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SPANISH LEMONS AND WATER.

A. RESILIENCE TO CLIMATE CHANGE.

B. SPANISH LEMONS AND GRAPEFRUITS WATERFOOTPRINT

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The Spanish lemon industry has been adapting to the lack of available water resources for hundreds of years, being prepared for a scenario of diminishing rainwater as a result of climate change.

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SEGURA RIVER BASIN: The main lemon producing area in SPAIN

- The Segura river runs through the SE of Spain
- Main LEMON producing area in Spain
  - 34,000 ha of lemon in the Basin = 73% of total Spanish lemon area

Characteristics of Lemon Producing areas in SPAIN

- One of the driest areas in Spain
- Irregular distribution of rainfall
- Torrential rainfall patterns

- Expansion of irrigation from the 13th century by the Arabs
- Introduction of lemon cultivation in the 15th century
- WATER CULTURE (tradition, infrastructure, landscape, innovation, efficiency)
- Water in the LEMON farmer's DNA

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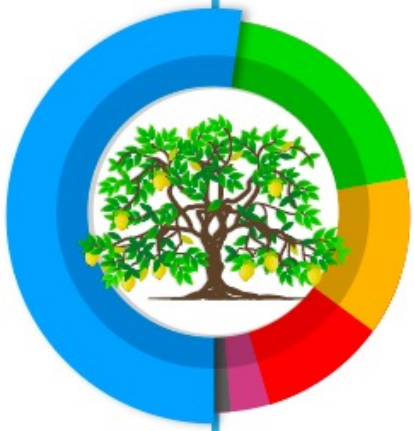
WHERE DOES THE WATER COME FROM?

SOURCES OF WATER IN THE SEGURA RIVER BASIN



- Segura river and groundwater — 51%
- Water transfers — 21%
- Desalination — 13%
- 10% — Treated wastewater
- 4% — Irrigation returns (drainages)
- 1% — Others

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MAIN WATER SOURCES IN THE SEGURA BASIN

2.1 RAINFALL

- Scarcity of rains. Average rainfall is 370 mm per year
- Large water storage capacity in reservoirs
- Rainfall has decreased slightly in the last 30 years (4% reduction)
- It is forecasted a 5% decrease of rains by 2033 as a consequence of climate change

2.2 WATER TRANSFERS

- 322 hm^3 per year transferred as average (222 hm^3/year for irrigation)

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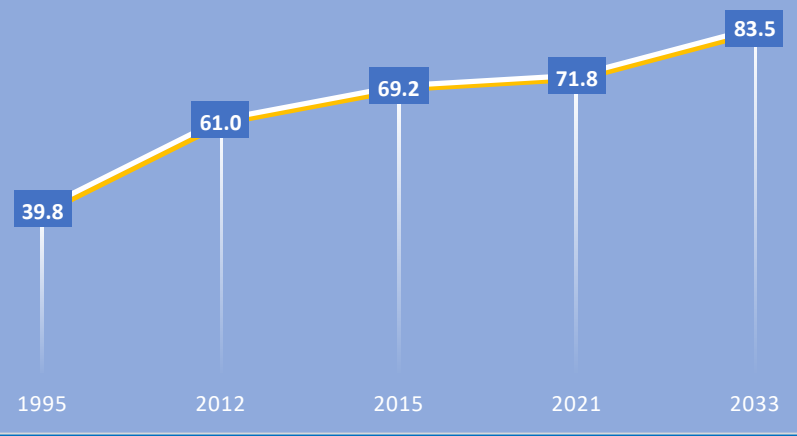
MAIN WATER SOURCES IN THE SEGURA BASIN

2.3 REUSE OF TREATED WASTEWATER (*)

- Wastewater has proven to be a realistic option for unconventional water sources
- **Worldwide. Only 20% of wastewater is treated**
- **Murcia:**
  - **99,2% of wastewater is treated**
  - 78% of treated wastewater is currently being used in agricultura
  - Currently 70 hm^3/ year are used and the outlook is to have 83.5 hm^3 by 2033

CHART 2. TREATED WASTEWATER REUSED IN AGRICULTURE (HM^3)



(*) In Spain, wastewater is used by strictly following the legal regulations for its use (Directive 91/271/EEC of 21 May on urban wastewater treatment and Royal Decree 1620/2007, of 7 December, laying down the legal regime for the reuse of treated water)

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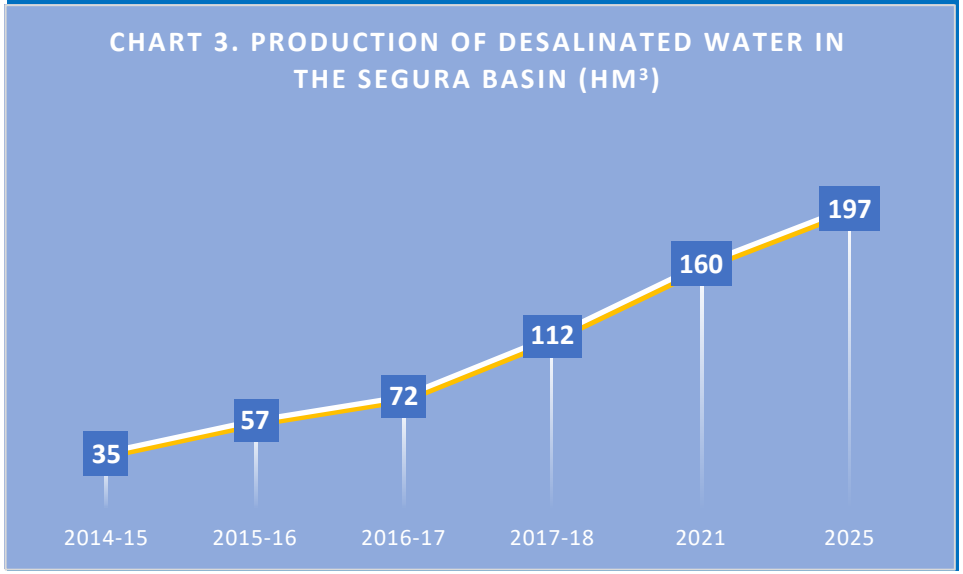
MAIN WATER SOURCES IN THE SEGURA BASIN

2.4 DESALINATED WATER

Inexhaustible water resource not subject to climatic variations

- **Worldwide: 36,500 hm³/year**
- **SPAIN (4th country in the ranking) 1,825 hm³ /year**
- **Segura River Basin**
  - **2017: → 112 hm³**
  - **2021: → 160 hm³**
  - **Forecast 2025: → 197 hm³**



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OPTIMISATION AND REDUCTION OF WATER USE FOR IRRIGATION. LOCALISED IRRIGATION → THE LEMON STUDY CASE

Water consumption per hectar in Spain

- 1950 → 8,250 m^3/ha
- 2007 → 6,500 m^3/ha

SPAIN

- A model in the optimal use and management of water
- Localised irrigation
  - 91,9 % of the lemon Surface
  - (increasing by 323,3 % in 30 years)

Increasing yield per hectar by 274%

Today we need 63% less water to produce one kilo of lemons)

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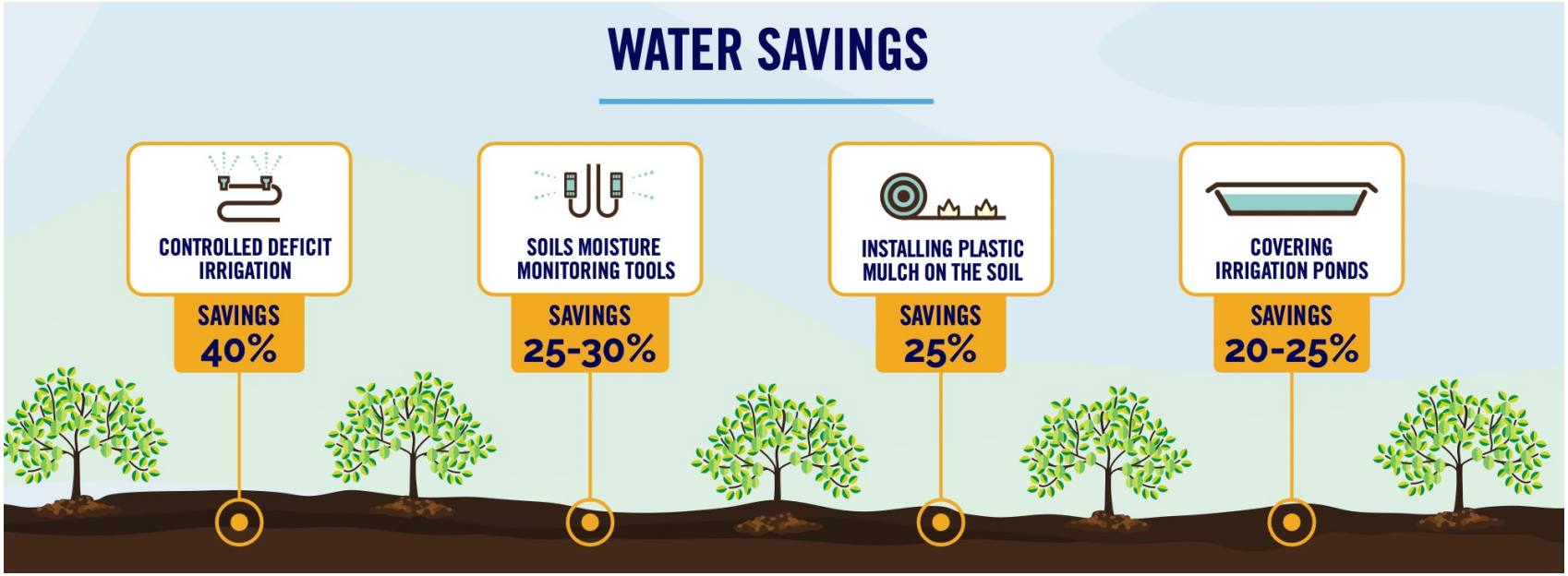
LEMONS AND WATER SAVINGS STRATEGIES IN SPAIN

- Water is in the LEMON farmer's DNA
- ALWAYS LOOKING FOR INNOVATIVE SOLUTIONS TO SAVE WATER



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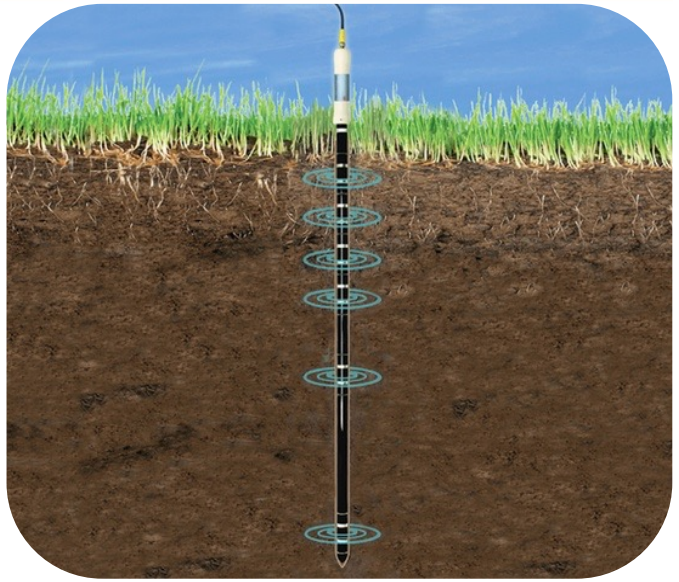
INNOVATIONS TO REDUCE WATER CONSUMPTION ON FARMS → THE LEMON STUDY CASE



SOIL MOISTURE MONITORING TOOLS

- **Used to monitor:**
  - **Soil humidity**
  - **Water effectively absorbed by the tree**
  - **Water lost by the roots**
  - **The ideal timing to irrigate**
  - **Optimal quantity of water**

LEMON. Water Savings up to 25-30%

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INNOVATIONS TO REDUCE WATER CONSUMPTION ON FARMS → THE LEMON STUDY CASE

CONTROLLED DEFICIT IRRIGATION (CDI)

- Consists of applying doses of water below the crop´s needs for a short period of time as an emergency measure
- Positive influence on water productivity
- Cannot be prolonged for many years

NORMAL	CDI
6,000 m3/ha	3,500-4,000 m3/ha

LEMON
Water Savings up to 40%

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INNOVATIONS TO MINIMAZE WATER LOSSES DUE TO EVAPORATION → THE LEMON STUDY CASE

INSTALLING PLASTIC MULCH ON THE SOIL

- Stops the growth of weeds that compete with the lemon tree for water and nutrients
- Reduces the use of herbicides as weed is controlled

Water savings up to 25%

COVERING IRRIGATION PONDS

Between 20 and 30% of the water stored annually evaporates, so having covers means avoiding these losses

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LEMON AND GRAPEFRUIT WATER FOOTPRINT IN SPAIN

Detailed reports and methodology:
https://www.ailimpo.com/en/water-footprint-2/

ailimpo LEMON FROM SPAIN SUSTAINABLE DEVELOPMENT GOALS

ailimpo GRAPEFRUIT FROM SPAIN SUSTAINABLE DEVELOPMENT GOALS

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WHAT IS THE WATER FOOTPRINT?

Indicator of fresh water use that looks not only at direct water use of a consumer or producer, but also at the indirect water use.

Blue water footprint (WFblue)

Green water footprint (WFgreen)

Grey water footprint (WFgrey)

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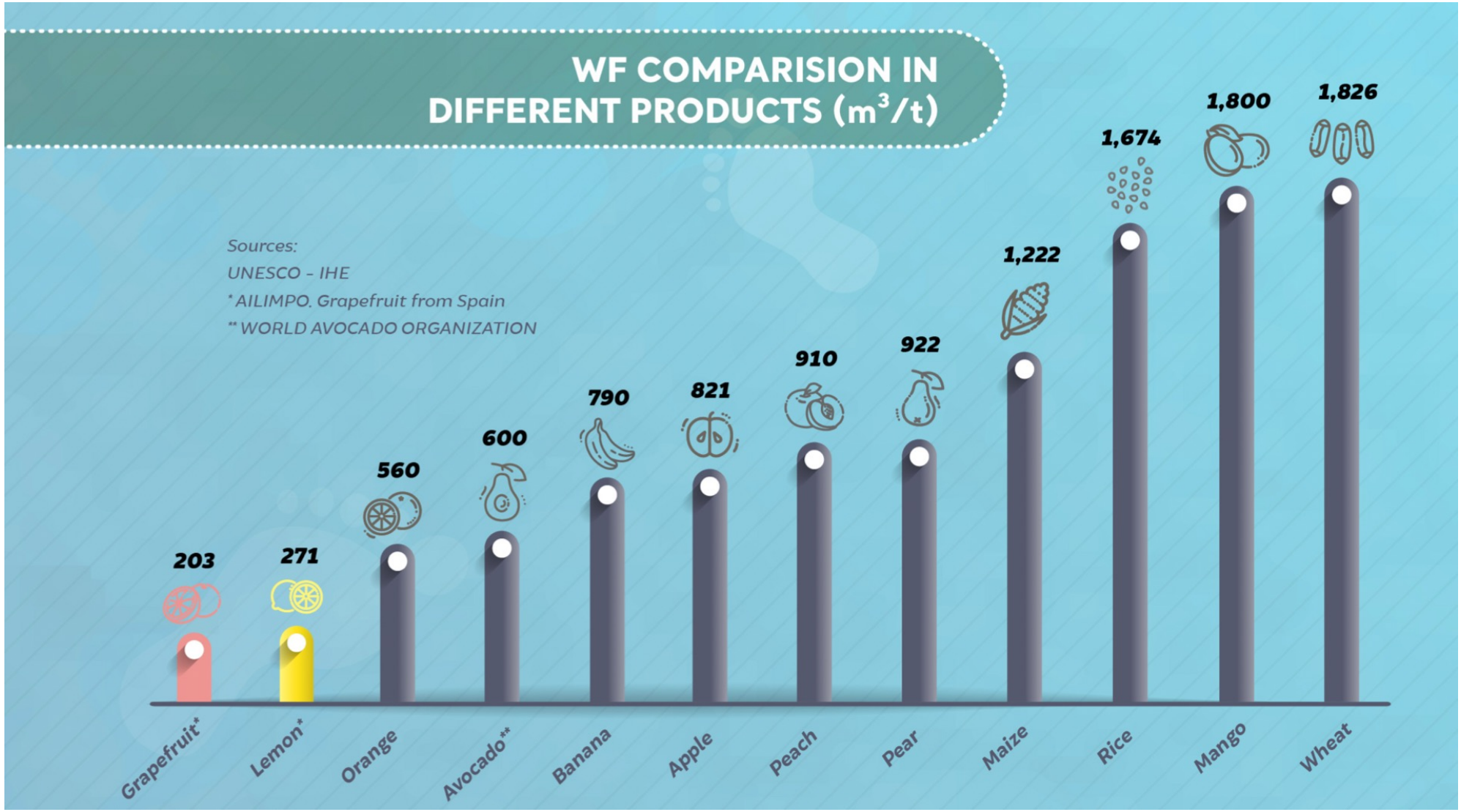
LEMON AND GRAPEFRUIT: THE LOWEST WF



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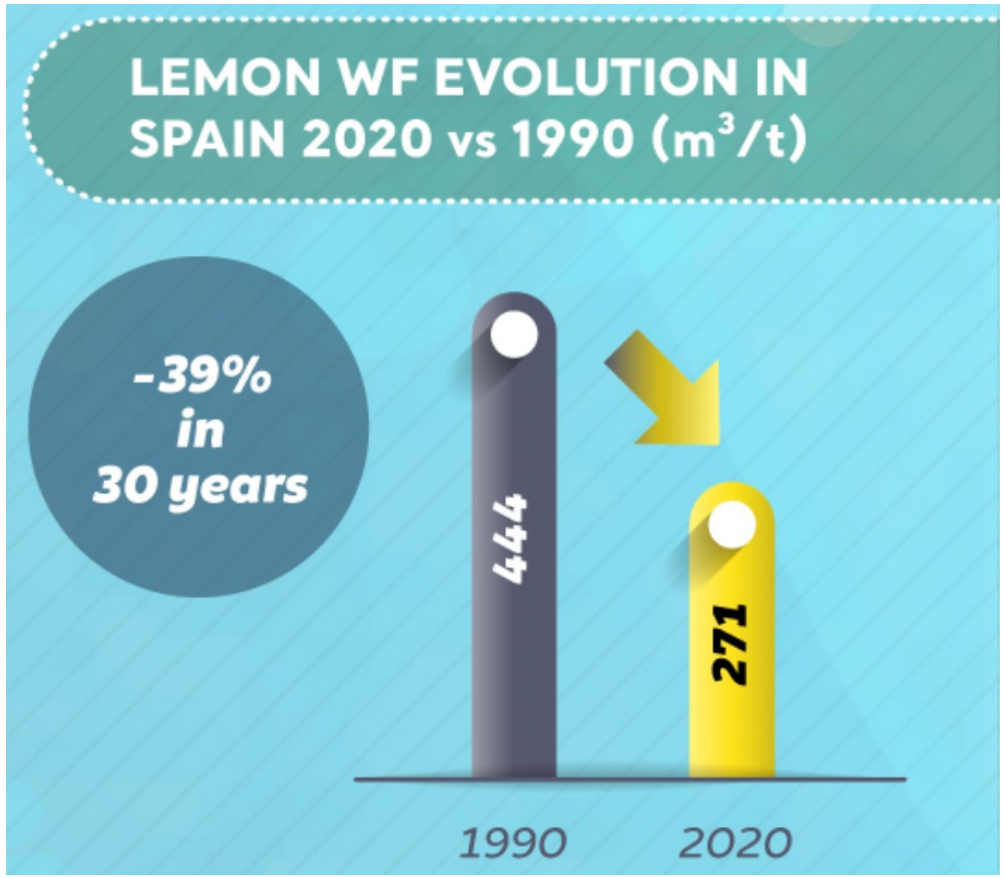
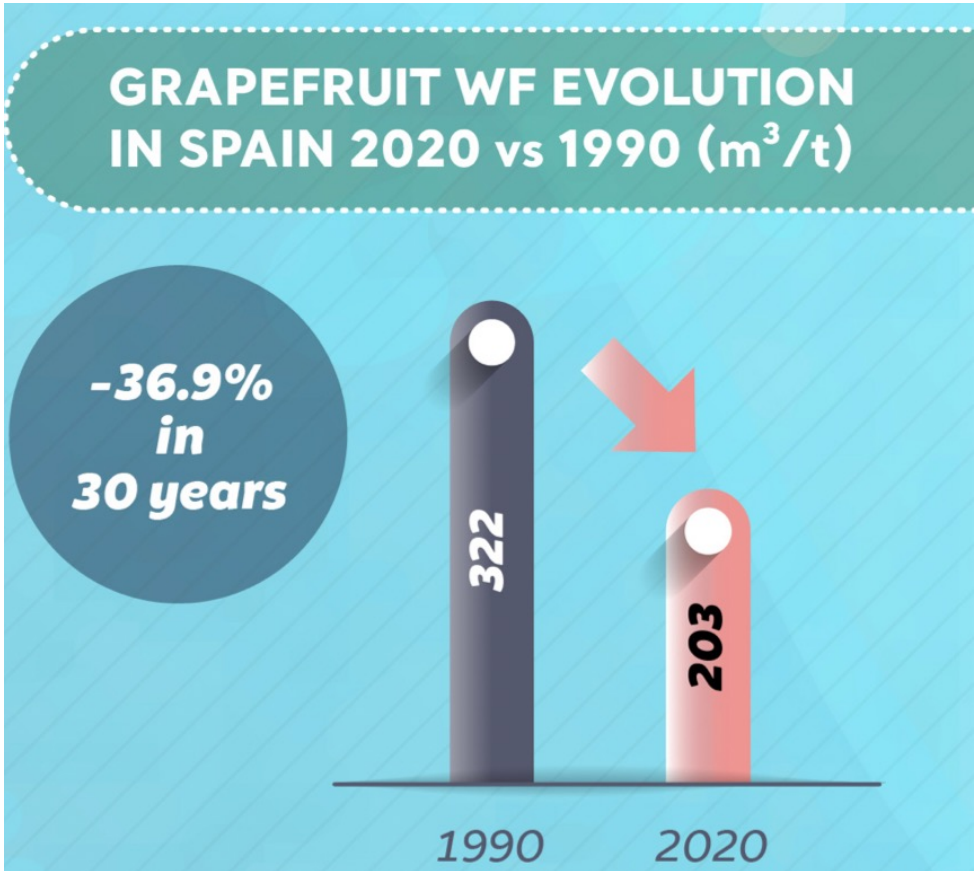
30 YEARS EVOLUTION WATER FOOTPRINT IN SPAIN





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LEMON WATERFOOTPRINT DATA COMPARISON

	WATER FOOTPRINT			
	UNESCO-IHE	ARGENTINA	SOUTH AFRICA	SPAIN
WFblue	152	83.4	113	155
WFgreen	432	300.4	62	56
Hgris	58	S/D	50	60
HH total	**642**	**383.8**	**225**	**271**

***RSA. Considering very high average yield per hectar (52 tons/ha vs 24 tons/ha in Spain)**