The Realities of Water in Agriculture: An Increasingly Unreal World

The Rosenberg Forum

Madrid/Zaragoza

June 2008

Reality

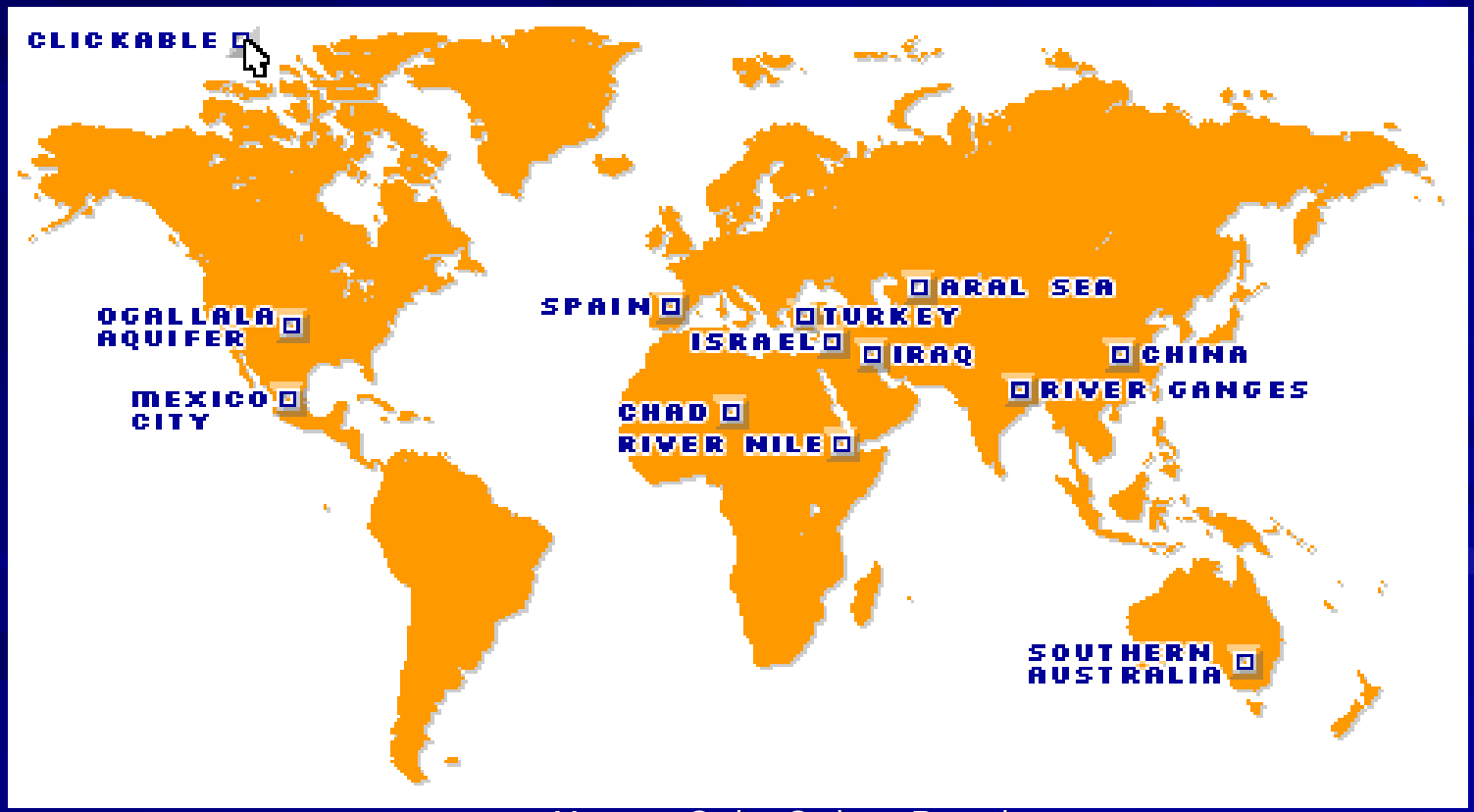
- Water stressed populations growing
- Climate Change forecasts firming up
- Agric Water Demand sharply increasing.
- Rising Municipal and industrial water use
- Food prices doubling, tripling
- Groundwater depletion – brick wall
- No new investment in low yield areas
- 70 River Basins closing – 1.4b people

Unreality

- Investments in Agricultural research falling
- Few changes in incentives – or negative
- Population growth – taboo; no investment
- Doha round stuck
- Subsidies stay in high price climate
- Closed door, closed minds to drought/temperatures resistance GMOs
- Maps of potential conflict areas grow
  - Water short, agriculturally dependant areas

Some Pictures of the Challenge: CIA “Water Hot Spots” Map

- Rich and poor….



Water Scarcity 2000

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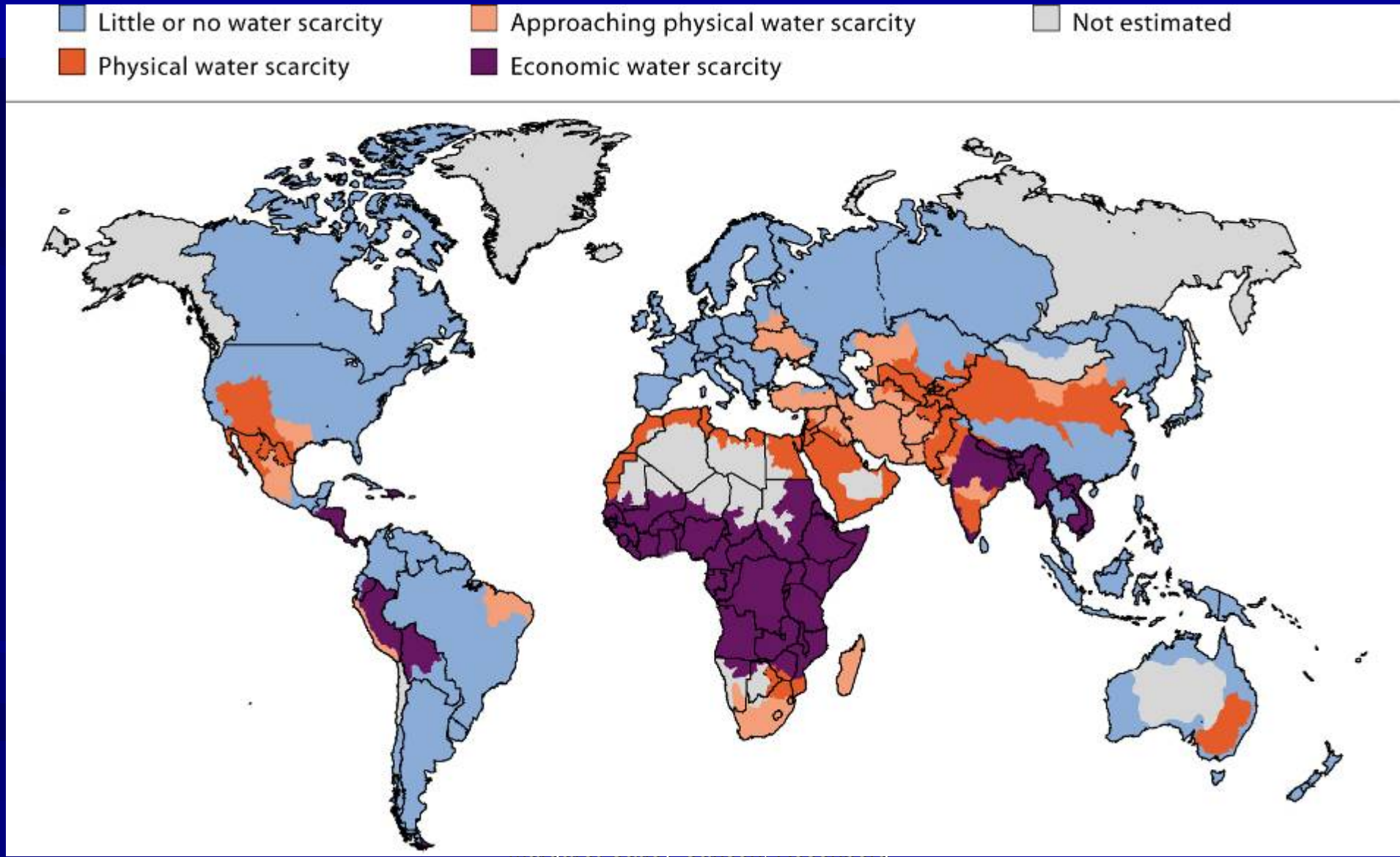
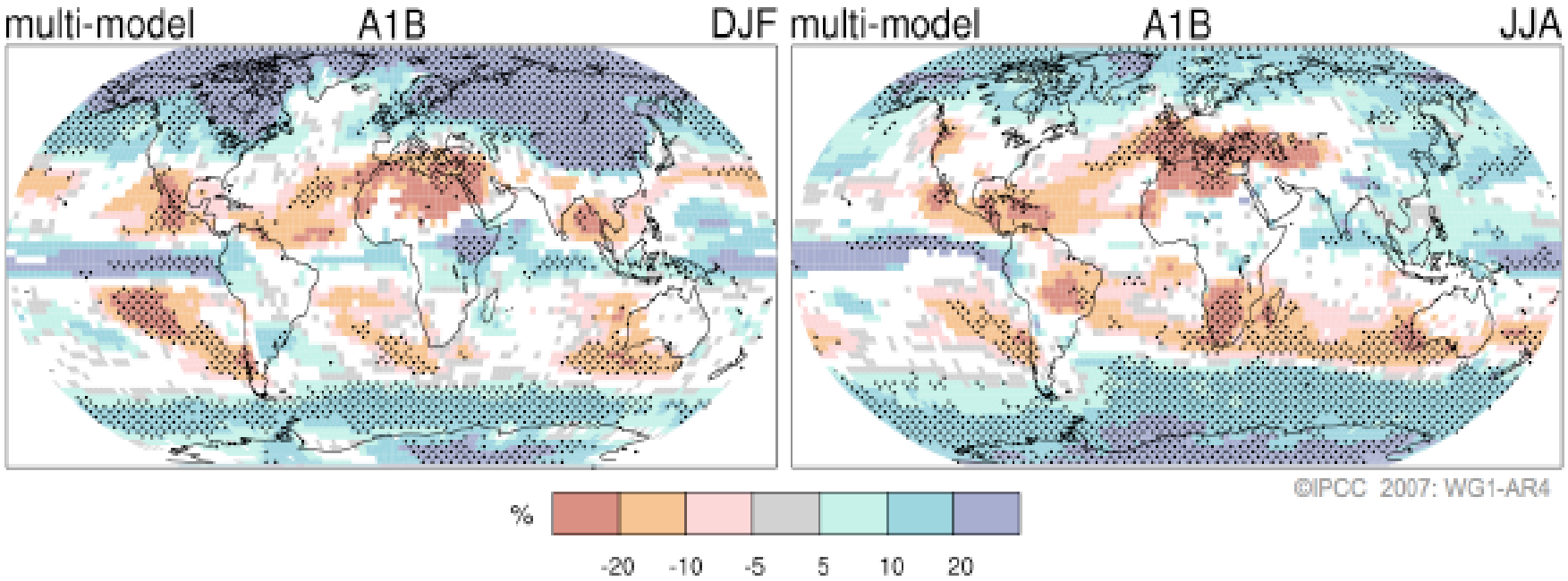


1/3 of the world's population live in basins that have to deal with water scarcity

IPCC Report

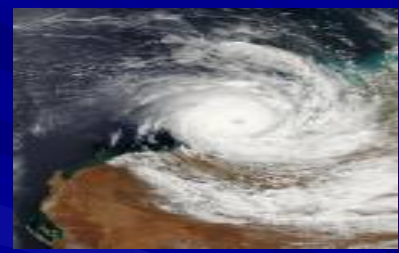


Relative changes in precipitation (by percent) for the period 2090-2099, relative to 1980-1999. Values are multi-model averages based on the SRES based on the A1B scenario for December to February (left) and June to August (right). White areas are where 66% of the models agree on the sign of the change and stippled areas are where more than 90% of the models agree on the sign of the change.

IPCC Report

The new 'common wisdom': temperatures up, sea level rise– and new water realities

- Heavy and more frequent precipitation events
- Area affected by droughts will increase
- Intense tropical cyclone activity will increase
- Snow cover will contract
- Extra-tropical storm tracks will move poleward
- Increases in precipitation in high latitudes
- Decreases in precipitation in most sub-tropical land regions



IPCC 2007. Climate Change 2007: The Physical Science Basis. Summary for Policymakers. Contribution of Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change

Climate Change – latest IPCC

- Europe: summer of 2003,
  - temperatures 6°C above long-term means,
  - precipitation deficits 300 mm

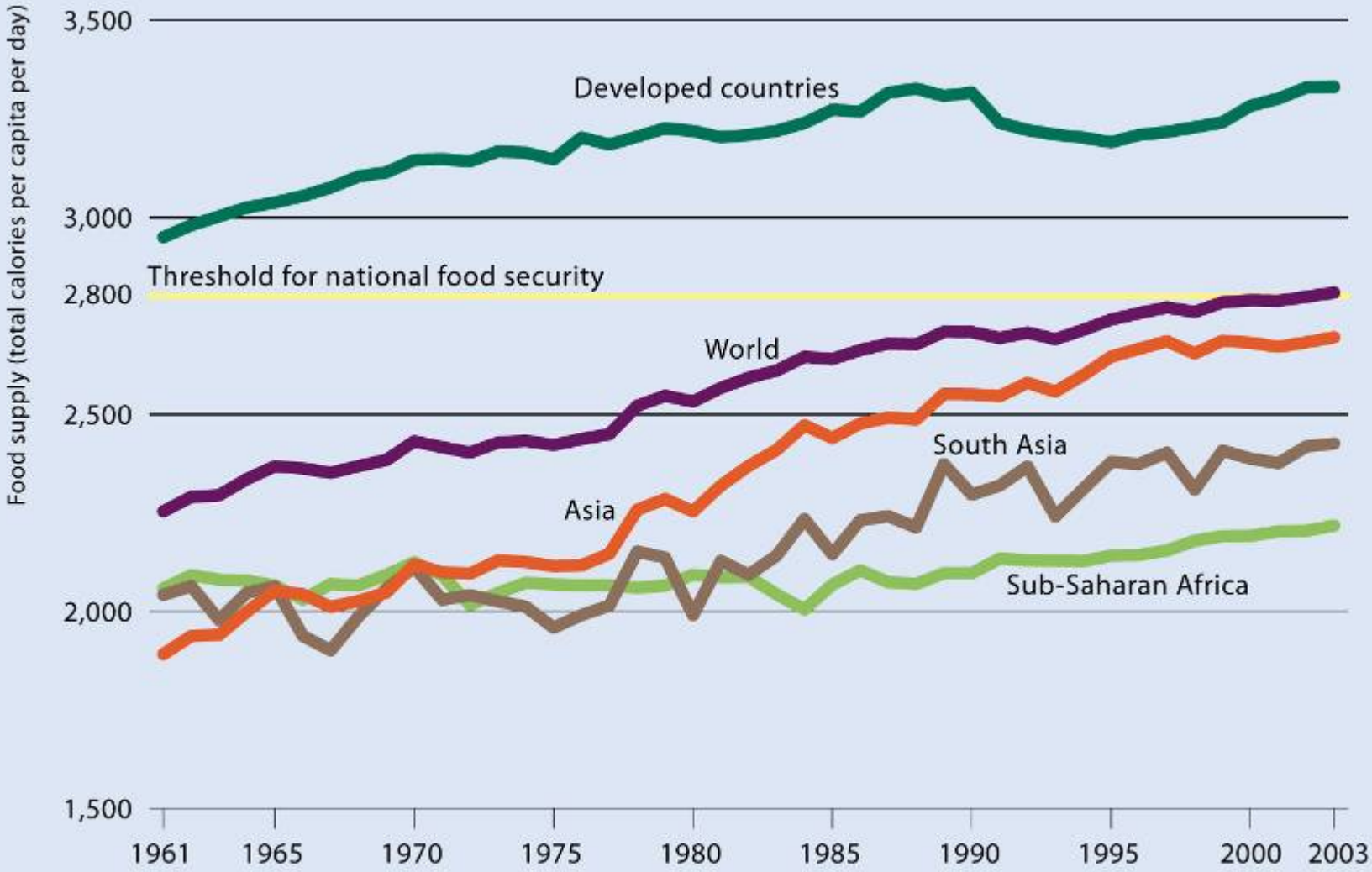
- A record drop in crop
  - yield of 36% Italy for maize grown in the Po
  - France, 2003 maize grain reduced 30%; fruit harvests declined by 25%.
  - Winter crops (wheat) near maturity
    - suffered less yield reduction (21% decline in France)
    - Forage production reduced ave by 30% France
    - Hay and silage winter stocks partly used
- Wine production in Europe was the lowest in 10 years

- (uninsured) economic losses for the agriculture sector in the European Union - estimated 13 billion, with largest losses in France

- **Food, Fibre and Forest Products Chapter 5**

Some Stark Food/Ag/Water Dilemmas….

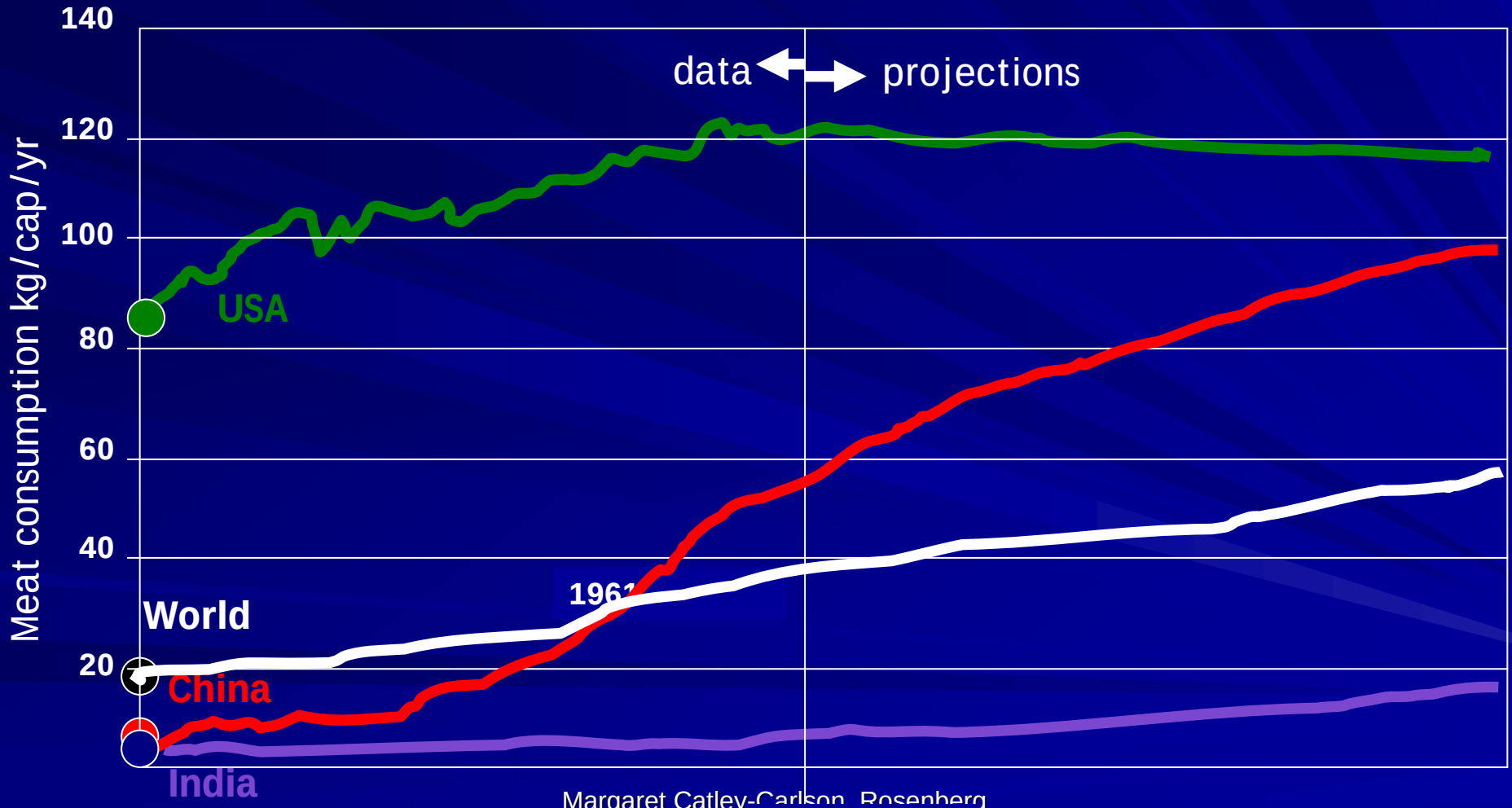
- 2 billion more to feed – with protein.
- We are NOT running out of drinking water – we are running out of economic water – agric, energy, industry, tourism – in competition.
- 5 x irrigated land since beginning of C20.
- First time in world history.
  - Water demand for nonagricultural uses is growing more rapidly in absolute terms than water demand for agriculture.
- Costs of irrigation installations rising.
- Subsidies – major factor in agriculture production decisions, including water use.



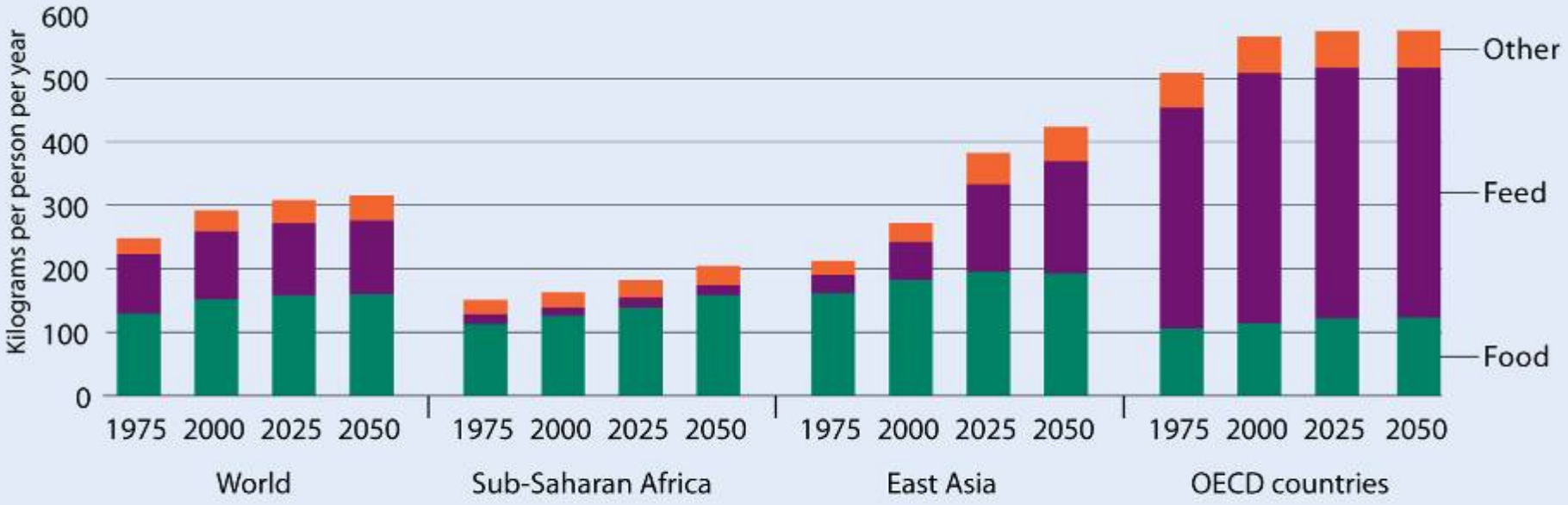
Source: FAO 2006b.

It takes a litre of water to produce every calorie, on average

Per capita meat demand (kg/cap/yr)



How much more cereals?

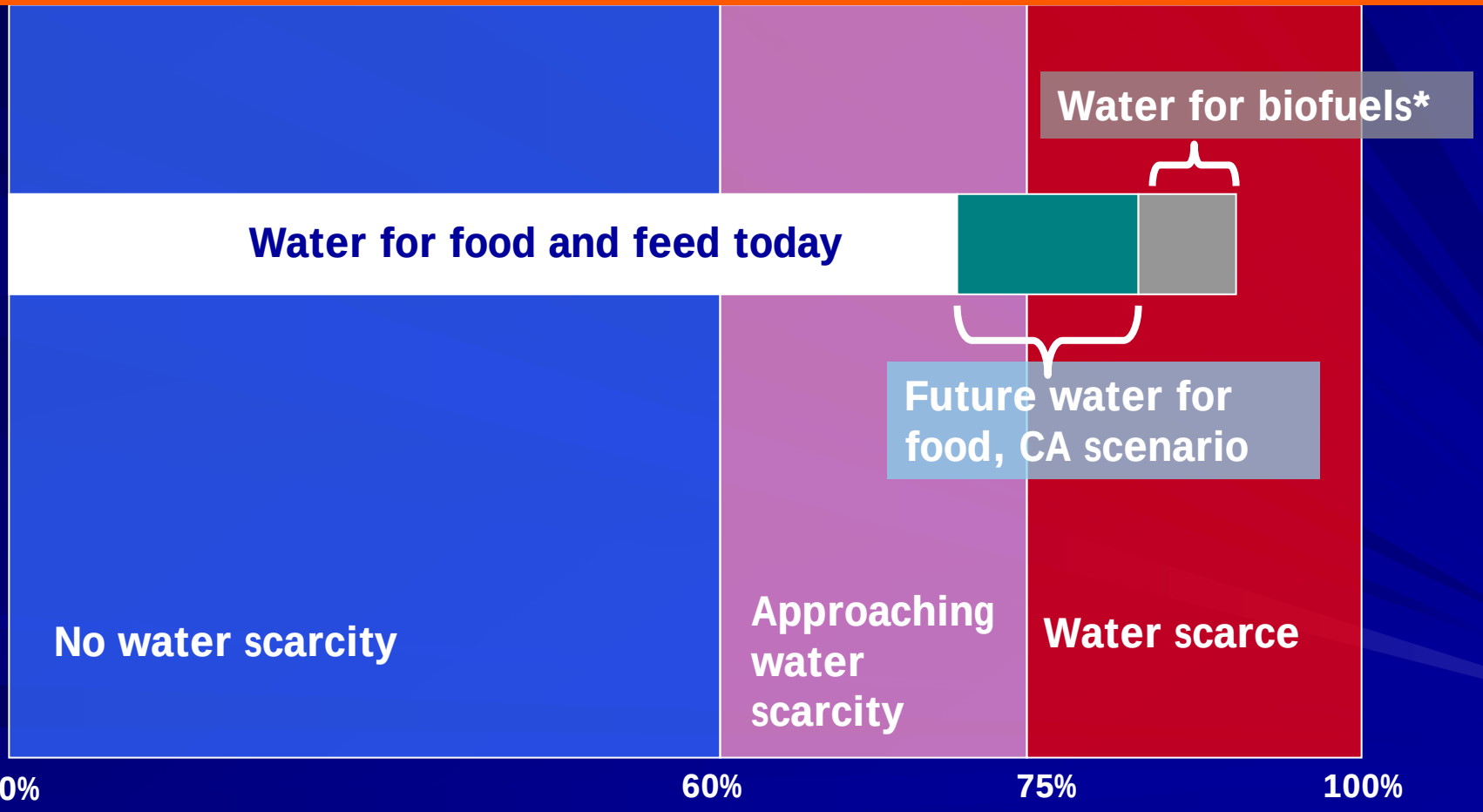


Source: For 1975 and 2000, FAOSTAT 2006; for 2025 and 2050, International Water Management Institute analysis done for the Comprehensive Assessment of Water Management in Agriculture using the Watersim model.

Food demand doubles over the next 50 because of diet and population

Water Needs (ET) will double – without water productivty gains

Biofuels: India: and in 2030 (WaterSim analysis by IWMI). Green solution with blue impacts



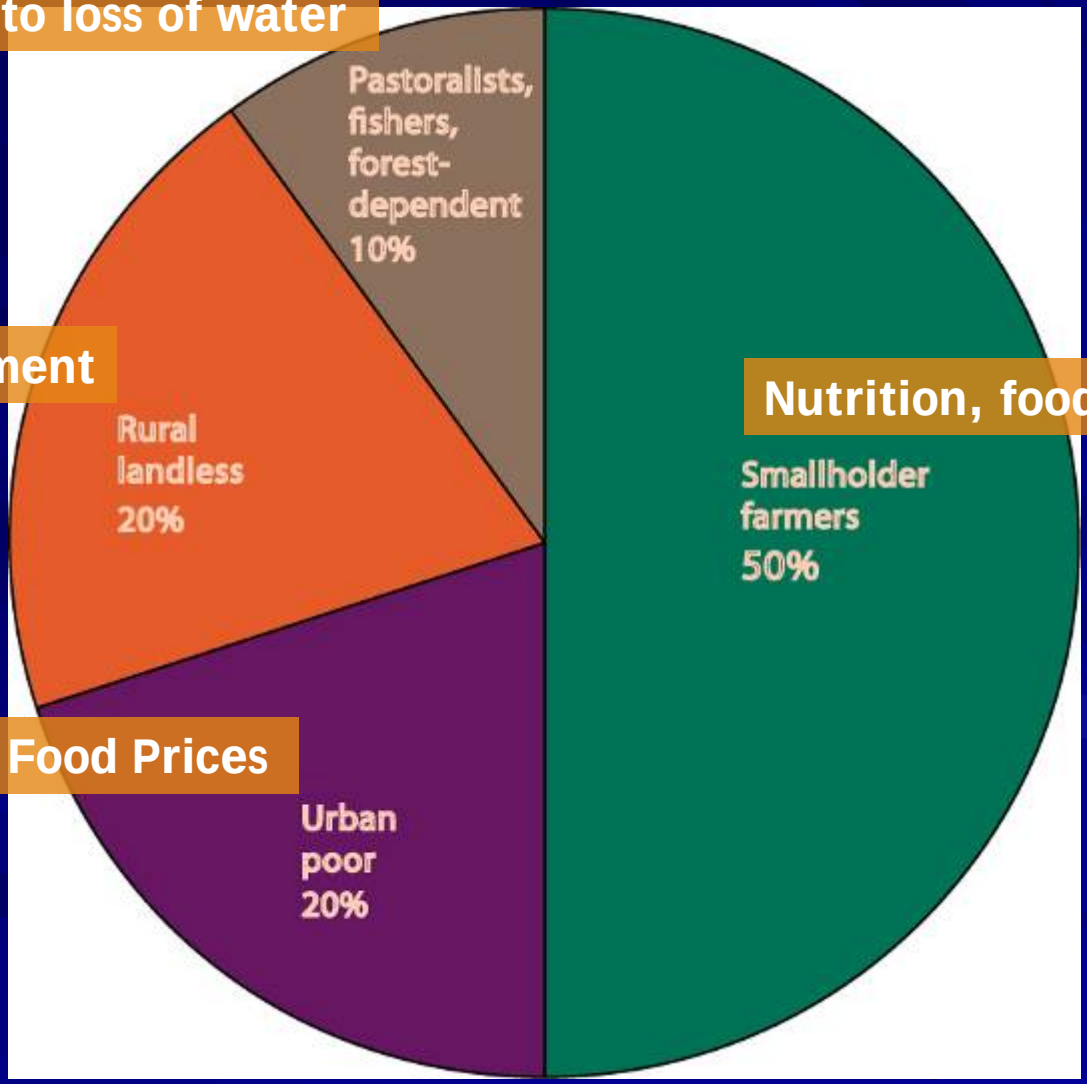
Water Week Stockholm, Rosenberg Forum, Zaragossa June 2008

*Assumes that 10% of gasoline demand is met by biofuels by 2030

The 850 million undernourished.

Dependent on Water for Agriculture?

Vulnerable to loss of water



Employment

Nutrition, food security, income

Lower Food Prices

There are few options outside of agriculture for most rural poor at present

Source: FAO data, graphic from SEI

Limits – reached or breached

- Closed basins – no water left for more development – Yellow River, Colorado, Amu/Syr Darya, Murray-Darling, Egypt's Nile, Lerma-Chapala, Jordan, Gediz, Zayanda Rud, Indus, Cauvery, Krishna, Chao Phraya,….
- Groundwater overdraft –
- Fisheries – ocean and freshwater at a limit, aquaculture will become more prevalent
- Livestock – limit on extent of grazing land, more will come from mixed and industrialized production

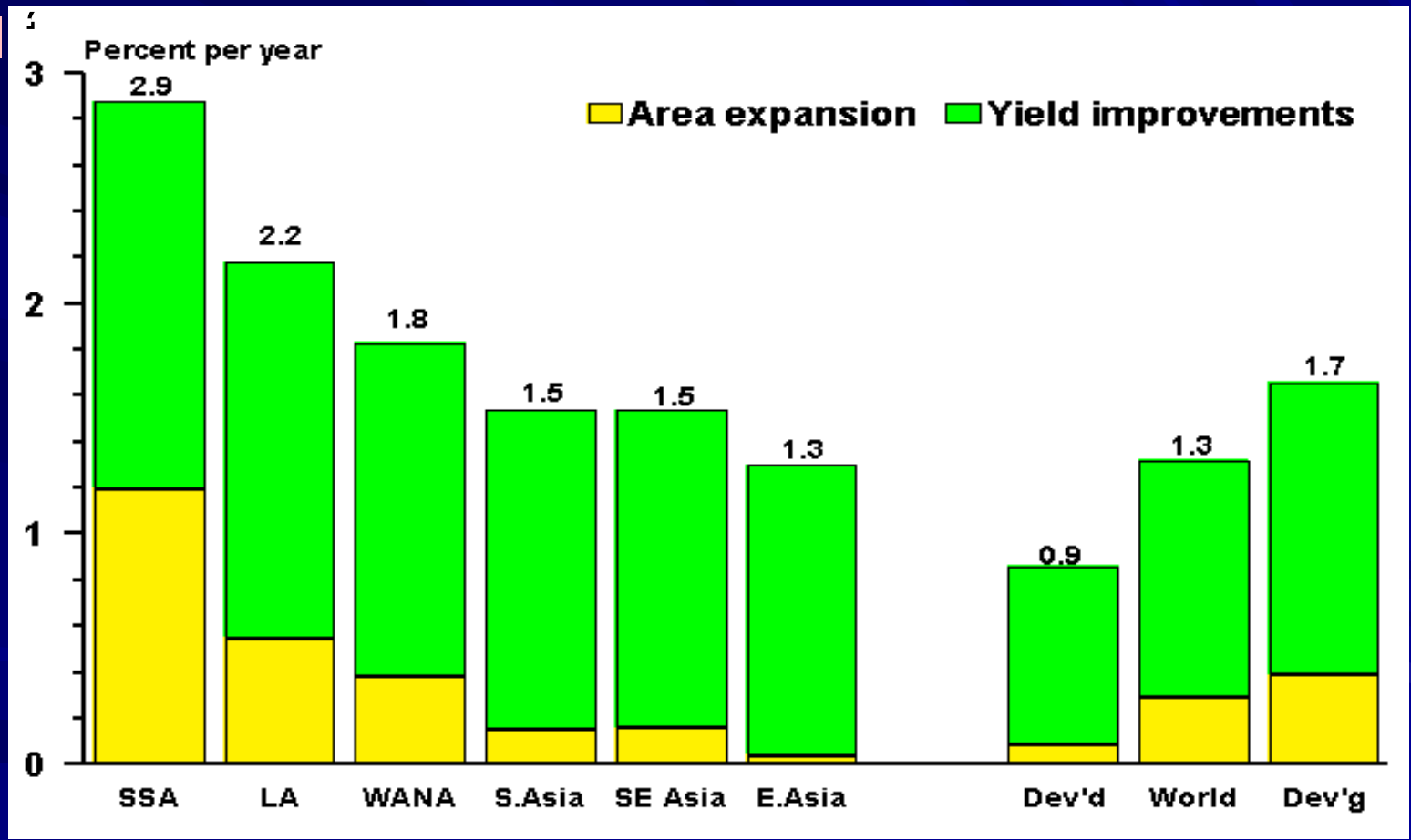
2008 Price Explosion

- As of April 2008,
  - 15 countries,8 major producers
  - Export restrictions on agricultural commodities.
  - China - banned rice and maize exports,
  - India - banned exports of rice and pulses.
  - Argentina has raised export taxes on soybeans, maize, wheat, and beef, and
  - Ethiopia and Tanzania banned exports of major cereals.
  - new or additional price controls - Benin, China, Malaysia, and Senegal.
- Fertilizer – 2 x cost increases – more for some components.

Answers?

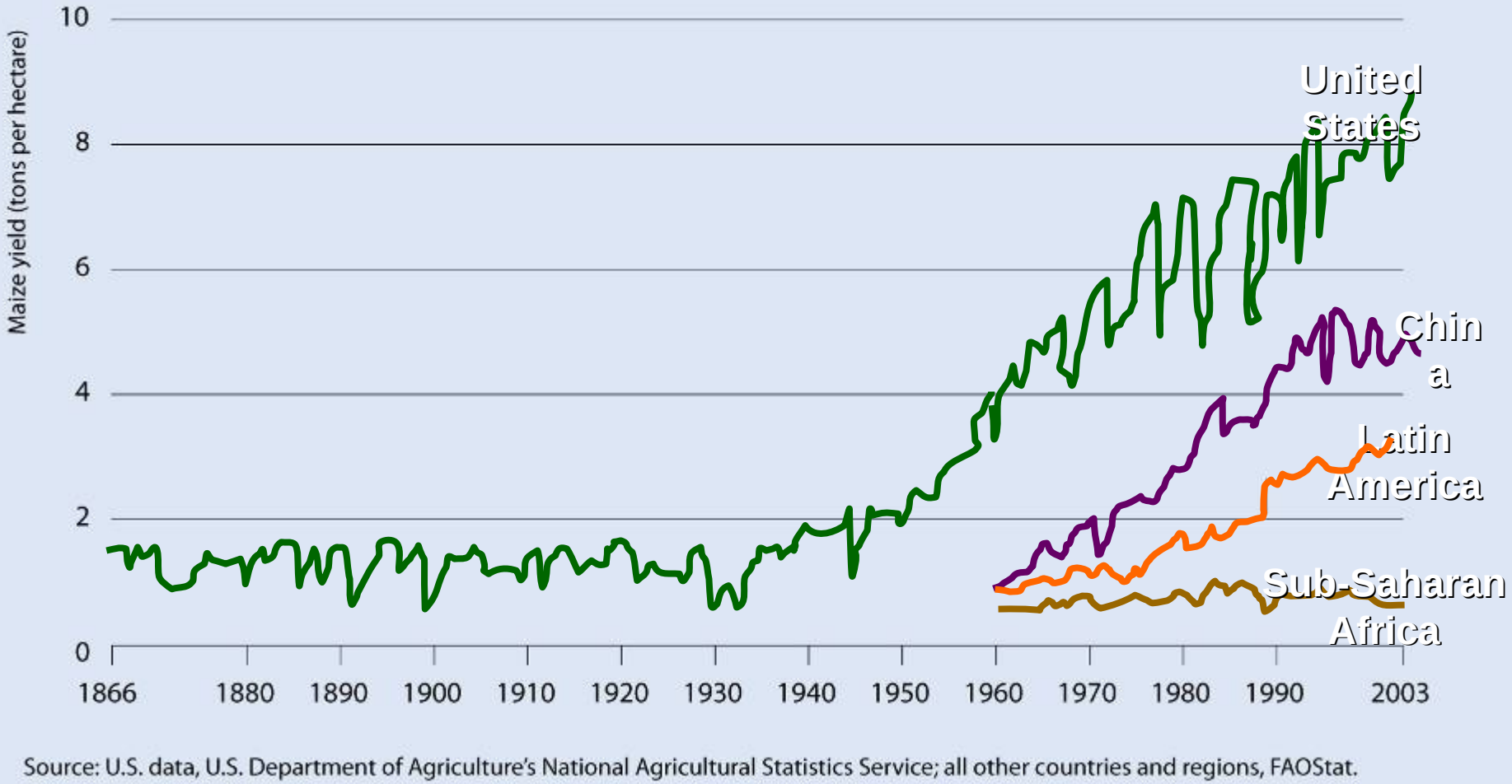
- Maybe…..

Growth in cereal production from yield growths (1995-2020)



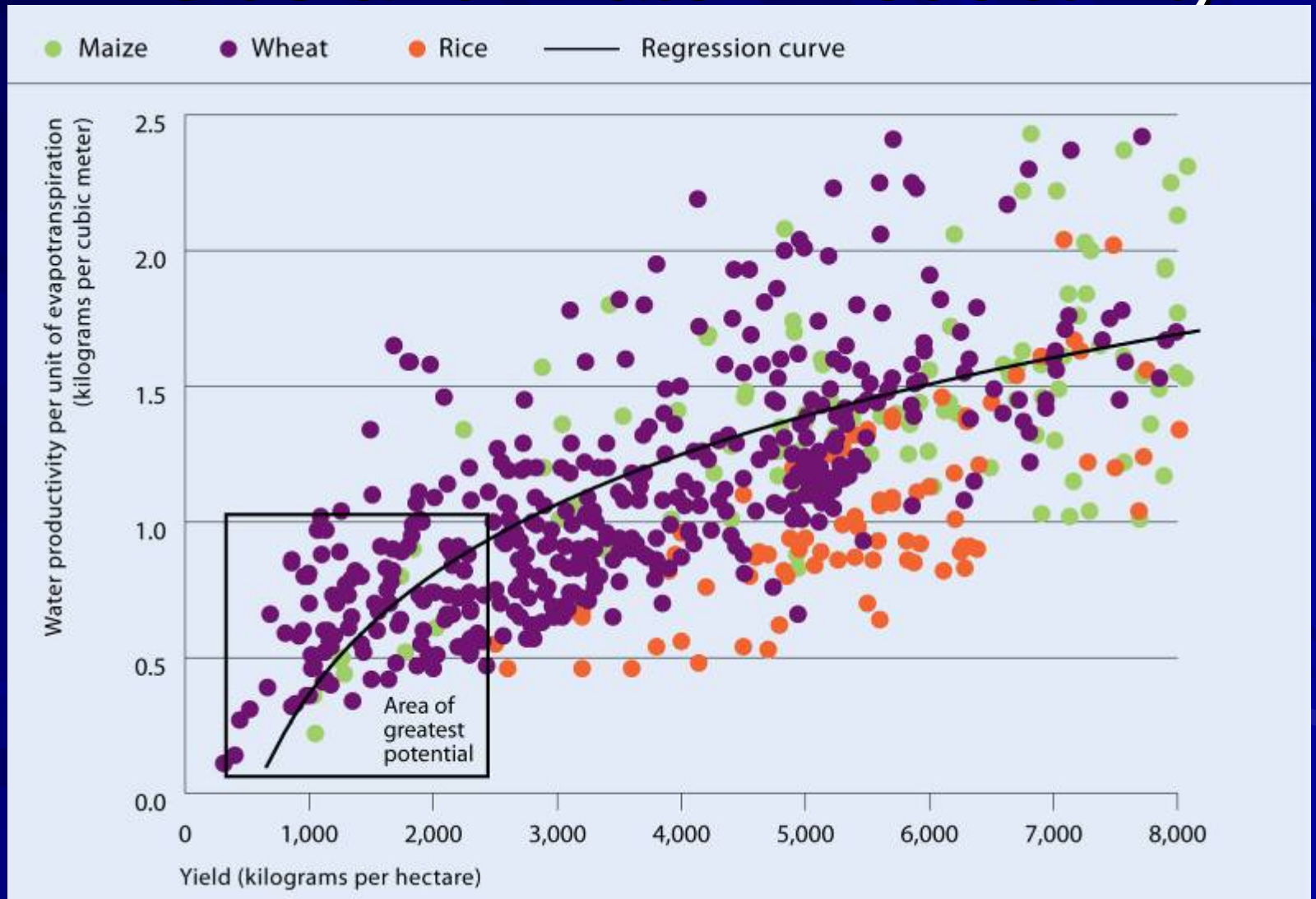
Source: P.Pinstrup-Andersen, et al. 1999

Growth in yields



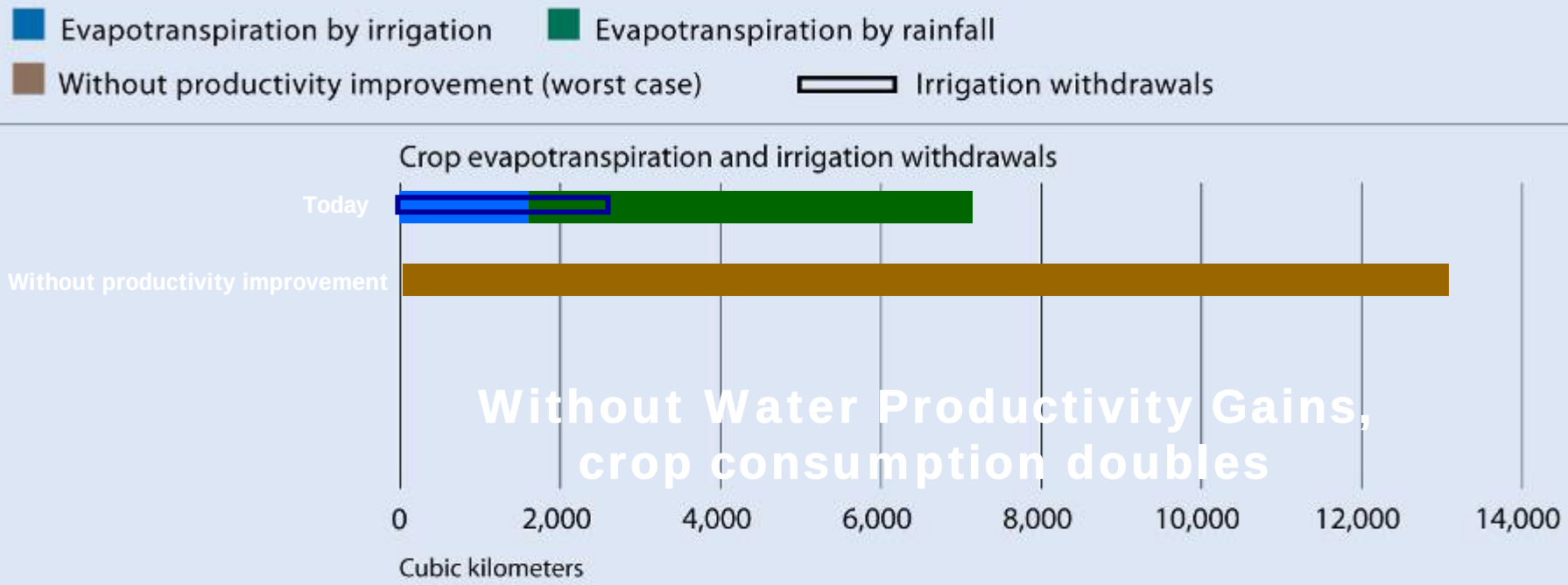
Source: U.S. data, U.S. Department of Agriculture's National Agricultural Statistics Service; all other countries and regions, FAOStat.

Yields and Water Productivity



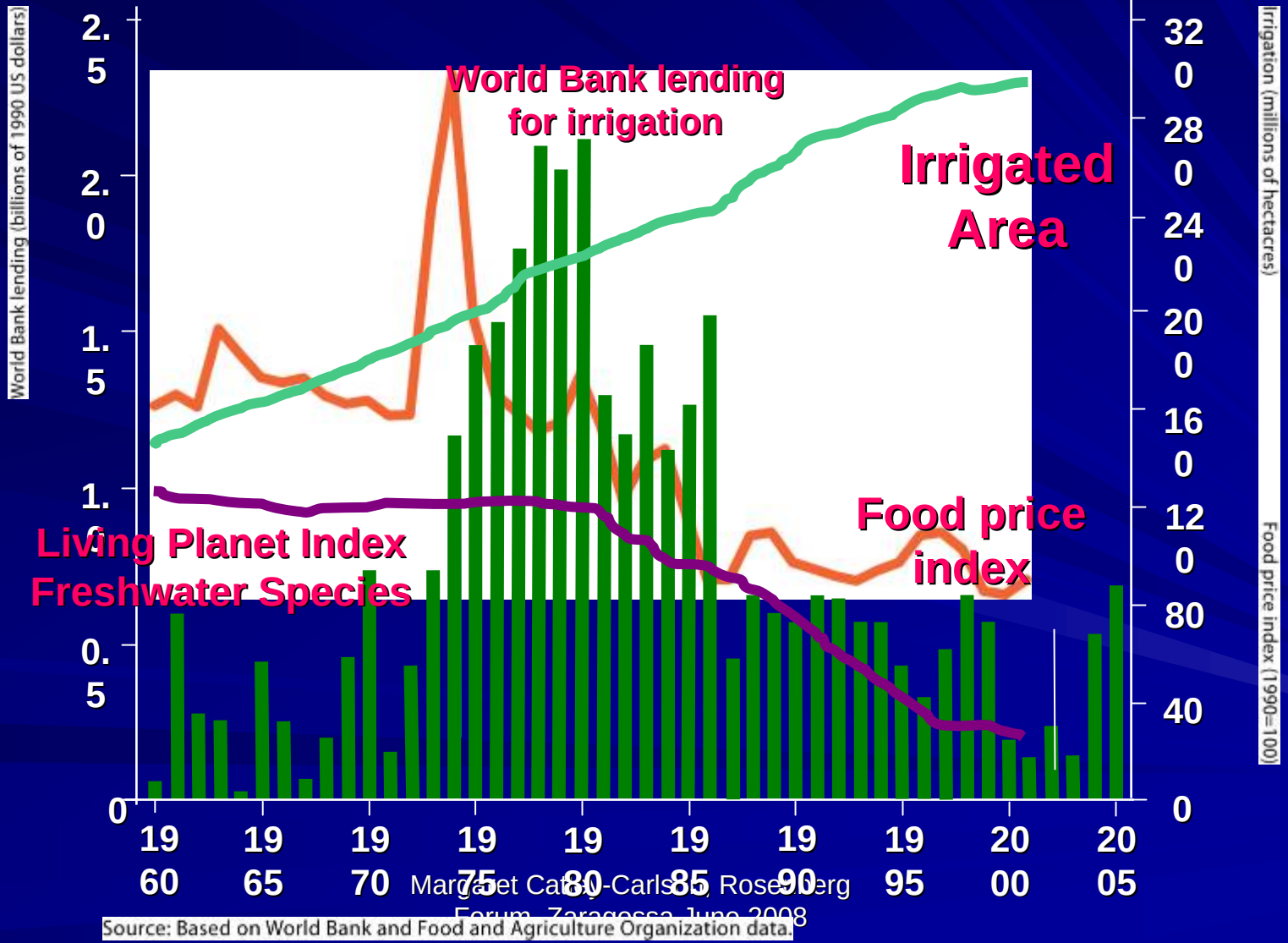
Source: Adapted from Zwart, S.J., and W.G.M. Bastiaanssen, 2004, "Review of Measured Crop Water Productivity Values for Irrigated Wheat, Rice, Cotton and Maize," Agricultural Water Management 69 (2): 115–33; chapter 7.

Crop water consumption to 2050



Based on IWMI WaterSim analysis for the CA

Investing in Irrigation



Source: Based on World Bank and Food and Agriculture Organization data.

Invest in Irrigation

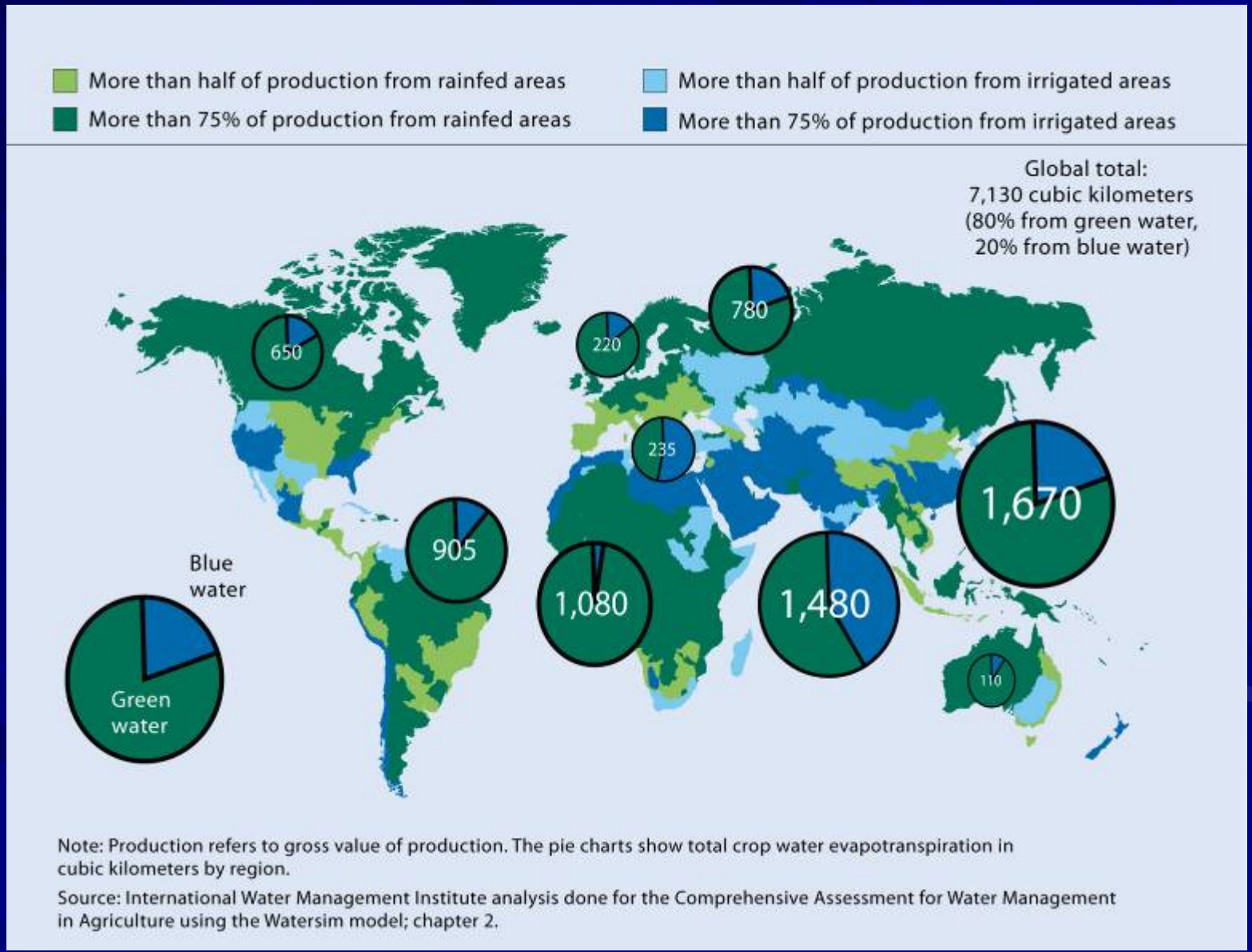
1. To reduce rural poverty
2. To improve performance of many systems, particularly in South Asia
3. To keep up with changing food demand
4. To adapt to changes – water scarcity, competition, climate change, energy
5. To increase multiple benefits and ecosystem services, while reducing negative impacts

Irrigation investments declined continuously since 1980s…

- past projects perceived to perform poorly
- irrigation projects more costly
- irrigation investments crowded out by lending in structural adjustment in 1980s & later focus on environment
- irrigation investments became less attractive with declining international food prices

upgrade rainfed agriculture

Dependence on green and blue water 2000



Key Actions to Upgrade Rainfed Systems

- *Technology*
  - water harvesting,
  - supplemental irrigation,
  - Field water conservation to reduce evaporation.
- *Build human capacity -*
- *Expand Policies to include upgrading rainfed*

Promising Pathways

- **Ensure secure access (including water rights)**
- **Targeted investments in pro-poor technologies**
- **Local management**
- **Informal irrigation**,
- **Multiple-use systems**
- **Maintaining fisheries**,

Complementary public investment and actions are needed in the improvement of markets access and infrastructure

Integrated Systems – more value per drop

- Integrated Agriculture-Aquaculture Systems. Livestock in irrigation
- Multifunctional Agriculture
- Multiple Use Systems

‘




Livestock Water Productivity

(Potentially more than doubled and more sustainable)

Improved by:

- Selecting animal feeds that need less water
- Enhancing animal productivity
- Improving grazing and watering impact of livestock

Through:

- Integrated investments, development and management of water and livestock

There are Technical Answers; Not necessarily implementable solution

- By common consent, the problem is management. Water is badly or not managed everywhere.
  - No science innovations required to achieve 90% of the desired water management objectives.
  - The last 10 % can be achieved with better monitoring systems, forecasting, data management, GIS.
- Rainfed areas, especially in the semi-arid tropics, have the highest potential for poverty reduction and water productivity gains.

CA Scenario – investment priorities

	Upgrade rainfed systems	Improve productivity of irrigation	Expand irrigation
SSA	high	low	high
MENA	low	high	low
C Asia	low	med	low
South Asia	high	high	low
East Asia	Med	high	low
Latin Amer	med	low	low
OECD	low	low	low

Institutional reform

- Sectoral reforms needed
  - craft solutions suited to local needs
  - no blueprints
- Policies outside of water sector have huge influence on water resources –
  diets, trade, agricultural subsidies, energy

Make difficult choices now, not later:

Choices:

- Which investments – for production, adapting to climate change
- Water storage for agriculture – water for environment
- Upstream – downstream
- Productivity - Equity
- This generation – the next one (GW decline)
- Our consumption patterns and their impact

Enabling Conditions

- Cost & affordability
- Price and profitability
- Risk – market, climate, water availability
- Markets
- Reliable supply of water
- Education
- Incentives and institutions

Sources of finance: global scan

- Major infrastructure mainly funded by governments, with some int'l bank –IFI- lending
- Large surface irrigation schemes rely on government
- Groundwater development mainly privately financed
- Large farmers use own funds, banks, official lending agencies
- Small farmers & households use savings, moneylenders, local mutual schemes, sweat equity, microfinance

Water Financing for Agriculture

- Water for agriculture MDG hunger goals $47bn rising to $67bn.
- Public and private both significant.
  - Large public irrigation schemes;
  - Private groundwater schemes and commercial estates;
  - Community mini-projects; household use, etc.
- Multiple systems - surface irrigation, rain fed systems, conjunctive & supplementary uses, catchments, etc.
  - A financing nightmare
- Two views:
  - There is a water crisis = reduce water for agriculture.
  - There is a food crisis = need more water for agriculture.
- Need to reconcile these by investing in greater water productivity.

Getting through the looking glass

- Meetings and conferences – what SHOULD be done.
- What we never explore – why it isn't done.
- Little utility in constant repetition of what an ideal state looks like….doesn't get us there.
- Need to concentrate on the "what would it take?"
- MCC hypothesis – the answer is "drought, disaster, massive displacements."

Connections not made

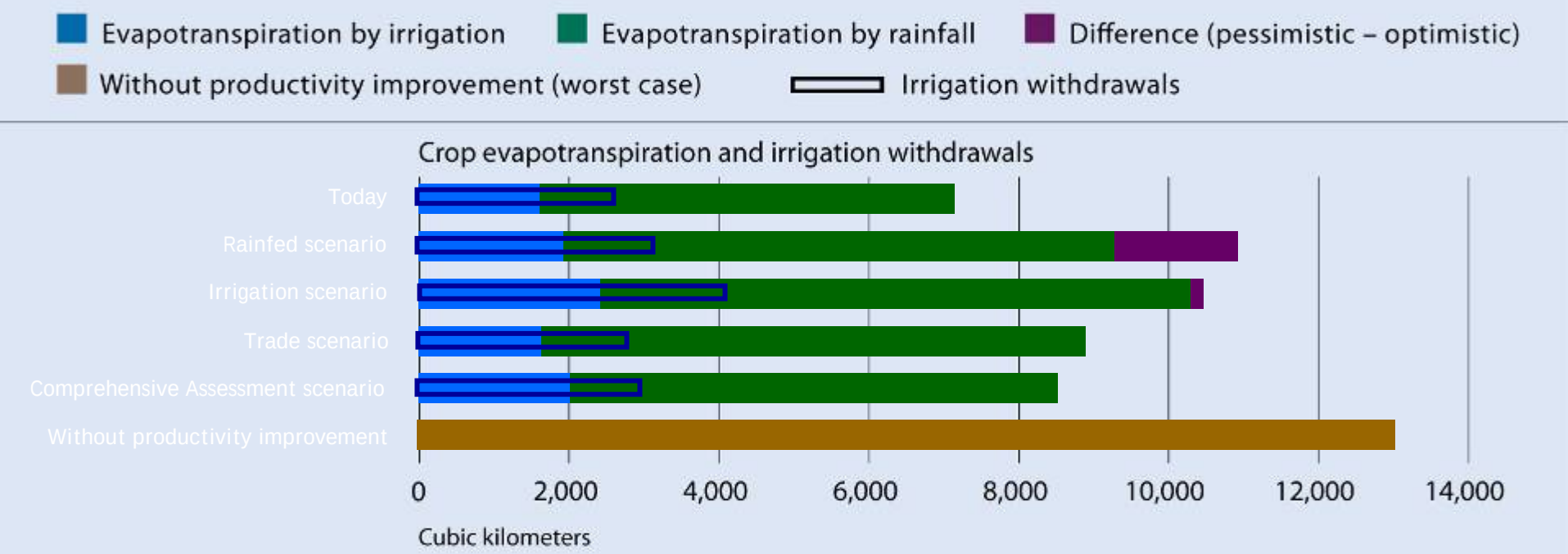
- Irrigators with crop specialists
- Feed and fodder as major attention area
- Real cost of destruction of environmental services
- “What would it take”? Vs more research

Reform is a negotiated political process—high stakes means powerful resistance

But it is not 2 individuals head-to-head:

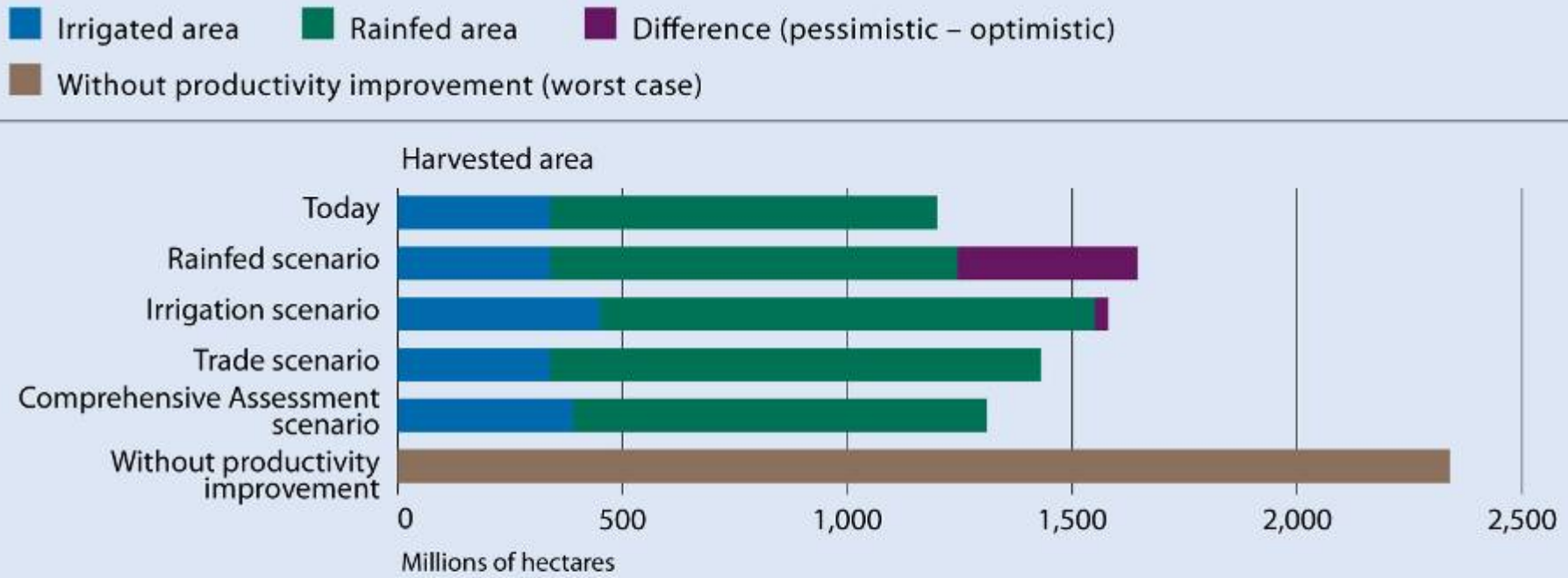
- **Coalitions**
- **Differential calculations of costs and benefits**
- **Knowledge producers and brokers have a role**

Make Choices: Scenarios to 2050



Based on WaterSim analysis for the CA

Area expansion to 2050



Note: The figure shows projected amounts of water and land requirements under different scenarios. The Comprehensive Assessment scenario combines elements of the other approaches. The purple segments of the bars show the difference between optimistic and pessimistic assumptions for the two rainfed and two irrigated scenarios. The brown bar shows the worst cases scenario of no improvement in productivity.

Source: International Water Management Institute analysis done for the Comprehensive Assessment for Water Management in Agriculture using the Watersim model.

Tools for making choices

- For assessing tradeoffs (water accounting, social and environmental impacts)
- Negotiating tradeoffs
- Mechanisms to compensate for those who stand to lose
- Foster social action and public debate
- Share knowledge and information & knowledge equitably

Focus on Africa a must…

- rapid rate of increase in demand for food contributing further to food insecurity
- 80% of the poor live in rural areas and depend on agriculture
- low proportion of cultivable land is irrigated
- low water productivity in existing irrigation schemes
- increasing competing use of water (85% for agriculture)
- high temporal and spatial variability of rainfall
- risks of climate change

The short term: Coping with current High Food Prices: What, Who, and How of Proposed Policy Actions - IFPRI

- Emergency response
  - expand emergency responses & humanitarian assistance to food-insecure people ,
  - eliminate agricultural export bans and export restrictions,
  - undertake fast-impact food production programs in key areas,
  - change biofuel policies.

The Medium Term: Resilience package

- calm markets with the use of market-oriented regulation of speculation, shared public
- grain stocks, strengthened food-import financing, and reliable food aid;
- invest in social protection;
- scale up investments for sustained agricultural growth;
- complete the Doha Round of (WTO) negotiations.

And the medium term; Mitigation = Energy

Adaptation = Water




Will there be enough water to grow enough food? Yes if...

Results of The Comprehensive Assessment of Water Management in Agriculture

Co-Sponsors:

CGIAR

Ramsar

FAO

CBD

Margaret Catley-Carlson, Ros
Forum, Zaragossa June 2008




Will there be enough water to grow enough food?

NO, UNLESS.....

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