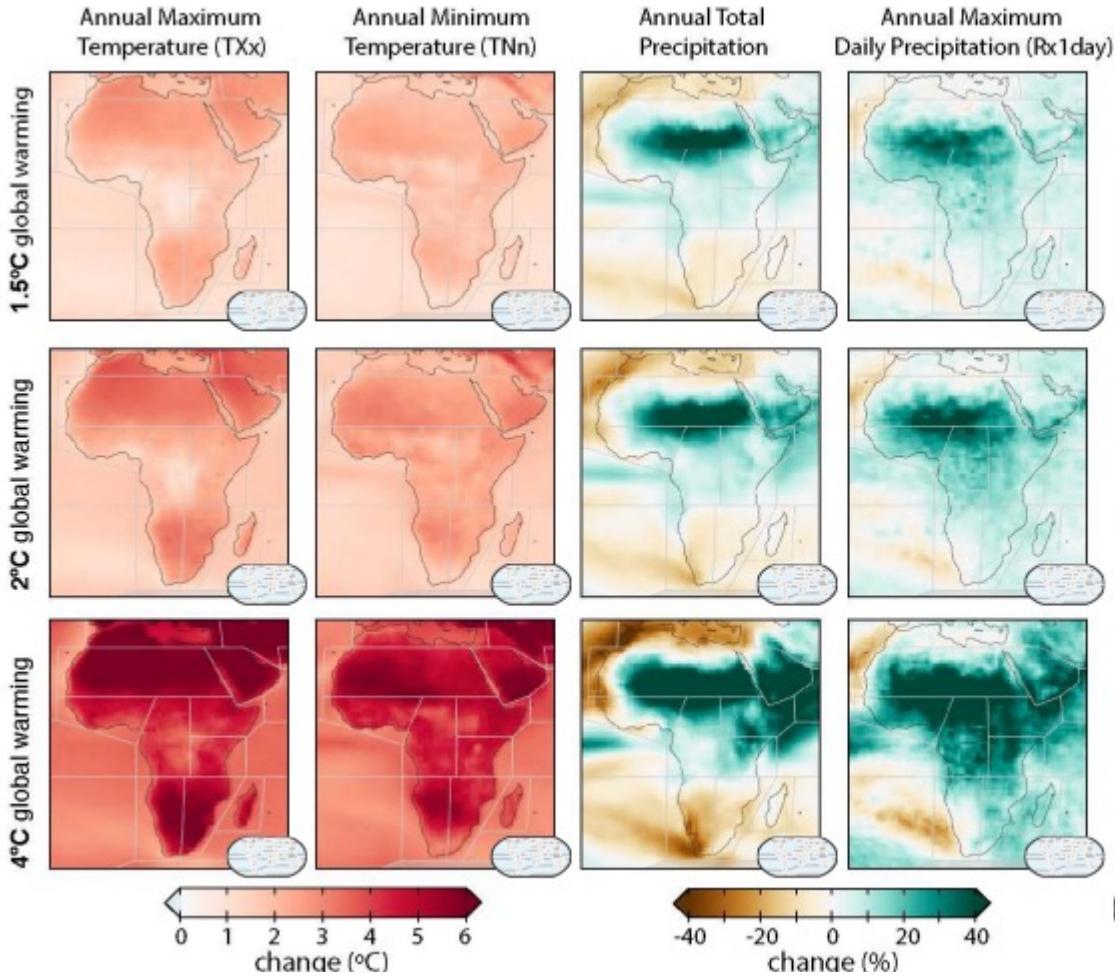
General circulation models GCM)

Resolution: 100-200 km




Regional climate models (RCM)

Resolución: 5-50 km




Source: AR6, IPPC (2021)

# EXPECTED CHANGES IN CLIMATE


Source: AR6, IPPC (2021)

- ↓ Mean precipitation
- ↑ Meteorological/hydrological/agricultural/ecological droughts
- ↓ Mean wind speed

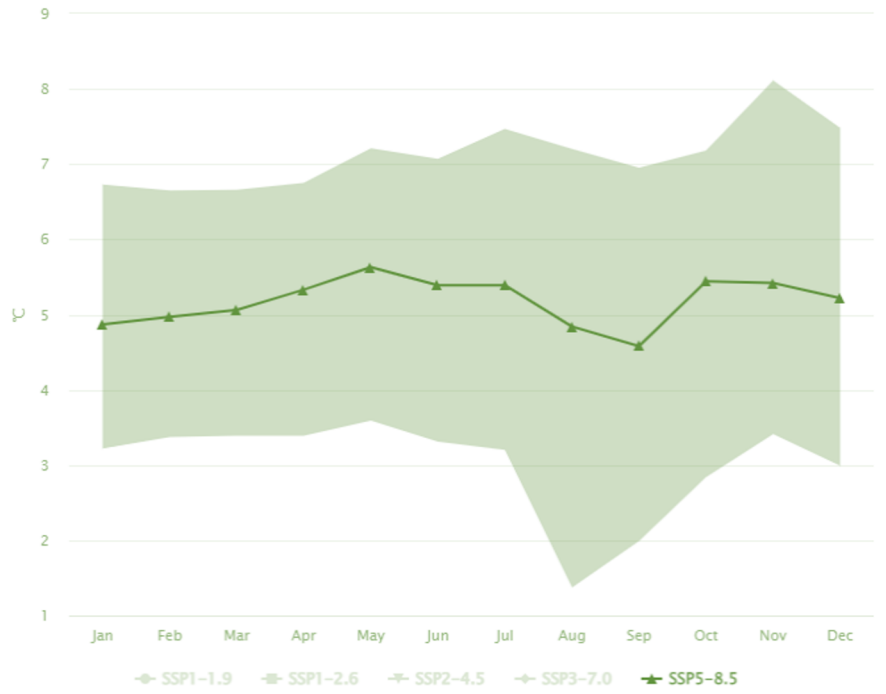
- ↑ Heavy precipitation and pluvial flooding

- ↑ Meteorological droughts at 4° GWL
- ↑ Heavy precipitation and pluvial flooding
- ↑ Mean wind speed

# EXPECTED CHANGES IN CLIMATE

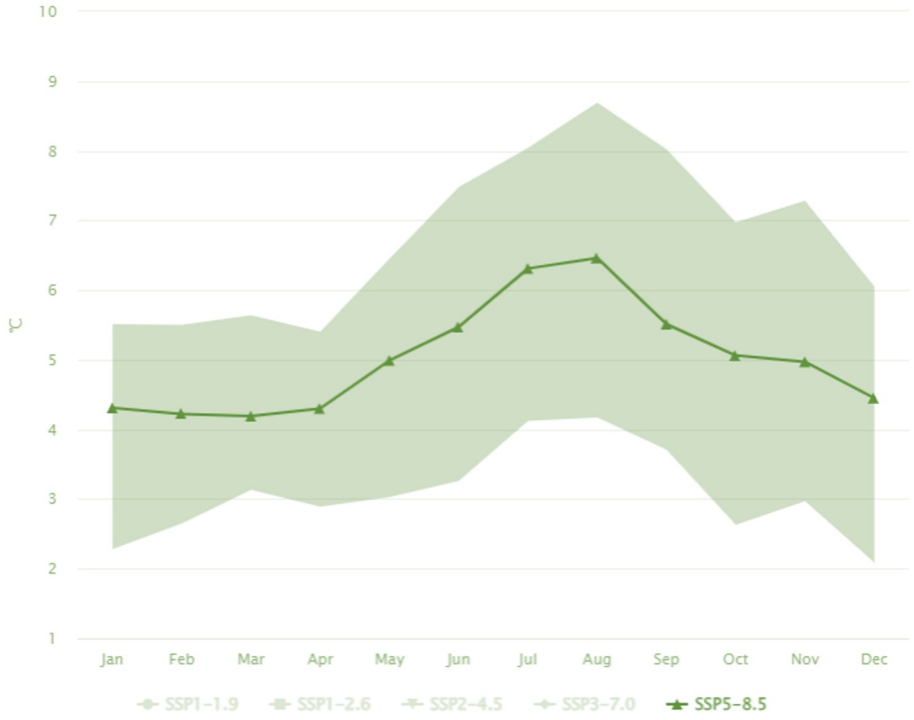
## Niger

Projected Mean-Temperature Anomaly for 2080-2099
Niger; (Reference Period: 1995-2014), SSP5-8.5, Multi-Model Ensemble




## Libya

Projected Mean-Temperature Anomaly for 2080-2099
Libya; (Reference Period: 1995-2014), SSP5-8.5, Multi-Model Ensemble

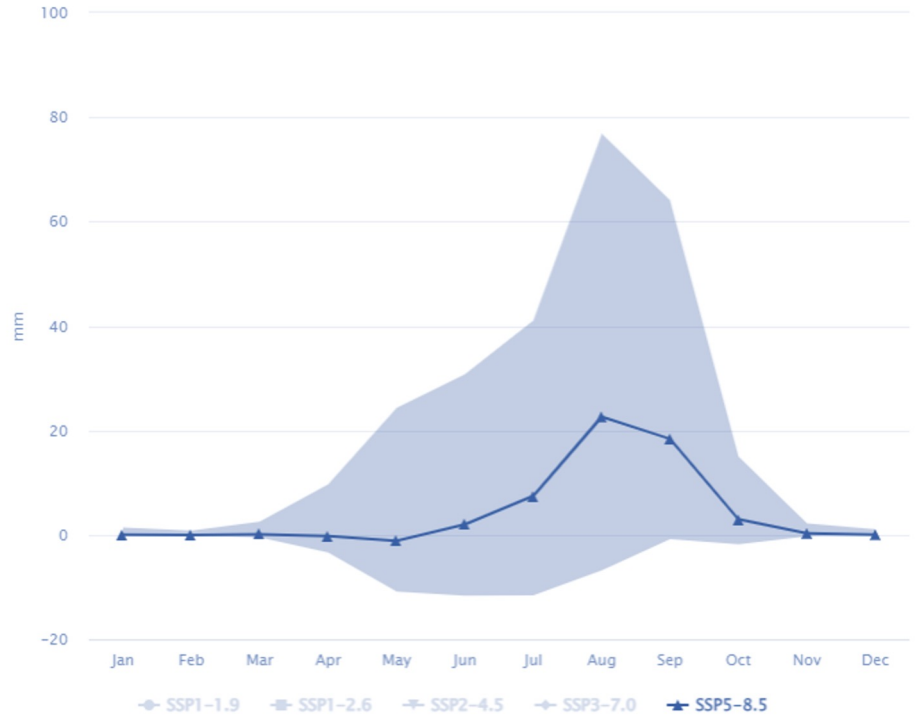



WBG (2021)

# EXPECTED CHANGES IN CLIMATE

## Niger

Projected Precipitation Anomaly for 2080-2099
Niger; (Reference Period: 1995-2014), SSP5-8.5, Multi-Model Ensemble

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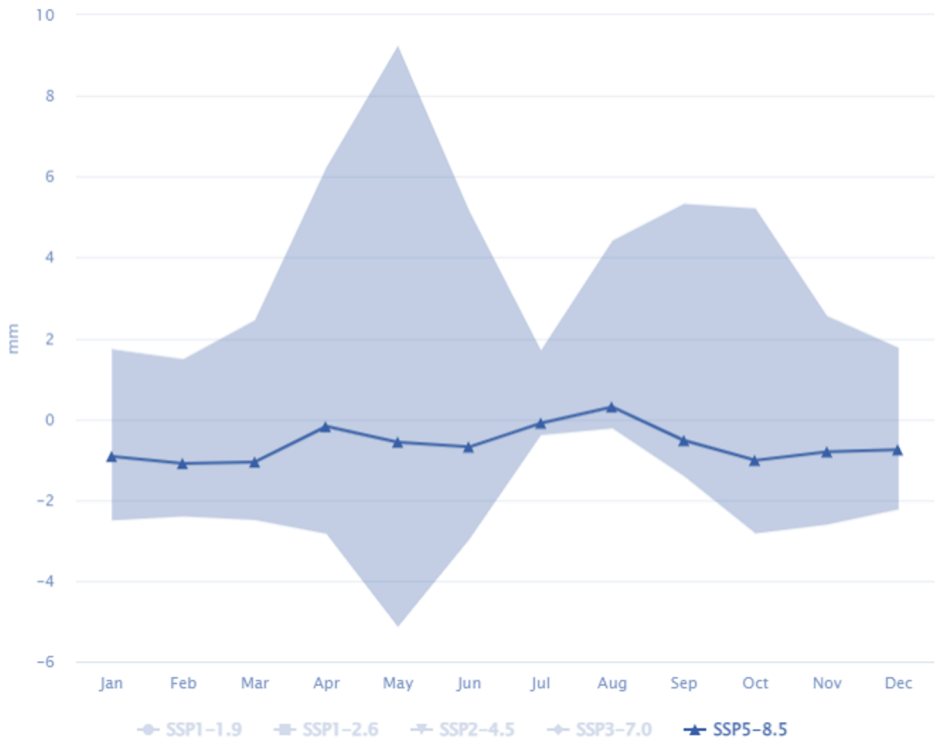


WBG (2021)

# HOW DOES CC AFFECT CROP IRRIGATION REQUIREMENTS?

## IMPACTS ON CROP WATER REQUIREMENTS

**Crop water requirements = Kc x ETo - Precipitation**

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# IMPACTS ON CROP WATER REQUIREMENTS

**$CO_2$ Increase in atmospheric [$CO_2$]**

**Kc**

Triggers stomatal closure

Reduce transpiration

Lower Kc

**Kc**

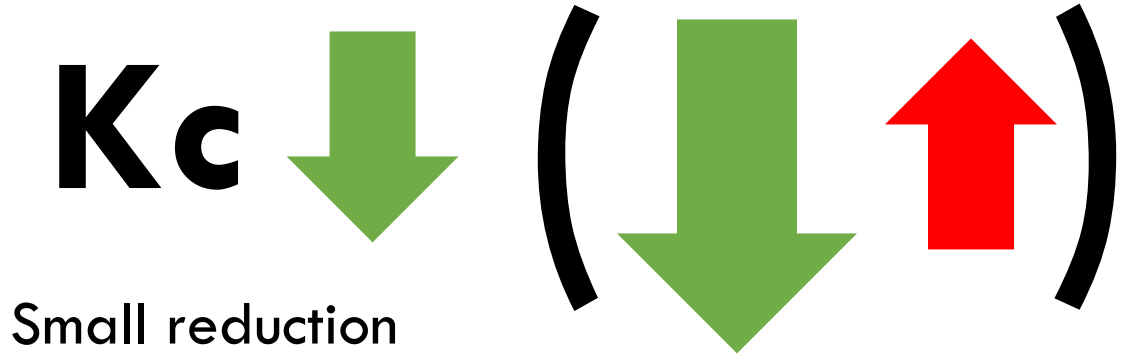
Photosynthesis stimulation

Higher crop growth

Higher Kc

# IMPACTS ON CROP WATER REQUIREMENTS

## ↑$CO_2$ Increase in atmospheric [$CO_2$]



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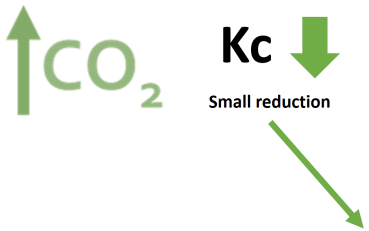
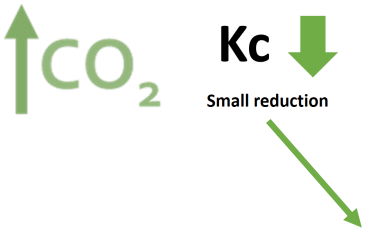



**Crop water requirements = Kc x ETo - Precipitation**

# IMPACTS ON CROP WATER REQUIREMENTS




**Crop water requirements = Kc x ETo - Precipitation**

# IMPACTS ON CROP WATER REQUIREMENTS

## Increase in temperature

**ETo**

**Larger evaporative demand**

↓

**Higher ETo**

**ETo**

**Faster development**

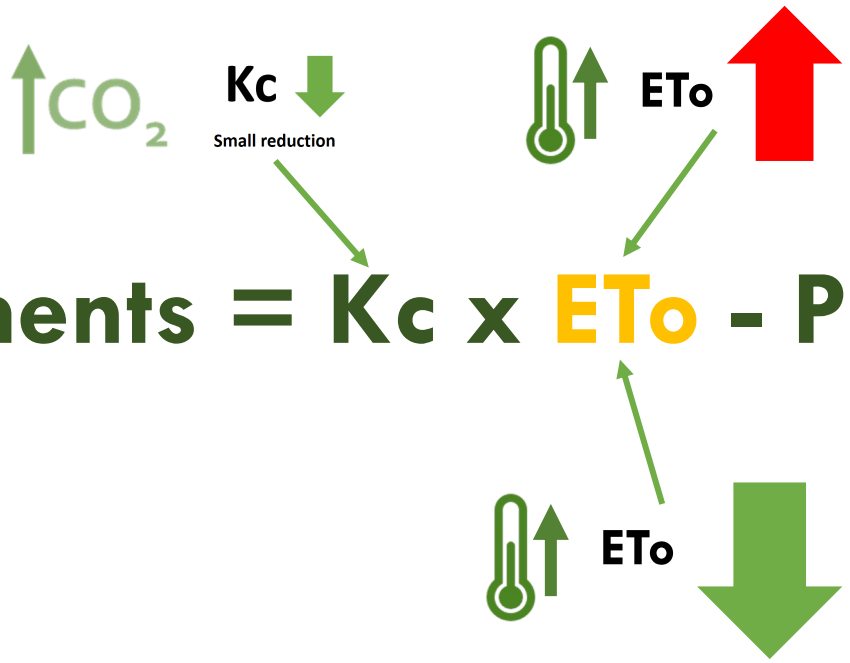
↓

**Shorter growing cycle**

↓

**Lower ETo**

# IMPACTS ON CROP WATER REQUIREMENTS



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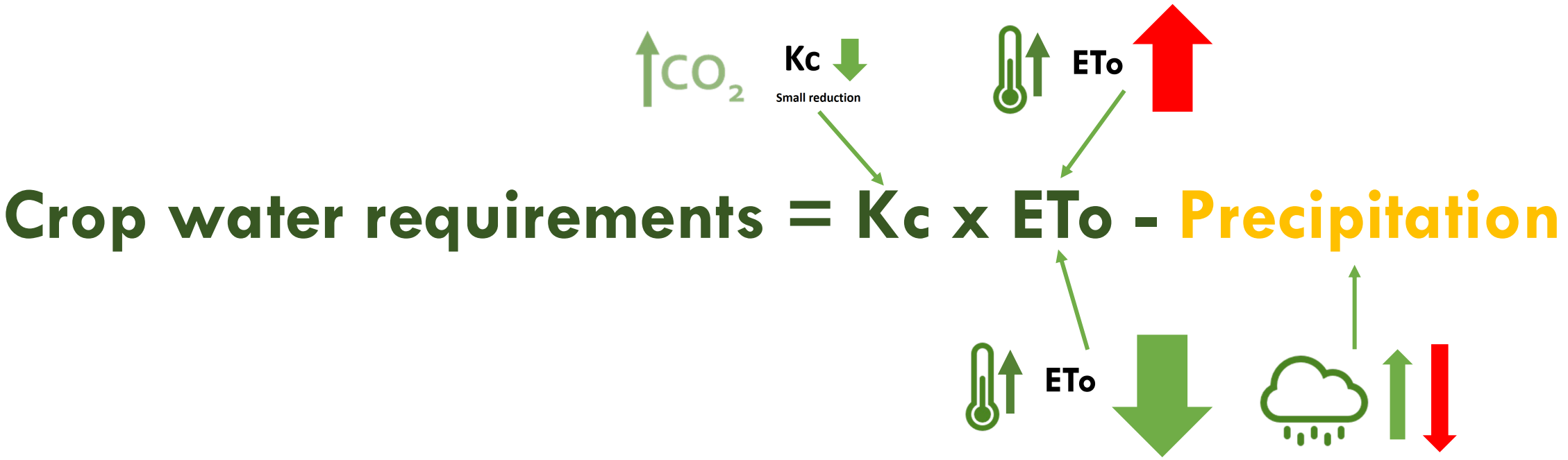

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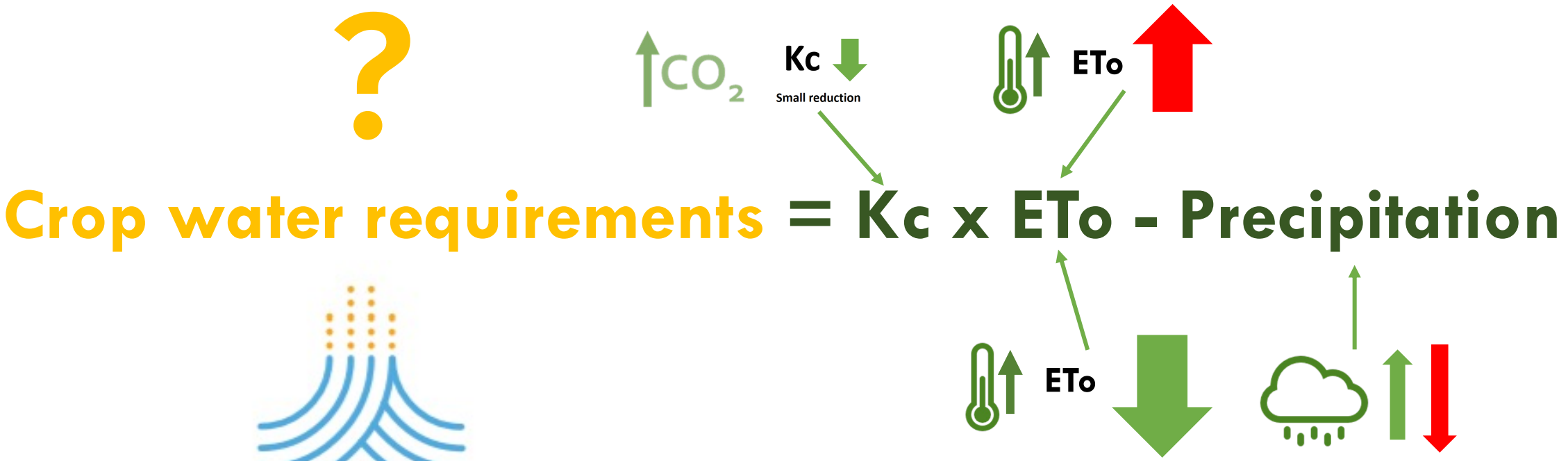
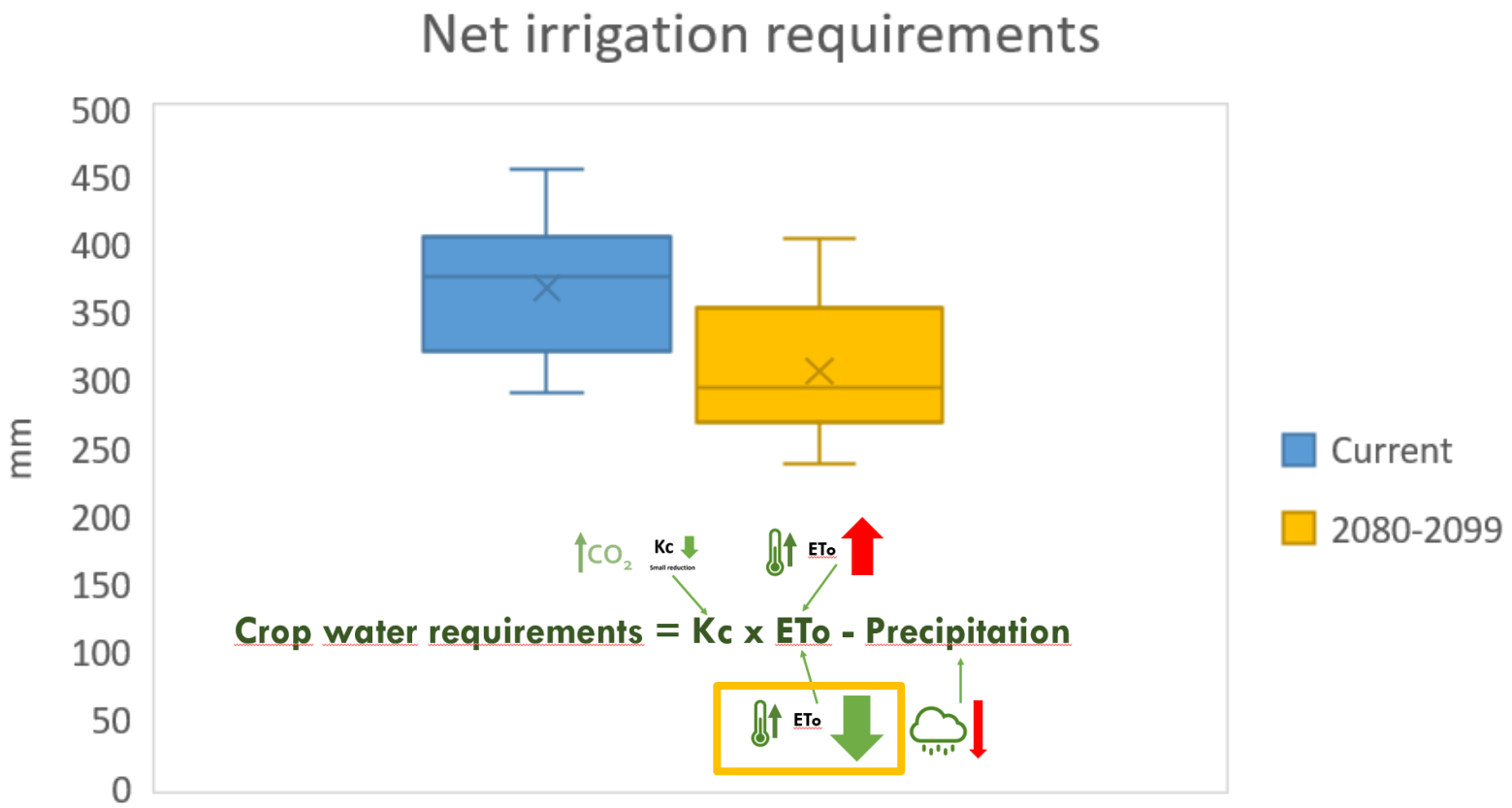


# IMPACTS ON CROP WATER REQUIREMENTS


Irrigated wheat

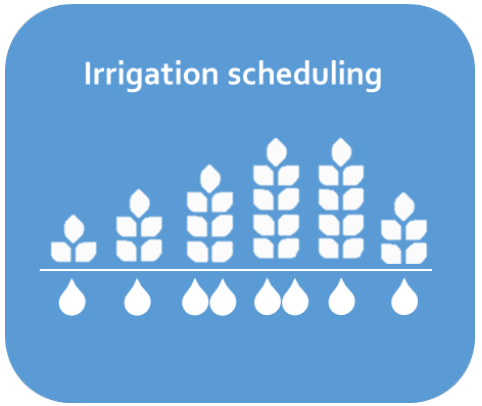
**Scenario:** 2080-2099, RCP 8.5



# EXPLORE OPPORTUNITIES FOR ADAPTATION

AQUACROP







Water supply

Water use efficiency