ENHACING WATER MANAGEMENT CAPACITY IN A CHANGING WORLD

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SESSION 5: WATER FOR ECONOMIC GROWTH AND DEVELOPMENT

JUNE 26 (8:30-10:10)

THE ADVANCES OF SCIENCE AND TECHNOLOGY ALLOW USING WATER FOR INCREASING DEVELOPMENT OF MOST COUNTRIES

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WATER OBSERVATORY

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References

1. SCOPE AND AIM

- To show how the recent advances in water resources science and technology may contribute to the development of all the countries (arid and humid).
- A general introduction on global issues.
- A national study: Spain (500,000 km^2 and 45 million inhabitants).
- A watershed: river Guadalquivir (South Spain: 58,000 km^2; 4 million inhabitants).

2. THE ANTHROPOCENE ERA AND THE CHANGING PARADIGMS (I)

- This is not an era of changes but a change of era.
- Its main characteristic is the greater influence of human technology in modifying the environment: for the good or for the bad.
- It began in the middle of 20 th century:

  a) Rachel Carson's "Silent Spring"
  b) Lynn White's paper on Judeo-Christian paradigm based on Bible: Genesis 2.

2. THE ANTHROPOCENE ERA AND THE CHANGING PARADIGMS (II)

- The results of white's debate.

  a) human being as nature's predator or steward.

  b) Saint Francis of Assisi patron of ecologists.

  c) Increasing relevance of water (environment) ethics.

- The UNESCO COMMISSION ON THE ETHICS OF SCIENCE AND TECHNOLOGY (COMEST) report on the ethics of fresh water uses.

3. IS THERE A NEXUS BETWEEN ECONOMIC GROWTH AND DEVELOPMENT VERSUS WATER AVAILABILITY OR ABUNDANCE? (I)

- There is no clear nexus or correlation between the poverty or wealth of a country and its abundance of water.
- Poverty and development depend on many drivers or factors.
- Water is only one of them.

3. IS THERE A NEXUS BETWEEN ECONOMIC GROWTH AND DEVELOPMENT VERSUS WATER AVAILABILITY OR ABUNDANCE? (II)

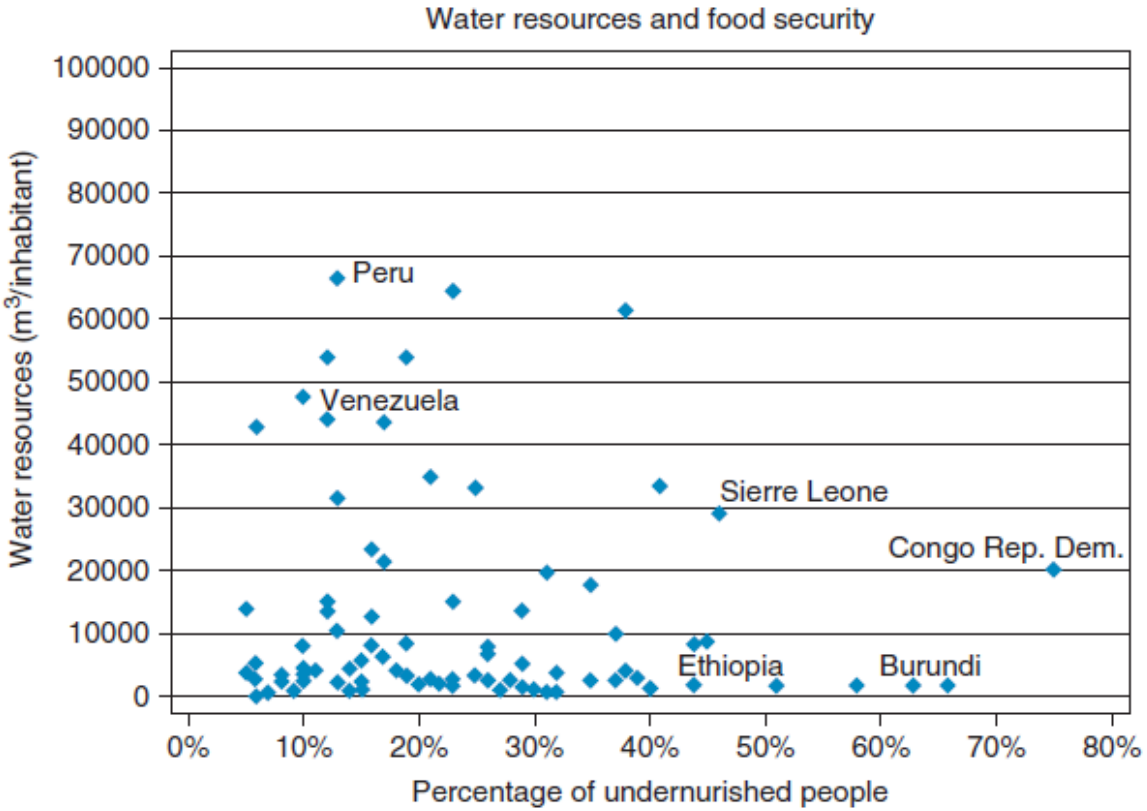


Figure 1. Water resources and food security in developing countries.
Source: FAO (2009).

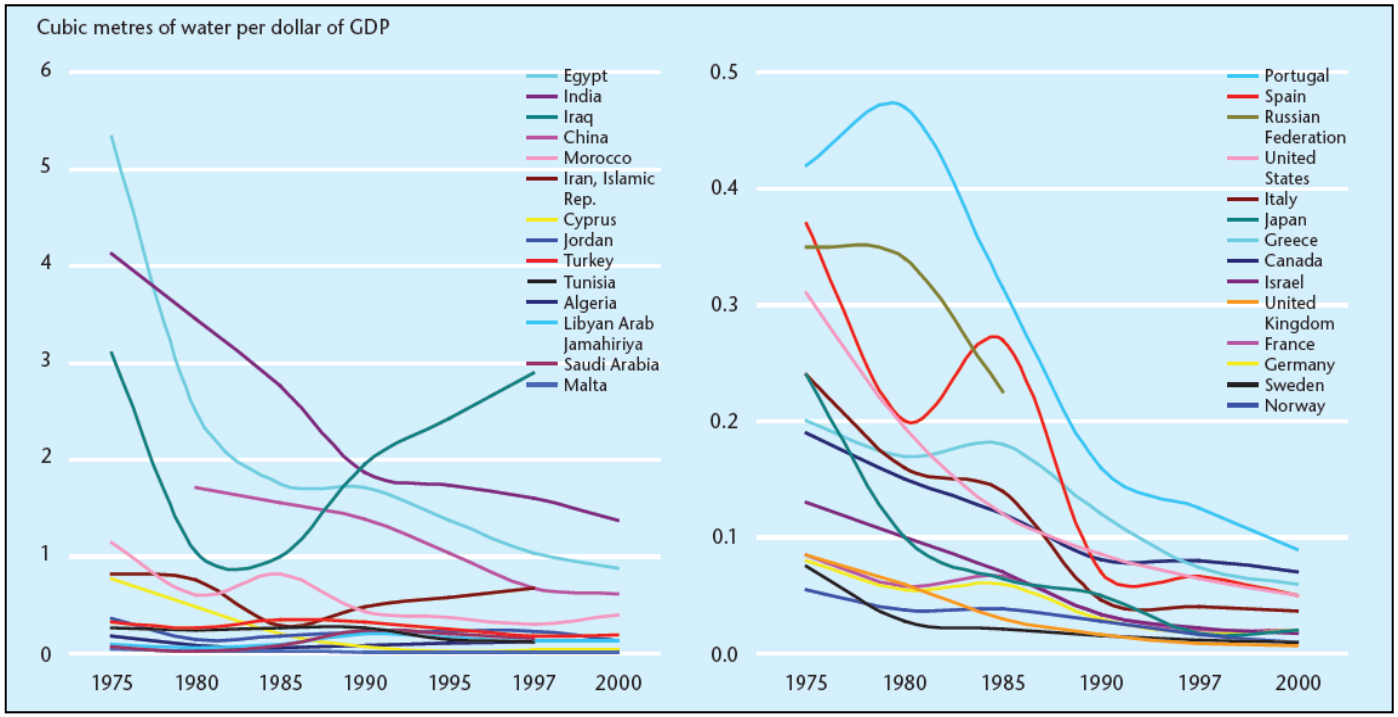
3. IS THERE A NEXUS BETWEEN ECONOMIC GROWTH AND DEVELOPMENT VERSUS WATER AVAILABILITY OR ABUNDANCE? (III)

- Other relevant factors
  a) oil (gulf countries)
  b) high tech (Israel, India?)
  c) tourism (Spain, Egypt, California…)
  d) minerals (South Africa, Angola, Perú, Chile…)
  e) business (Switzerland)
  f) renewable energies (mainly solar)

- Self-sufficiency in food is not a must now because of the international trade of food (virtual water).

3. IS THERE A NEXUS BETWEEN ECONOMIC GROWTH AND DEVELOPMENT VERSUS WATER AVAILABILITY OR ABUNDANCE? (IV)

Water decoupling, i.e. using less water and causing fewer environmental impacts per unit of economic output, is possible and already happening in many regions and sectors, offering win-win opportunities, especially in developing countries.



The ratio of water use to GDP in different countries (Source: UN-Water, 2009)

4. THE CASE HISTORY OF SPAIN'S WATER POLICY (I)

- The driest country in the EU

  a) Rainfall: 700 mm/year or 8,000 m^3/ person/year.
  b) Green water: 500 mm/year or 6,000 m^3/person and year.
  c) Blue water: 200 mm/year or 2,000 m^3/person and year.

- Population: 25 million in 1950 to 45 million in 2010.
- 1300 high dams (fourth in the world).

4. THE CASE HISTORY OF SPAIN'S WATER POLICY (II)

- Socio-economic changes in half a century: from (mild) dictatorship to (young) democracy.
- From rural country to industrialized country in half a century (rural population from 40 to 4 %).
- GDP/per capita and year from US$ 300 to 30,000. (one hundred fold).

4. THE CASE HISTORY OF SPAIN'S WATER POLICY (III)

Table 1. Percentage of GDP, labour and water consumption of the Spanish economic sectors
Source: INE (2011a, 2011b), MYTIC (2011, MARM (2011a)

	Sector	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
% of GDP	Agriculture, livestock and fisheries	3.8	3.7	3.5	3.4	3.1	2.7	2.4	2.5	2.3	2.3
	Industrial	18.8	18.3	17.7	17.2	16.7	16.3	15.8	15.6	15.6	14.6
	Constructio n	9.3	9.9	10.5	10.9	11.4	12.1	12.6	12.4	12.5	12.1
	Tourism	11.6	11.5	11.1	11.0	10.9	10.8	10.9	10.8	10.5	10.0
	Services (except tourism)	46.9	47.3	48.0	47.8	47.8	47.4	47.2	48.6	50.8	53.2
% Labour	Agriculture, livestock and fisheries	6.1	5.8	5.8	5.6	5.4	5.1	4.7	4.5	4.4	4.3
	Industrial	19.4	19.0	18.5	17.9	17.3	16.8	16.3	15.8	15.6	13.6
	Constuction	11.2	11.8	12.1	12.5	12.8	13.3	13.6	13.8	12.6	11.1
	Tourism	11.6	11.5	12.0	12.12	12.37	12.78	13.3	13.6	13.8	10.8
	Services (except tourism)	51.8	51.8	51.6	51,9	52,1	52,0	52,1	52,3	53,6	53,8
Water consumption (Mm^3)	Crop production	27,206	28,855	28,795	29,126	30,899	21,037	25,819	30,681	33,077	25,145
	Livestock	40,839	42,301	42,952	43,733	44,343	44,008	42,969	49,331	42,995	42,563
	Industrial and constructio n	2,081	1,874	1,870	1,892	2,007	1,366	1,677	1,993	2,148	1,633
	Tourism	518	467	466	471	500	340	418	496	535	407
	Services (Urban except	1,735	1,874	2,012	2,078	2,047	2,178	2,077	1,983	1,921	1,965

4. THE CASE HISTORY OF SPAIN'S WATER POLICY (IV)

- Economy, employment and water use.

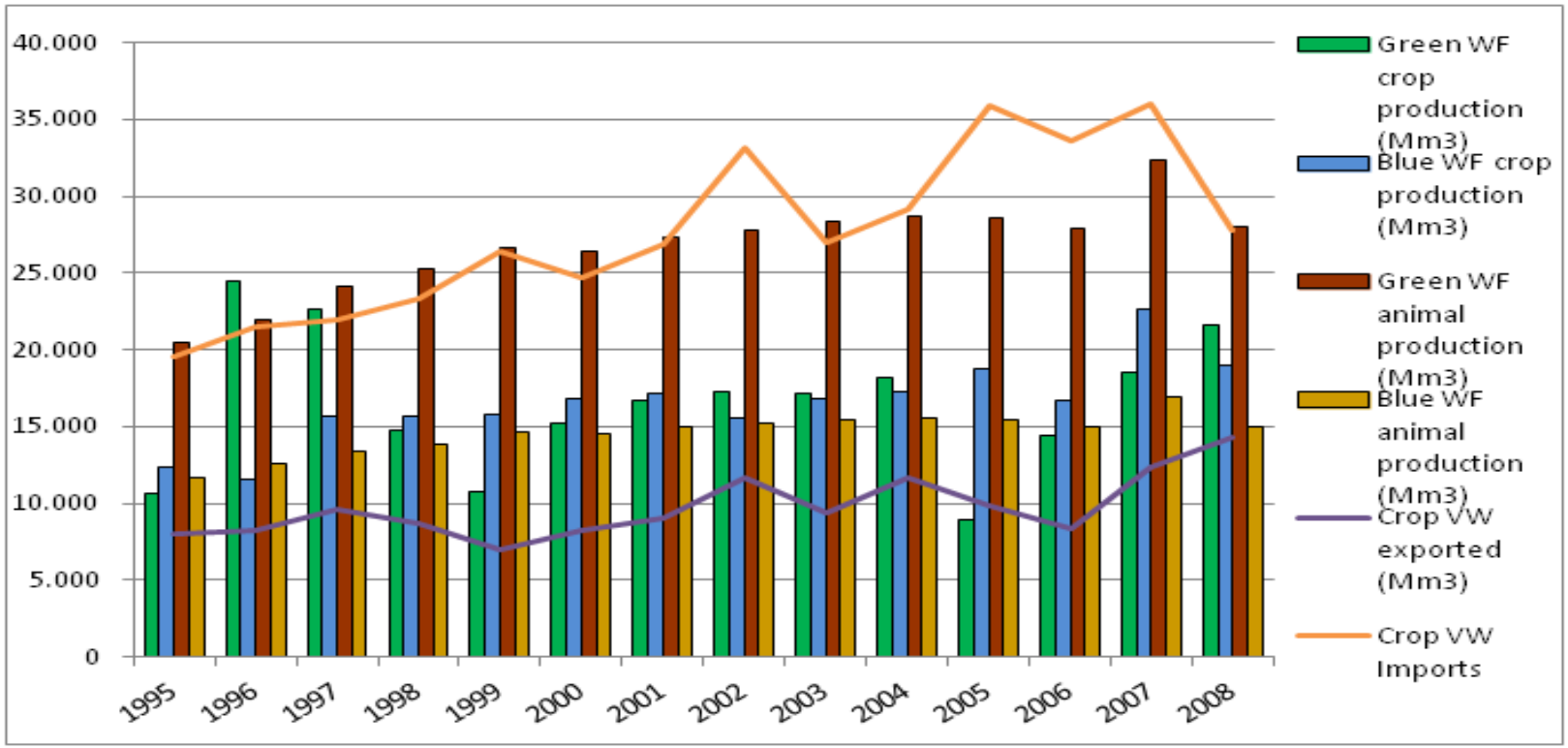
AGRICULTURE

- Simplified data: Economy (2-3% of GDP): Labor (4%).

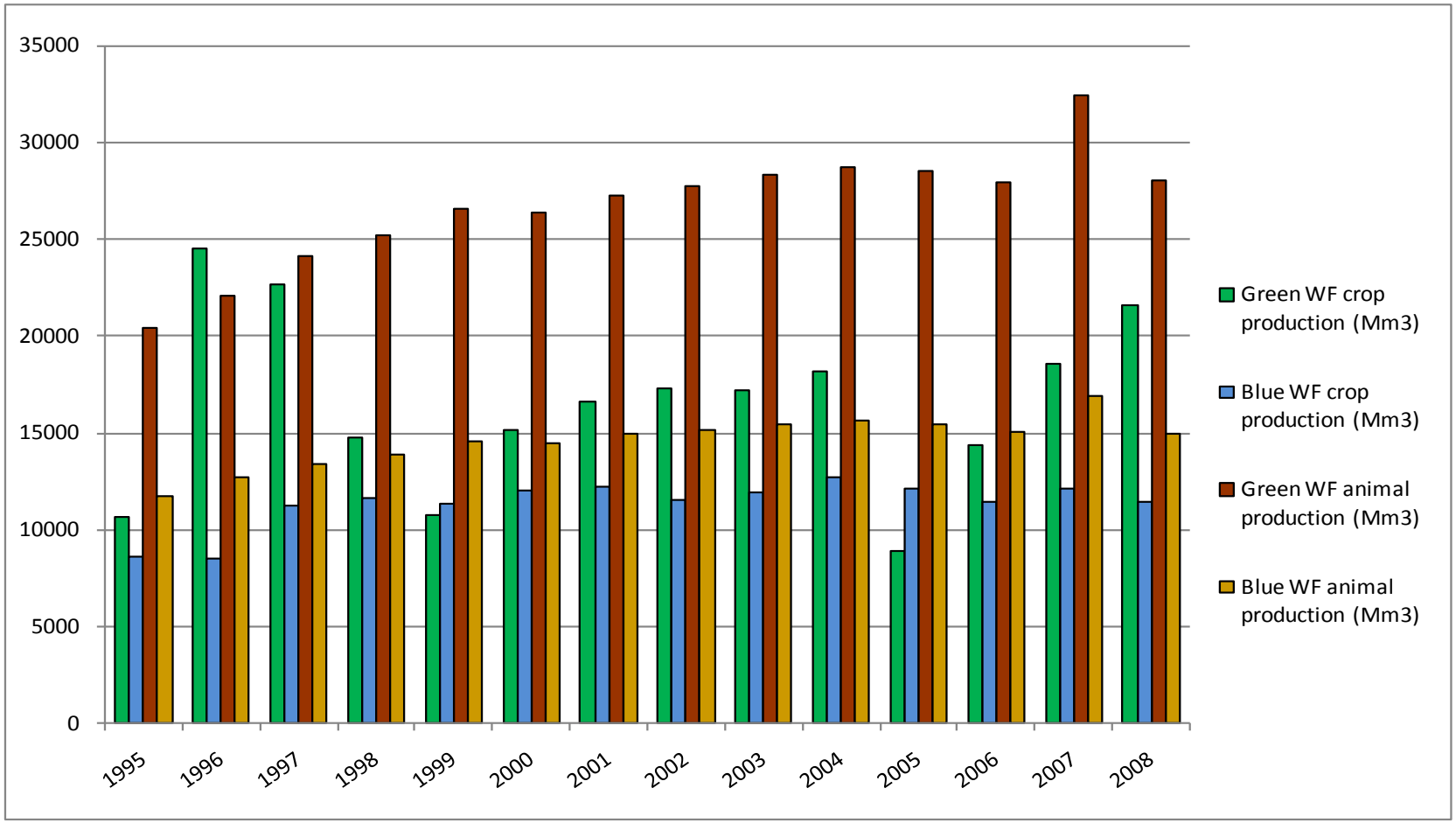
- Consumptive use (domestic and import) for crops production plus livestock (70 Km^3/year or 90-95%).

4. THE CASE HISTORY OF SPAIN'S WATER POLICY (V)

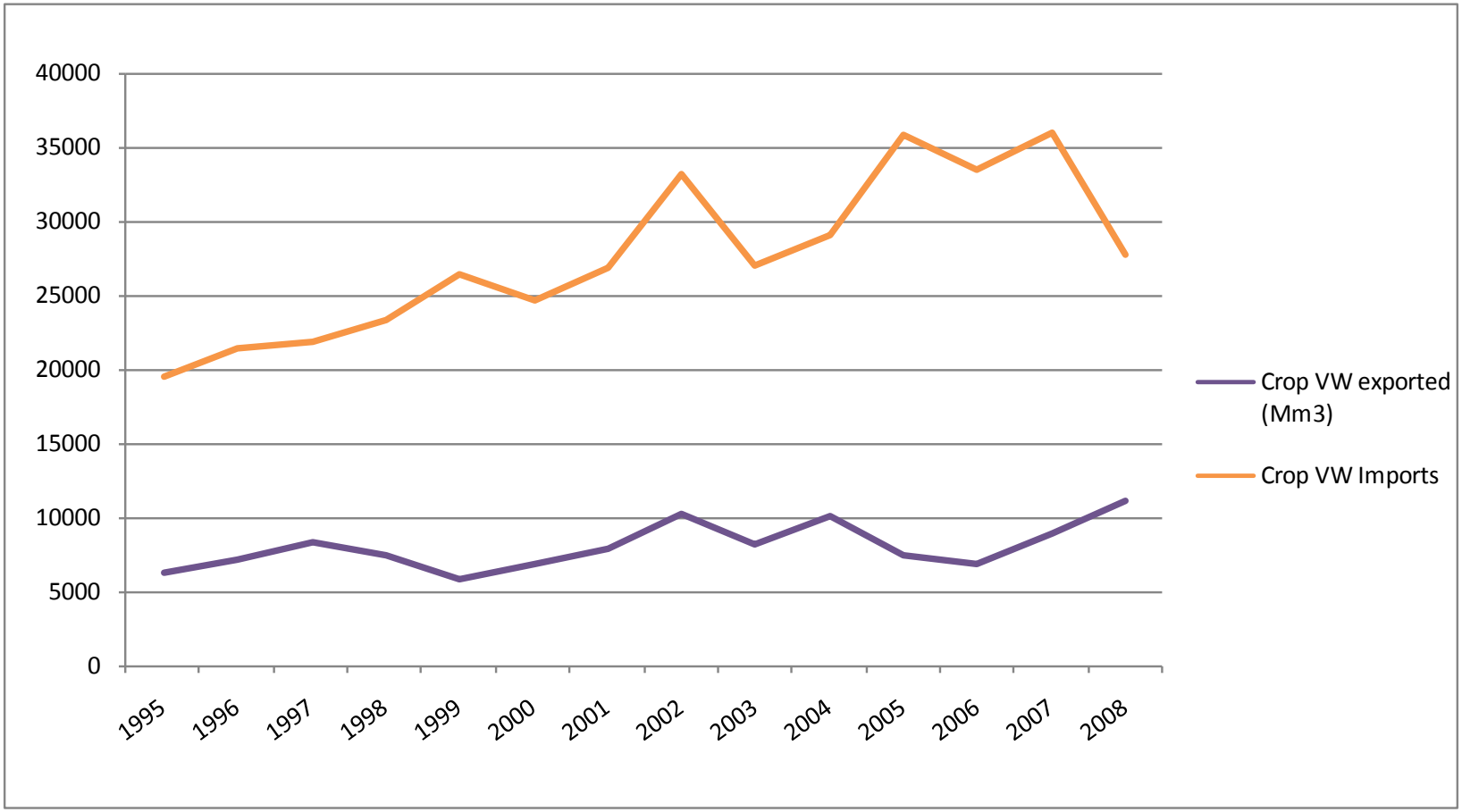
TEMPORAL CHANGES IN GREEN AND BLUE WATER CONSUMPTIVE USES AND IMPORT AND EXPORT OF VIRTUAL WATER.



4. THE CASE HISTORY OF SPAIN'S WATER POLICY (VI)

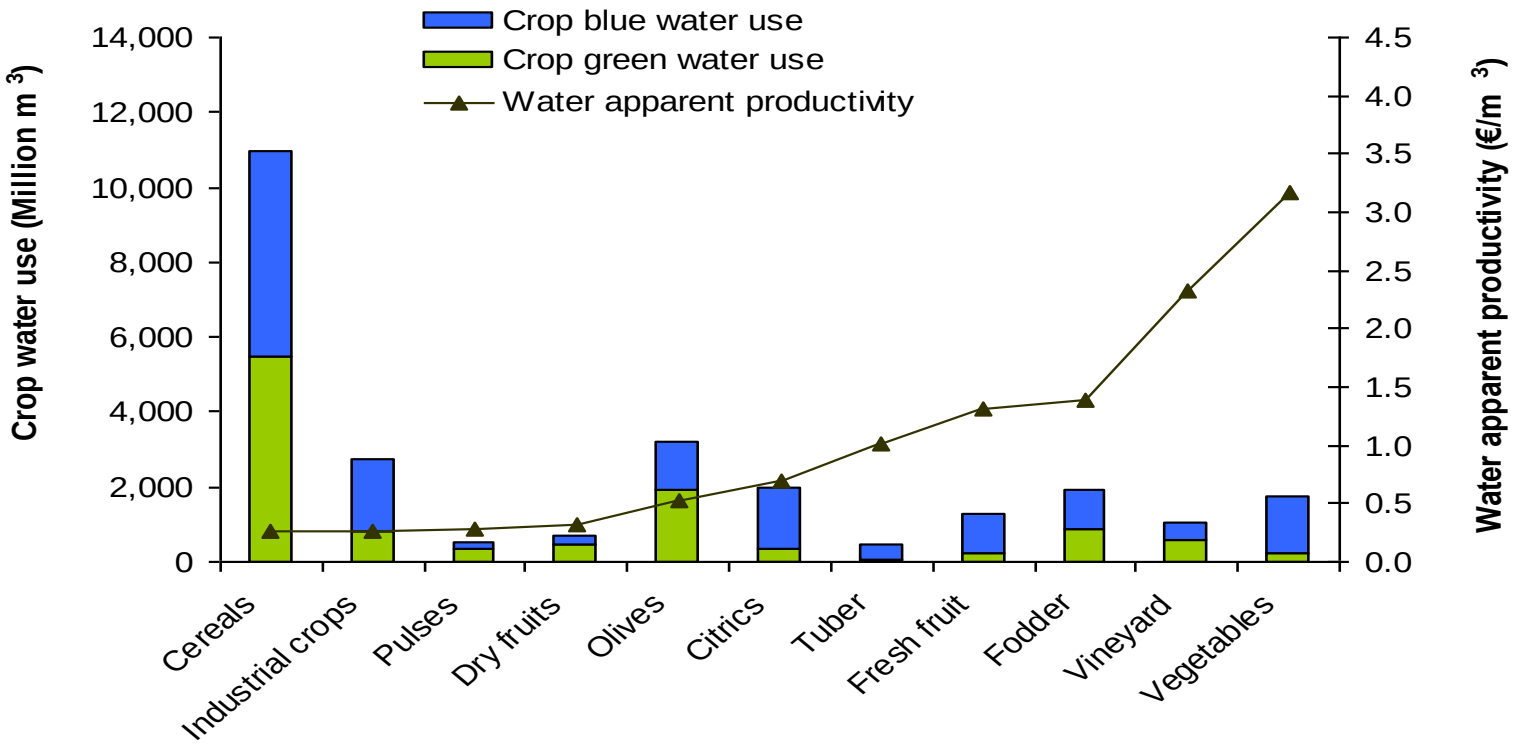


4. THE CASE HISTORY OF SPAIN'S WATER POLICY (VII)



4. THE CASE HISTORY OF SPAIN'S WATER POLICY (VIII)

APPARENT ECONOMIC PRODUCTIVITY AND WATER FOOTPRINT OF DIFFERENT CROPS

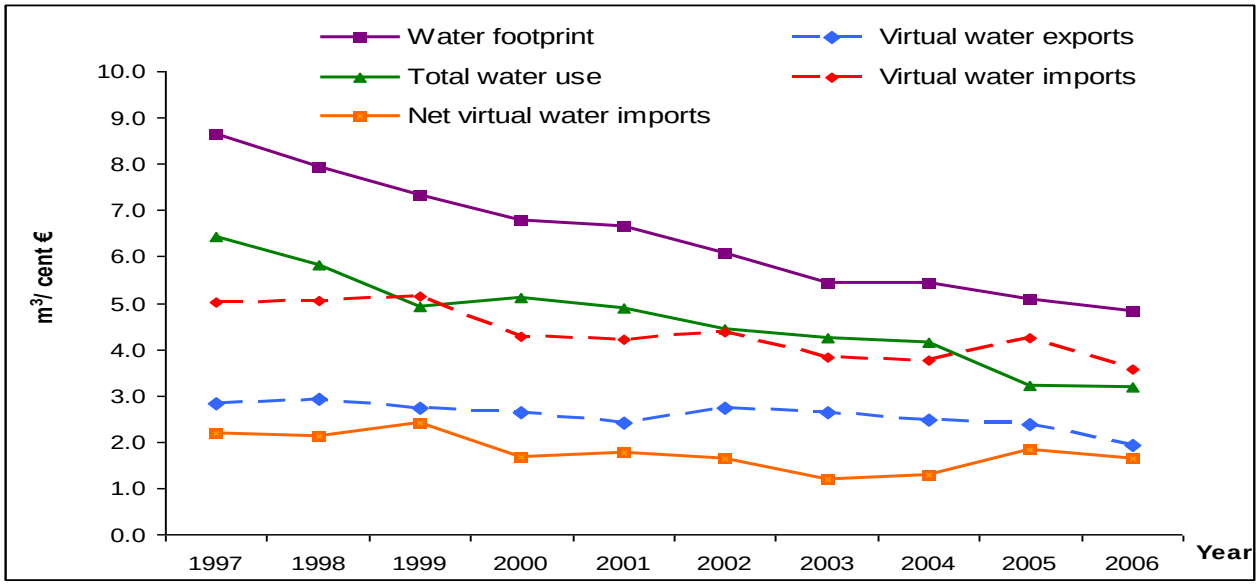


4. THE CASE HISTORY OF SPAIN'S WATER POLICY (VIII)

DECOUPLING ECONOMIC GROWTH FROM WATER USE IN SPAIN

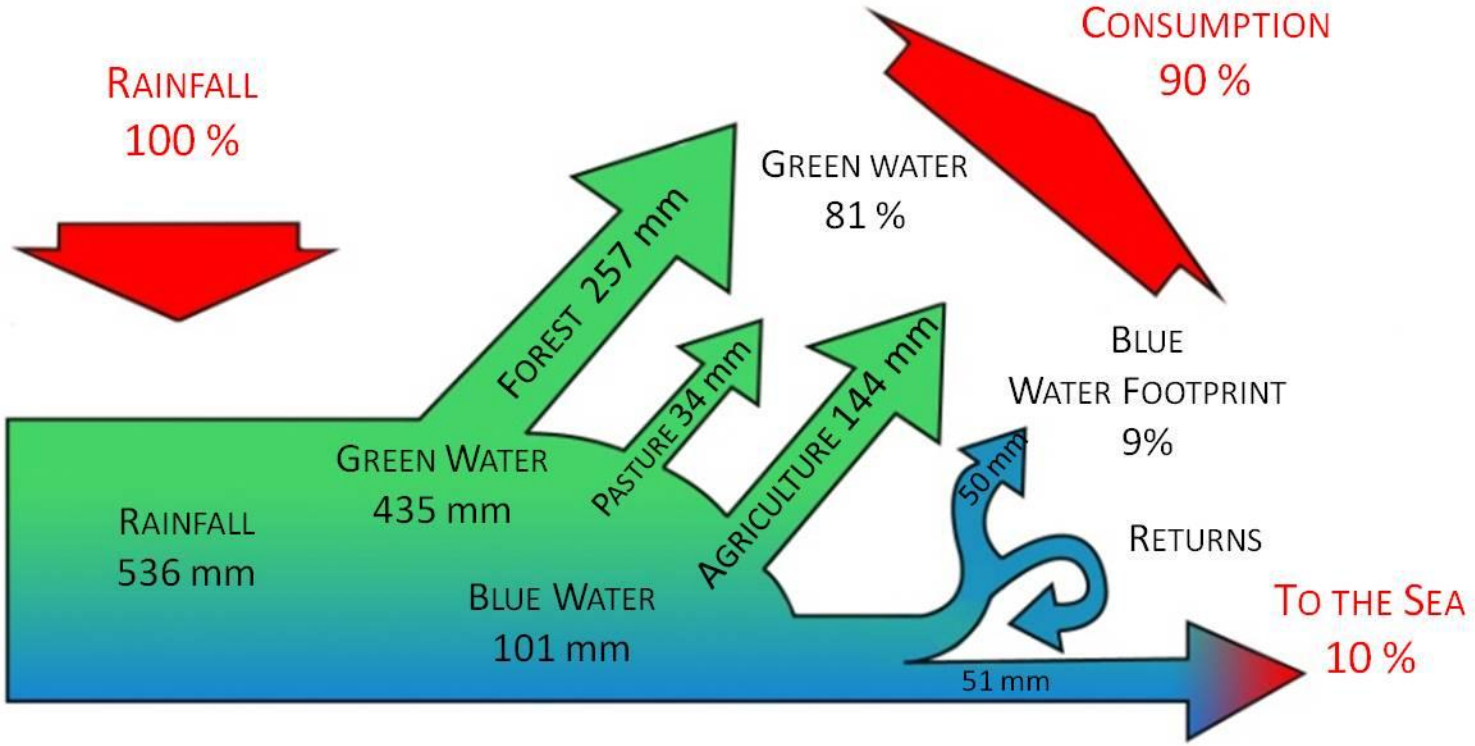
Can Growth be decoupled from Water Use?

- Spanish economic growth is decoupled from all the primary water variables (water footprint and water use). However, virtual water 'imports' have grown more quickly than the other main water variables, both directly from its trading partners and indirectly from the rest of the world. However, Spain is also supplying water to the rest of the world in the form of virtual water 'exports'.



Source: **Garrido et al. (2010)**

5. THE EXAMPLE OF THE GUADALQUIVIR RIVER (I)



5. THE EXAMPLE OF THE GUADALQUIVIR RIVER (II)

- *Numerous studies have been published (see www.fundacionbotin.org/agua.htm).*

5. THE EXAMPLE OF THE GUADALQUIVIR RIVER (III)

- Guadalquivir basin (South of Spain) has an area of 57.527 km^2 and contains 4.1 millions of inhabitants. The rain for an average year is 535 mm and the irrigated area reached 846,000 ha in the year 2008.

5. THE EXAMPLE OF THE GUADALQUIVIR RIVER (IV)

- An innovative aspect of this study is that not only the use of blue water for direct human use (irrigation, urban and industrial supply) has been taken into account but also the use of green water for the mentioned uses and the natural ecosystems.

- It amounts to 291 mm/year (50% of the precipitation). The analysis of the demand of water by the ecosystems is an issue of growing importance and changes in land use seem to affect the availability of blue water as much or more than the potential climatic change.

5. THE EXAMPLE OF THE GUADALQUIVIR RIVER (V)

- The Extended Water Footprint that considers both water consumption and the associated economic value.

- The results show that agriculture is the main consumer (192 mm/year), 34% being blue water and 66% green water. Olive represents the major consumer: in the last decade the irrigated area rose more than 200.000 ha.

5. THE EXAMPLE OF THE GUADALQUIVIR RIVER (VI)

- Economic apparent productivity fluctuates between less than 0.4 €/m^3 for the most traditional crops (cereals, maize, cotton and rice) and values reaching 2 €/m^3 for olive and more than 4 €/m^3 for vegetables.

- But the highest economic apparent productivity is tourism (more than 200 €/m^3) and industries such as thermo-solar energy (50 €/m^3).

5. THE EXAMPLE OF THE GUADALQUIVIR RIVER (VII)

- A better water management could be reached thanks to a reallocation of water resources between the different uses.

- This reallocation may occur without social conflict with the farmers since the quantities of blue water required for these high value uses constitute 1-2 % of the current total blue water use.

- The Government should promote a **win-win** solution. This is the way the new motto **more cash and care of nature per drop** could be achieved.

6. CONCLUSIONS (I)

FIRST

- The nexus or correlation between poverty (or wealth) of a country and the abundance of water is weak or even non-existing.

- An excessive "**hydrocentrism**" is not a good policy.

- However, good governance of the water resources of a country is a relevant driver for its economic and social development.

6. CONCLUSIONS (II)

SECOND

- "There is not a size that fits everybody". The good water governance requires equilibrium between the utilitarian and the intangible values of water uses.

- The first ones are **"metrificable"**; the quantification of the intangible is difficult but these might be more important for the decision-makers.

6. CONCLUSIONS (III)

THIRD

- The recent advances in-Science and Technology are changing or introducing new global water policy paradigms that were unthinkable only two decades ago.
- The main driver of these changes is globalization, mainly in the aspect of cheap and fast food and fiber (virtual water) trade.
- This is changing the paradigm of the need of self-sufficiency in staple food.
- Membrane Technology, the groundwater intensive use silent revolution and the IT are other relevant drivers.

6. CONCLUSIONS (IV)

FOURTH

- The international food trade has become a good opportunity for water-rich countries; for example the “green gold” in Brazil and Argentina. On the other hand, in water poor countries it allows a reassignment of the scarce water resources to more profitable uses, as tourism, industry, cash crops, and others.

THANKS FOR YOUR ATTENTION

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These are only a few references. From the Water Observatory web, many others can be downloaded .