

# Water Resources and International Trade

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# How is Water Traded Internationally?

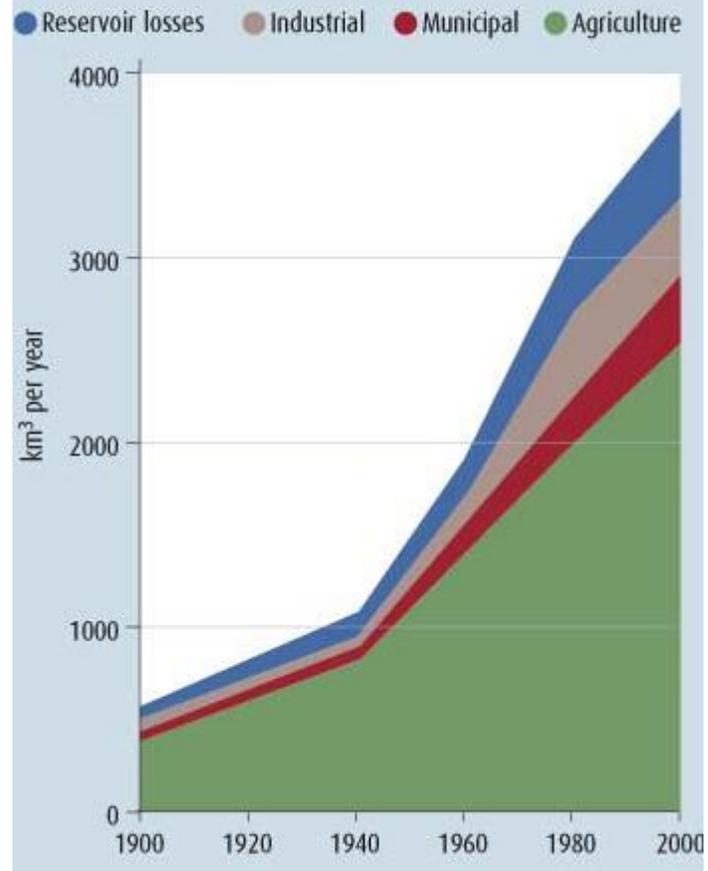
- **Direct Trade**
  - E.g. bottled, bulk water
  - Limited
  
- **Indirect Trade**
  - Trade in “virtual” or “embedded” water
    - Water required for production of each good/service (water content)
    - “Water footprints”
    - Much more significant than direct trade

# Dimensions of Virtual Water Trade

## The Link to Agriculture

- Agriculture is the largest user of global water resources
- Approximately 1250m<sup>3</sup> of water (blue water basis) used in agriculture is traded each year
  - One third of all water used in agriculture in a year
  - 15% of all water used on earth (including soil water)
- Wide variation in water content of agricultural products

Estimated world water use 1900 - 2000

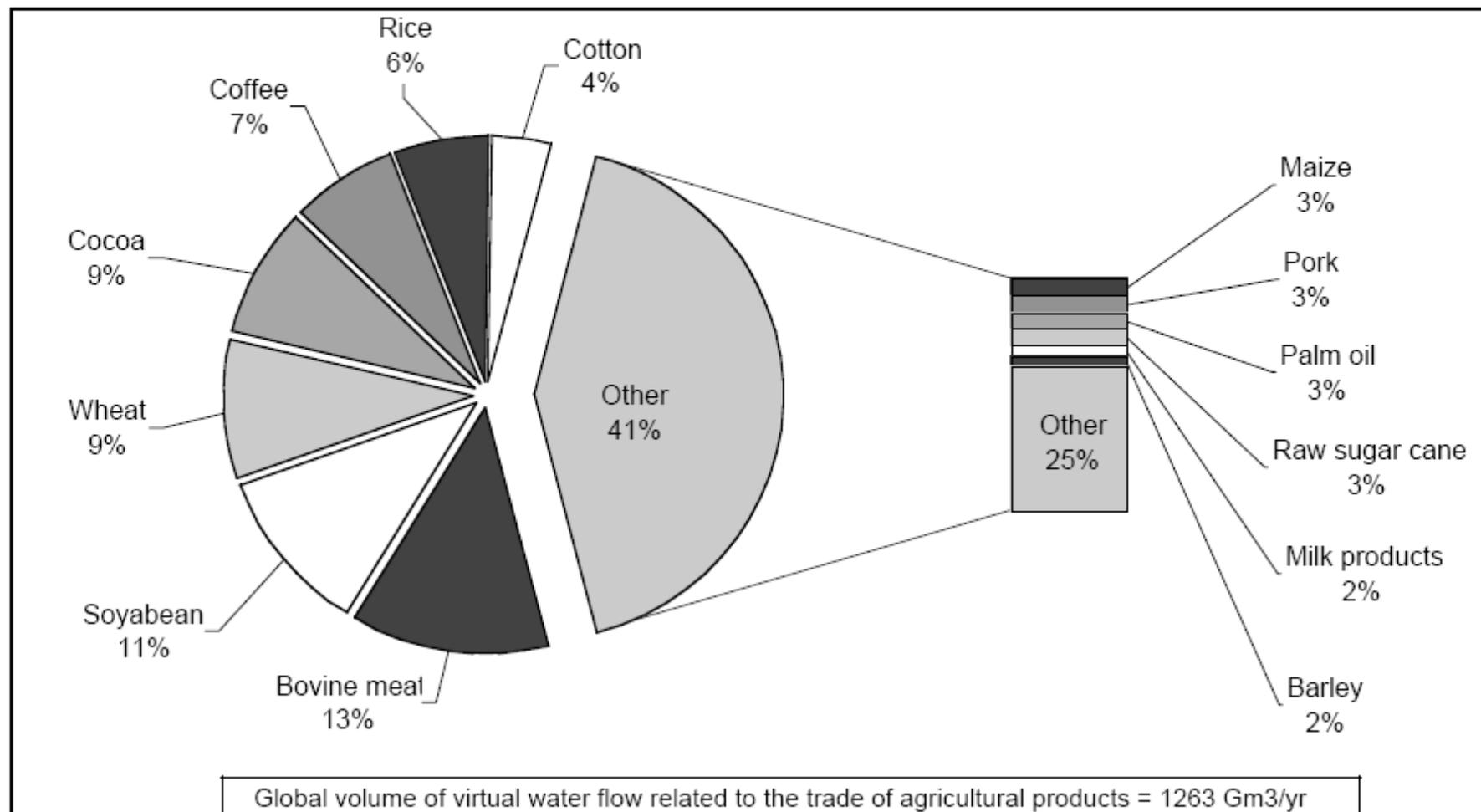


*Table 1: Virtual Water Content of Products  
Presentation – HOEKSTRA, p.4ff*

1 kg wheat	1 m <sup>3</sup>
1 kg rice	3 m <sup>3</sup>
1 kg milk	1 m <sup>3</sup>
1 kg cheese	5 m <sup>3</sup>
1 kg pork	5 m <sup>3</sup>
1 kg beef	15 m <sup>3</sup>
1 cotton T-shirt	4000 l
1 hamburger	2500 l
1 cup of coffee	140 l
1 glass of beer	75 l
1 slice of bread	40 l
1 sheet of A4 paper	10 l

Figure 4: Contribution of various agricultural products to the total sum of international Virtual Water flows

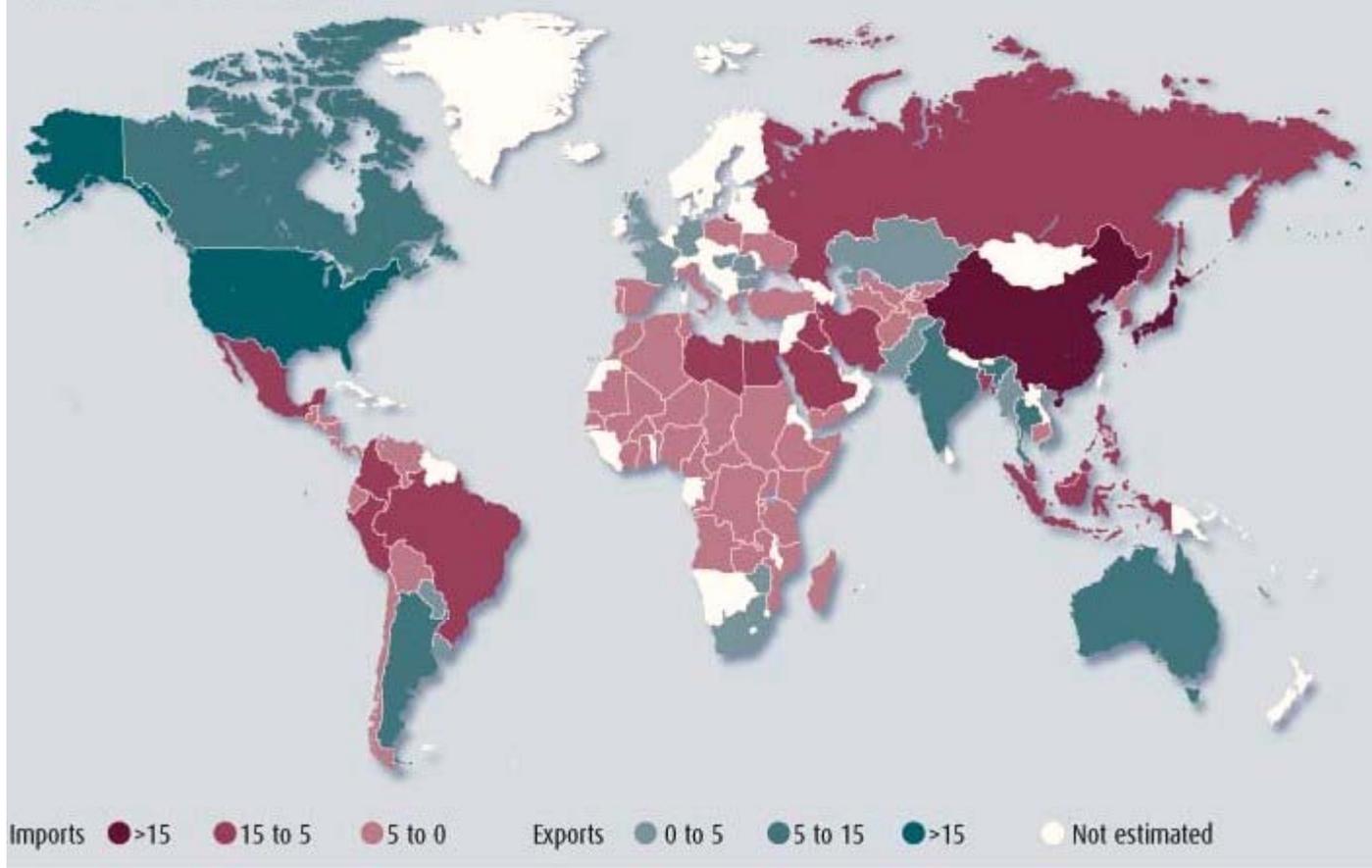
Presentation - HOEKSTRA, p.8



*Table 2: National Virtual Water balances (1997-2001)*  
*Presentation – HOEKSTRA, p.10*

Top 5 Exporter	Gm <sup>3</sup> /yr	Top 5 Importers	Gm <sup>3</sup> /yr
Australia	64	Japan	92
Canada	60	Italy	51
USA	53	UK	47
Argentina	45	Germany	35
Brazil	45	South Korea	32

Virtual water flow in cubic kilometres



# Virtual Water Trade and Agriculture

## Policy Implications

- Potential contribution of trade to rational allocation of global water resources
  - Water-abundant countries
    - Export water-intensive products
  - Water-scarce countries
    - Import water-intensive products
    - Produce products requiring less water
- Alternative policy approaches
  - Increased regulation of trade
    - Link to multifunctionality as approach to agricultural trade
  - Increased liberalisation of trade
    - Increased specialisation based on comparative advantage

# Comparative Advantage and Virtual Water Trade

- Comparative advantage based on opportunity cost
- Lower opportunity costs in producing goods making intensive use of abundant factors of production
  - Abundant factors of production cost relatively less
- Higher opportunity costs in producing goods making intensive use of scarce factors of production
  - Cost of scarce factors of production relatively higher
- Suggests
  - specialisation in water-intensive products by water-abundant regions/countries
  - water-scarce regions/countries specialise in products requiring less water

# Obstacles to Comparative Advantage as Basis for Global Allocation of Water Resources

- **Requires abundance/scarcity of water signalled to producers via cost of water**
  - **Capacity of trade to promote efficient allocation of global resources linked to efficient resource allocation at global/regional level**
- **Water only one of many resources**
  - **Signals from cost of water may be submerged by impact of prices of other factors of production**
- **Political economy of adjustment**
  - **Producer resistance to increase in cost of water**
- **Food security concerns**
  - **Highlights importance of disciplines or export controls as well as import controls**

# Some Optimistic Empirical Evidence?

- **Analysis (2006) by GEM at Sciences Po on Euro-Mediterranean Water Trade in 3 products**
  - **Increasing trade liberalisation among partners associated with increasing efficiency in water allocation**
- **With full liberalisation between the partners**
  - **International trade in crops saves water**
  - **Virtual water flows reallocated to favour countries using rainfed agriculture**  
**Water-poor countries import food from water-rich countries and use “water savings” for other purposes (domestic, industrial, environmental)**
- **Conclusion: trade liberalisation positive for allocation of water resources if:**
  - **Water exporters use water more efficiently in production process than importers**
  - **Exporters produce more intensively rain-fed crops rather than irrigated crops (relative to importers)**

# Food Security and Climate Change

- **Increasing frequency of climatic disturbances**
  - **Often associated with large disturbances in water availability**
- **Location and duration of disturbances unpredictable**
- **Open international agricultural markets facilitate adjustment**

# Food Security and Biofuel Production

- Dramatic “spike” in food prices 2008
- Prices have fallen since but not to former levels
- Explained by several causes including switch to biofuel production in USA and EU
  - Other factors included drought, speculation and effect of rising incomes on demand
- OECD projects continued increasing demand for biofuel feedstock (cereals, vegetable oils, sugar cane) through to 2017, based on
  - continuing high crude oil prices
  - US and EU mandates for biofuels production
- Other factors will also continue to put pressure on agricultural prices
  - especially strong growth and rising incomes