Real Water – Virtual Water

a process-based analysis of green and blue water scarcity, productivity, trade

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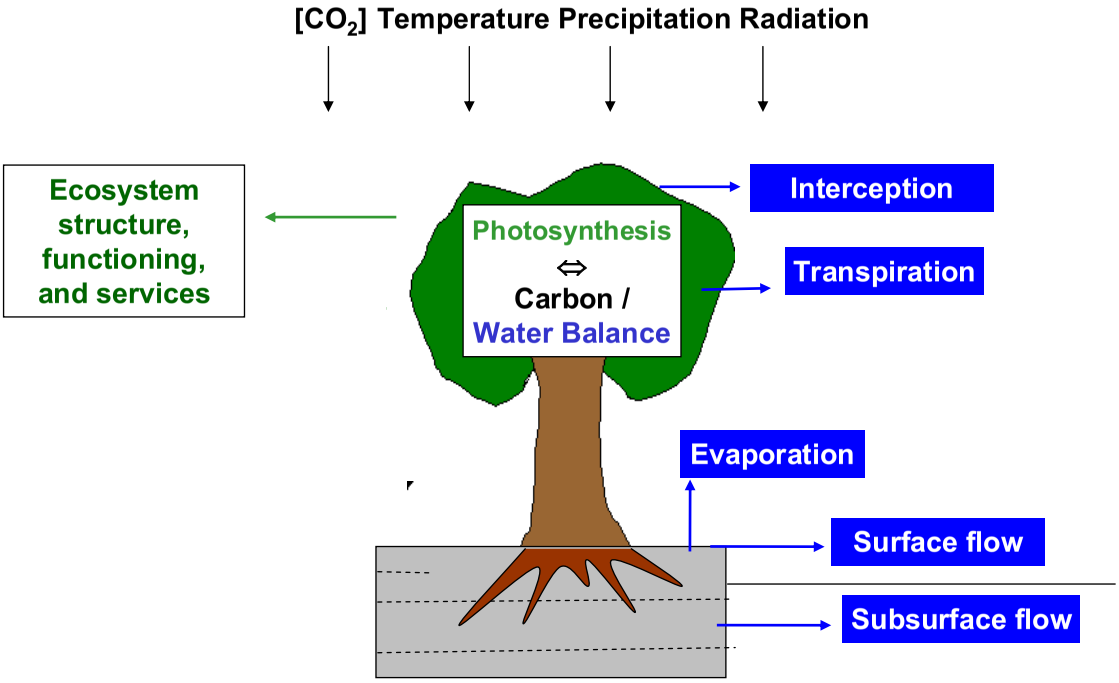
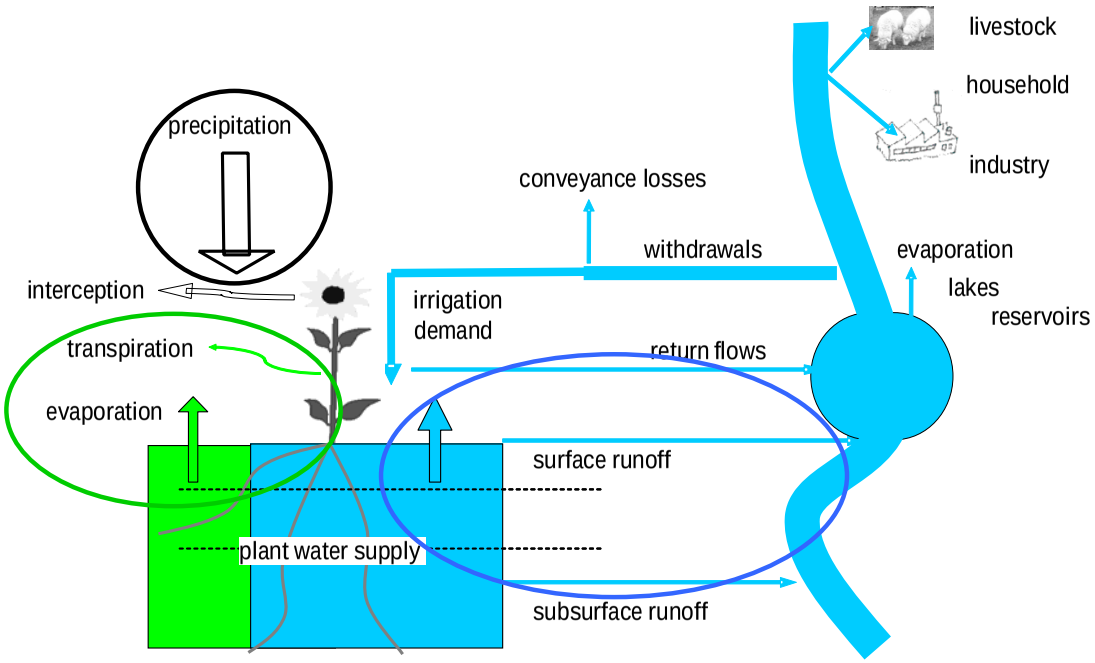
The LPJmL vegetation-hydrology model



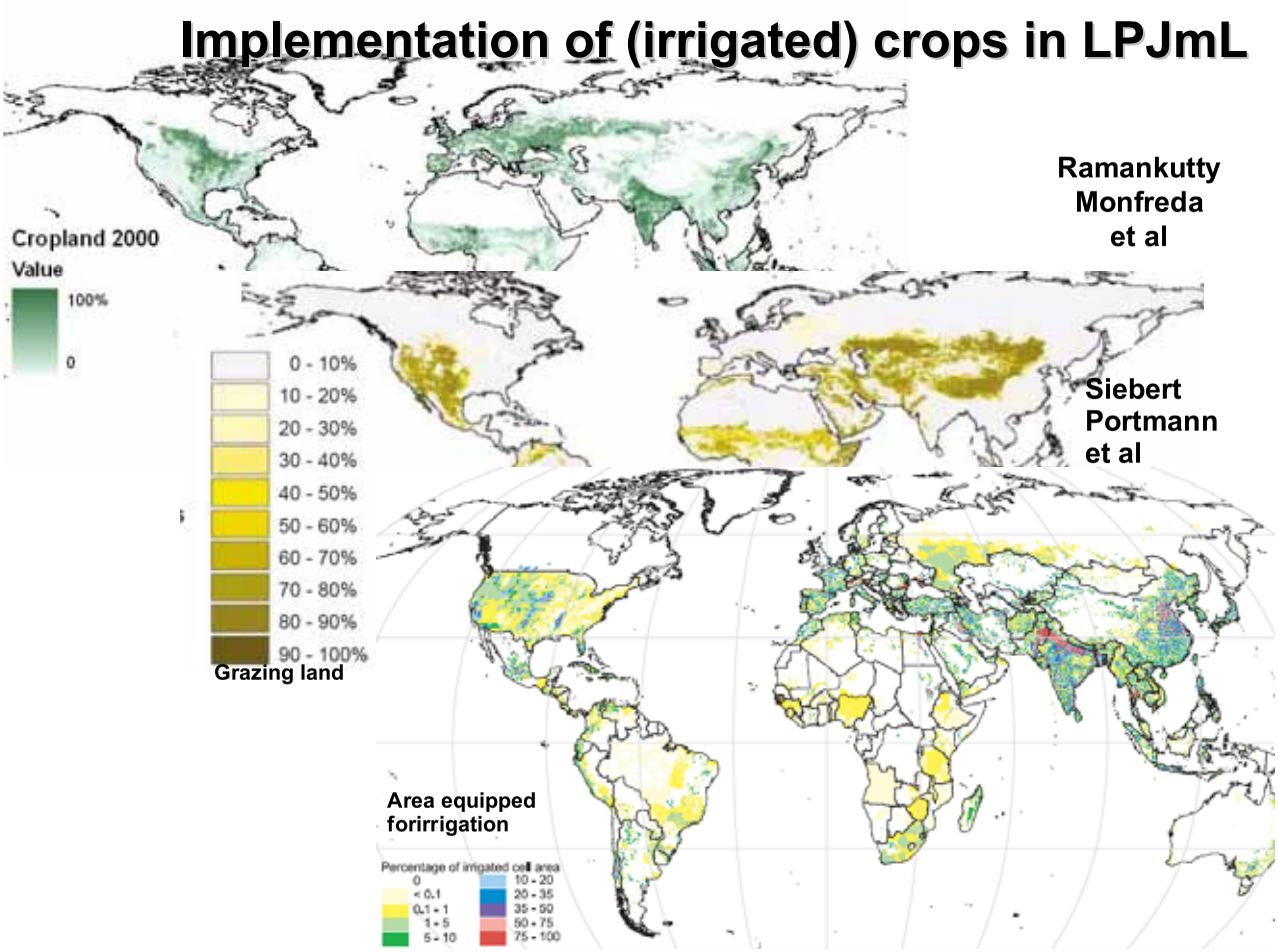
process-based simulation of plant water use and biomass production (at 0.5° pixel level)

The LPJmL vegetation-hydrology model

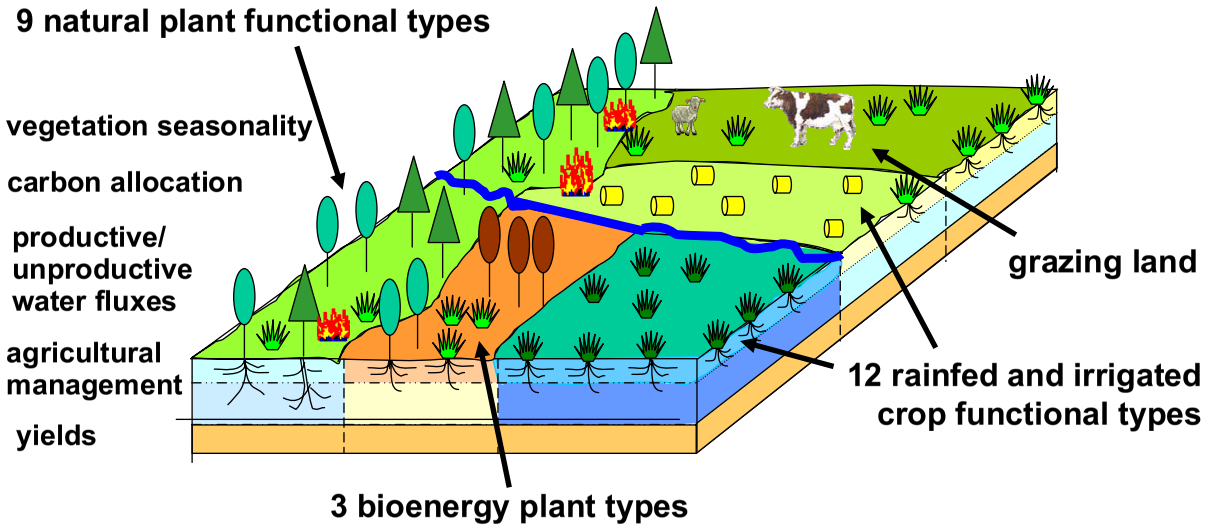


simulating the partitioning of precipitation into green and blue water -> consistent green and blue virtual water contents of biomass / crops and green and blue water availability

Implementation of (irrigated) crops in LPJmL



Implementation of crops & other vegetation



consistent green & blue water fluxes and biomass production for agriculture and other ecosystems / services

Sitch et al 2003; Gerten et al. 2004; Bondeau et al. 2007; Rost et al. 2008 ...

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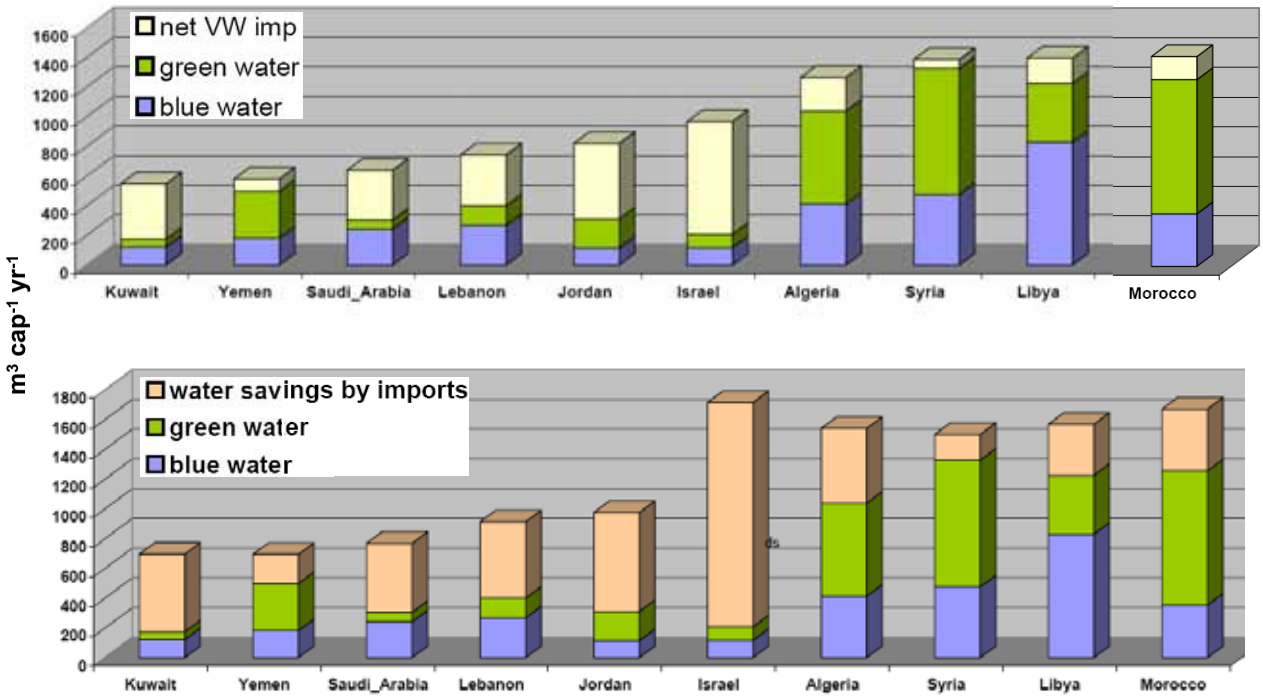
workshop scientific objective:

"to study the effect of international trade
on domestic water resources
and the effect of water availability on international trade"

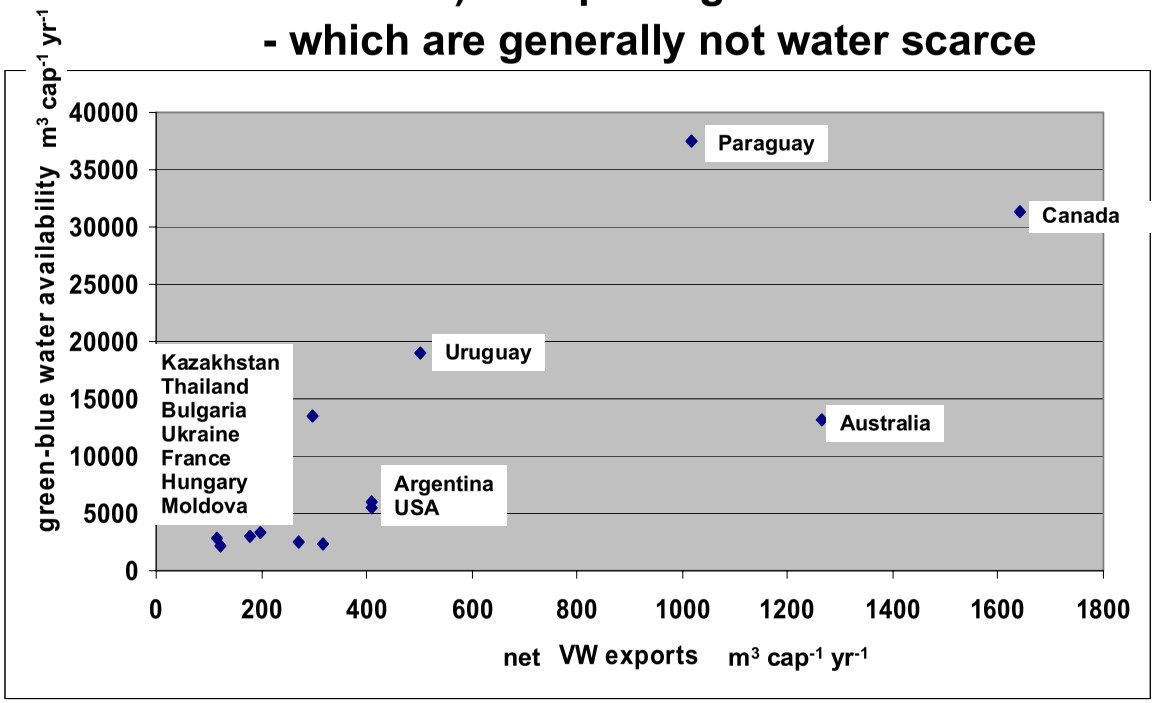
1) Effects of international trade on local water resources
   a) in water scarce (MENA) countries
   b) in exporting countries
   c) water footprints

2) Effects of water scarcity on international trade

1) Effects of international trade on local water resources
a) in water scarce (MENA) countries



1) Effects of international trade on local water resources
b) in exporting countries
- which are generally not water scarce

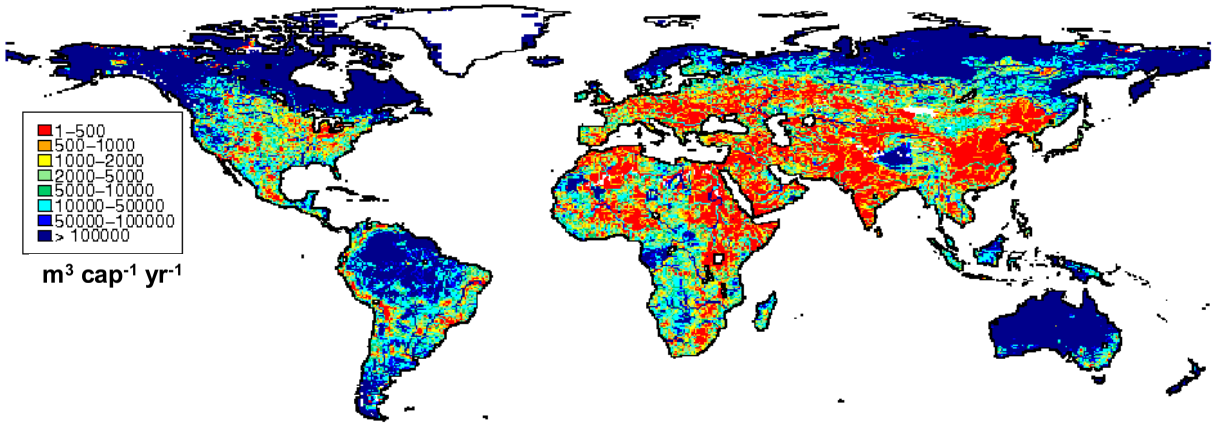


1) Effects of international trade on local water resources
b) in exporting countries

-> we analyse pixel level (0.5°)

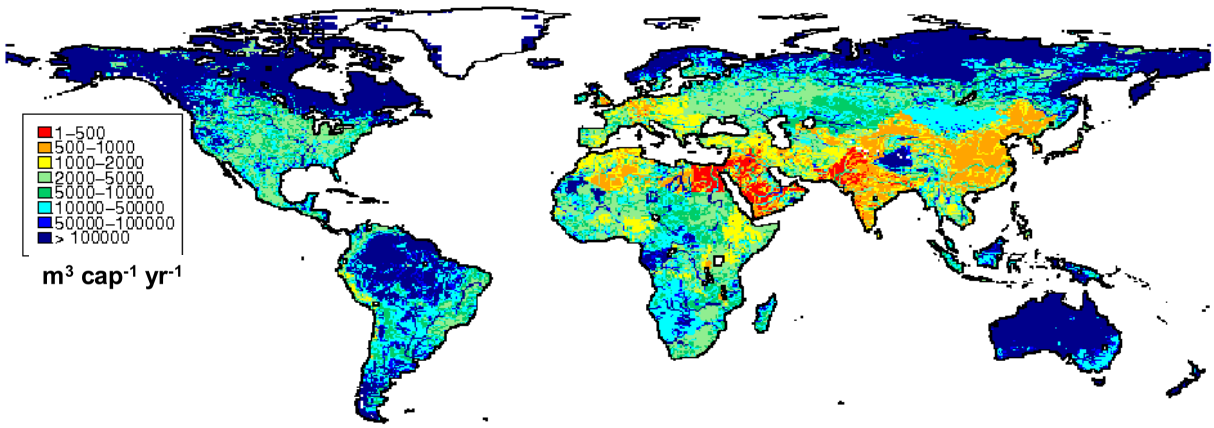
- **water scarcity**
- **net exports**

blue water availability per capita

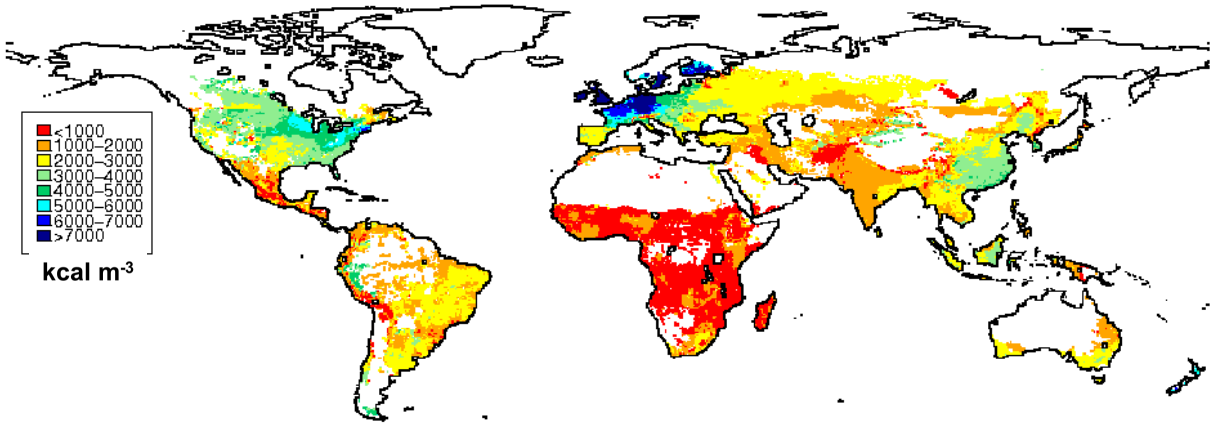


IIASA gridded population
Grübler et al (2007)

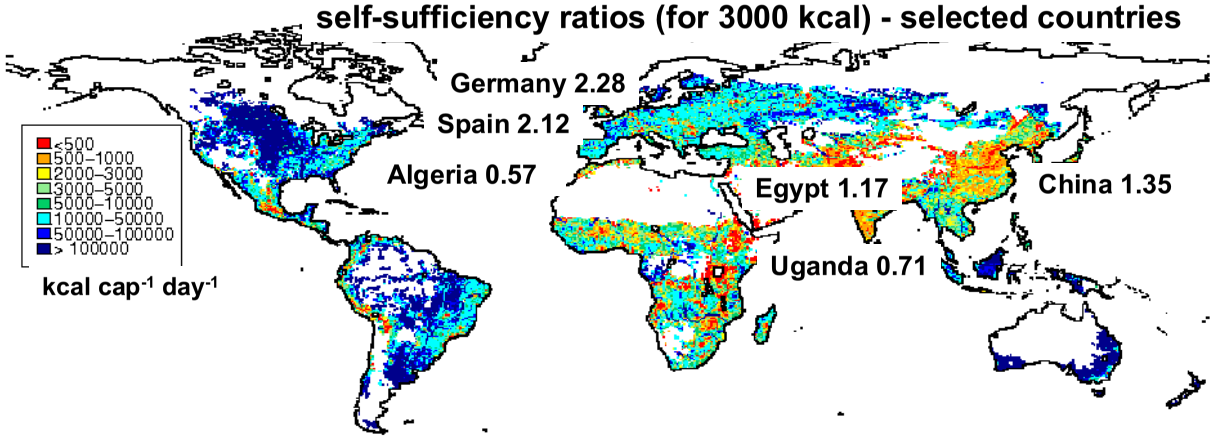
blue & green water availability per capita



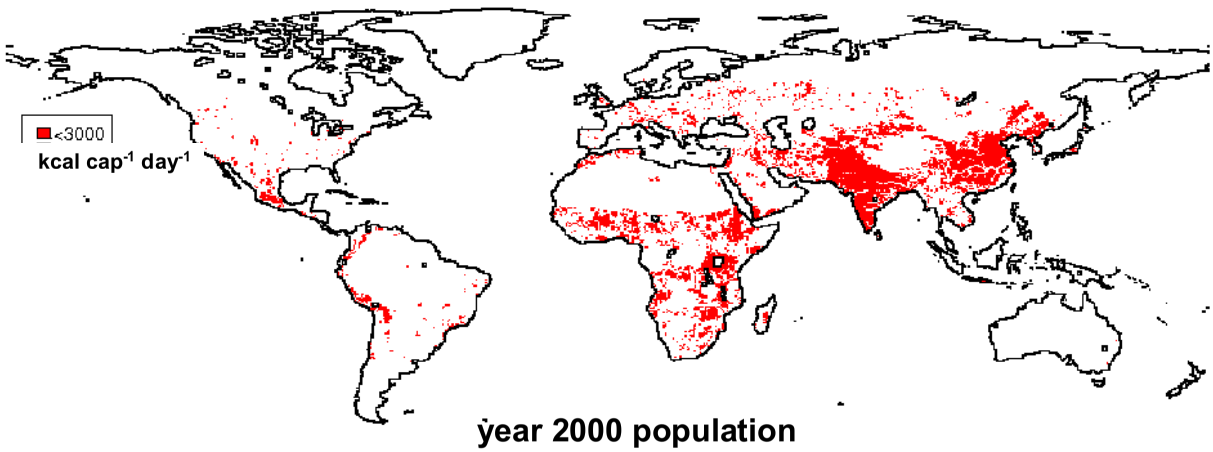
agricultural water productivity



water limited calorie production potential
self-sufficiency ratios (for 3000 kcal) - selected countries

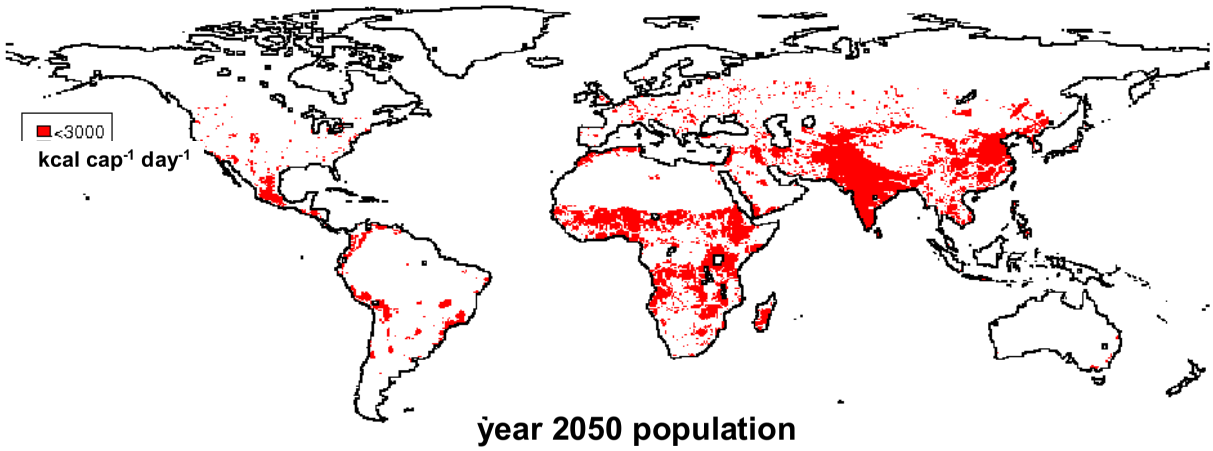


water limited calorie production potential



year 2000 population

water limited calorie production potential



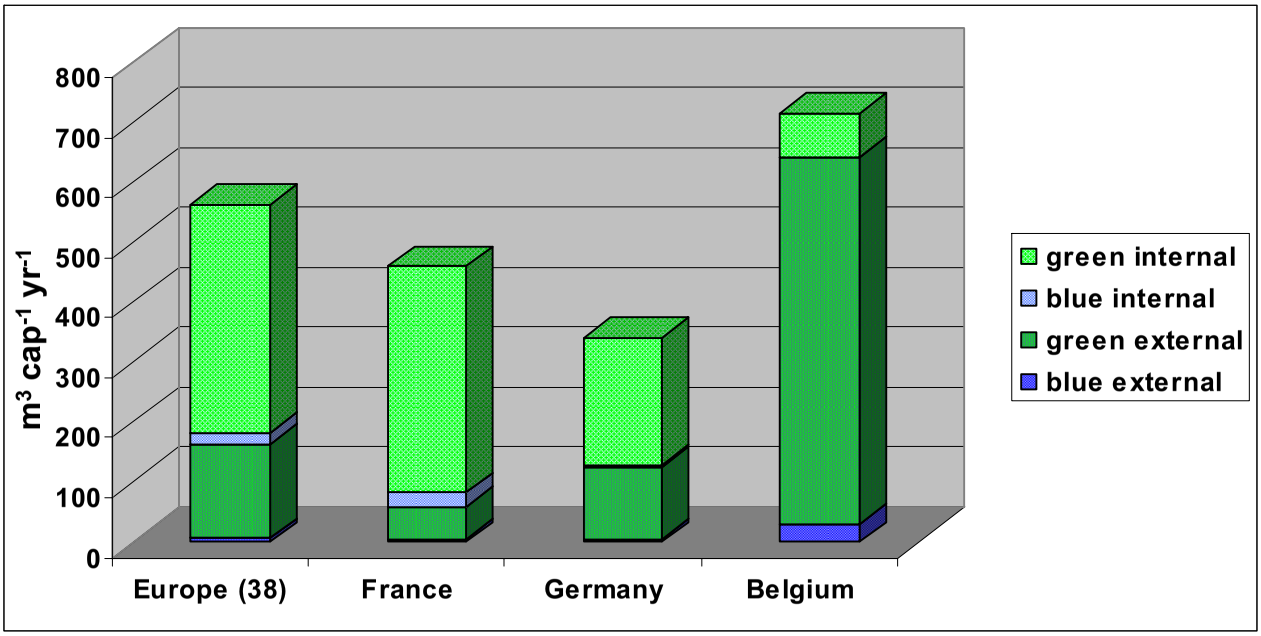
year 2050 population

-> other scenarios (climate, land use….)

identification of export (and import) pixels with MagPie land use model
(trade – no trade)

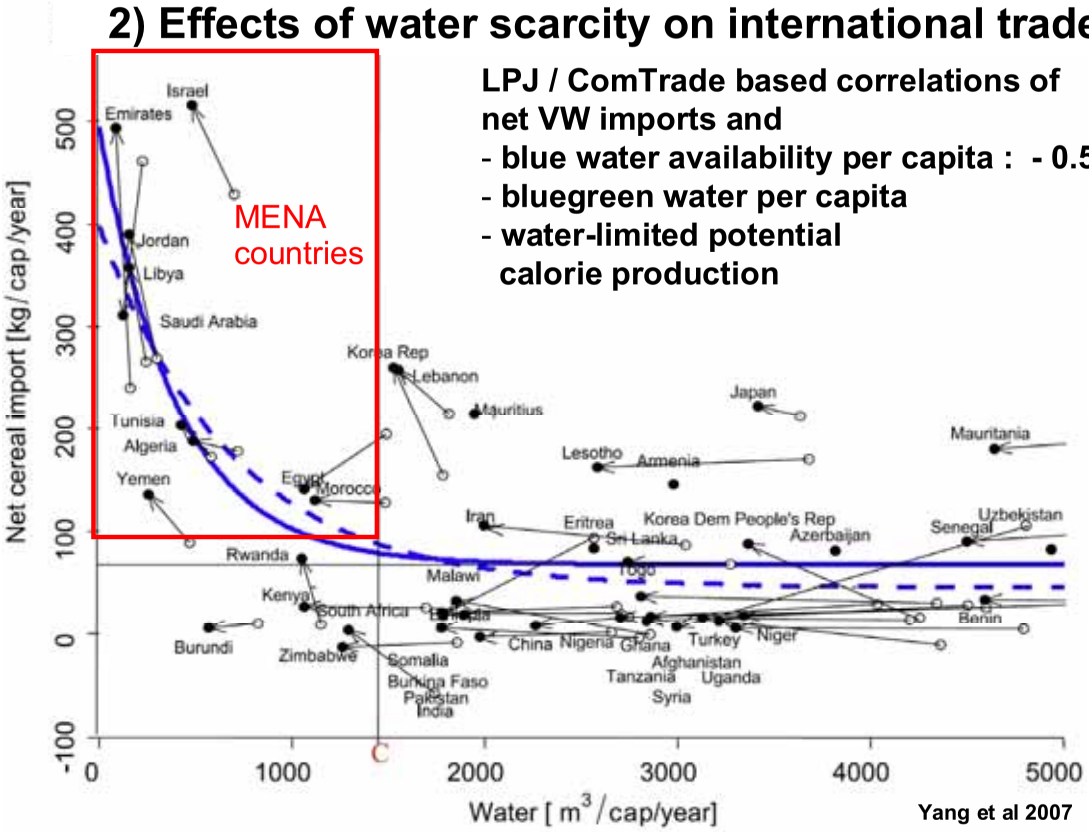
exports in relation to water scarcity
-> beginning to address non-sustainable VW trade

1) Effects of international trade on local water resources
c) water footprints



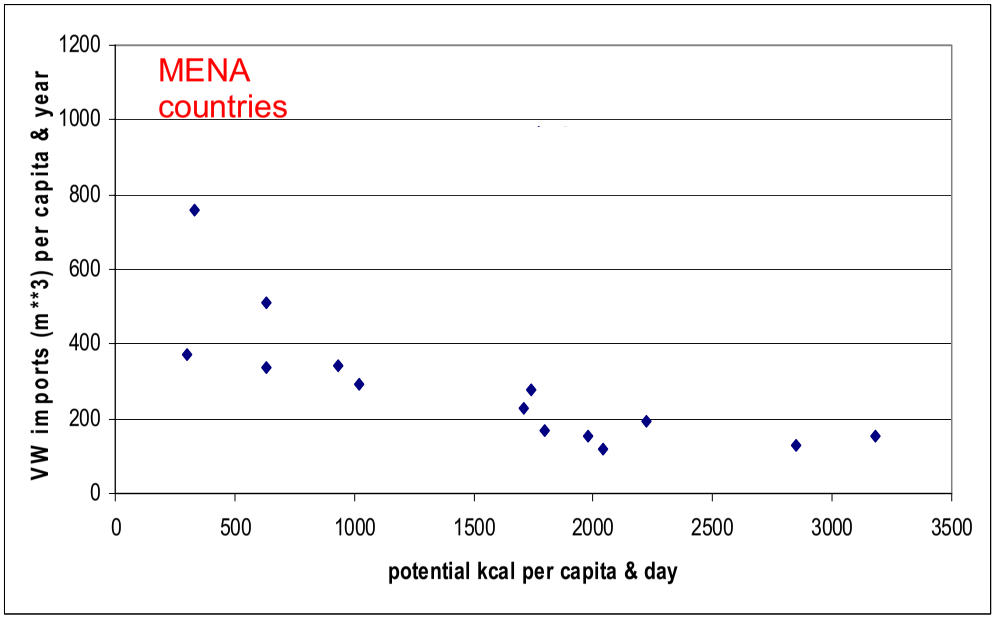
2) Effects of water scarcity on international trade

LPJ / ComTrade based correlations of net VW imports and
- **blue water availability per capita : - 0.51**
- **bluegreen water per capita - 0.6**
- **water-limited potential calorie production**



Yang et al 2007

2) Effects of water scarcity on international trade



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Initial conclusions:

- integration of green and blue water availability and productivity improves water scarcity assessments

- combining VW exports with green-blue water scarcity at pixel level can get us closer to footprints (as opposed to "shoesize")

- consistent quantification of green water fluxes in agricultural and other ecosystems begins to address green water / land opportunity costs, externalities, and tradeoffs