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Theme 5



IWMI
International
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Ensuring agricultural water supplies in a world of competing demands

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Challenge Program on Water and Food

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INTERNATIONAL FOOD POLICY RESEARCH INSTITUTE



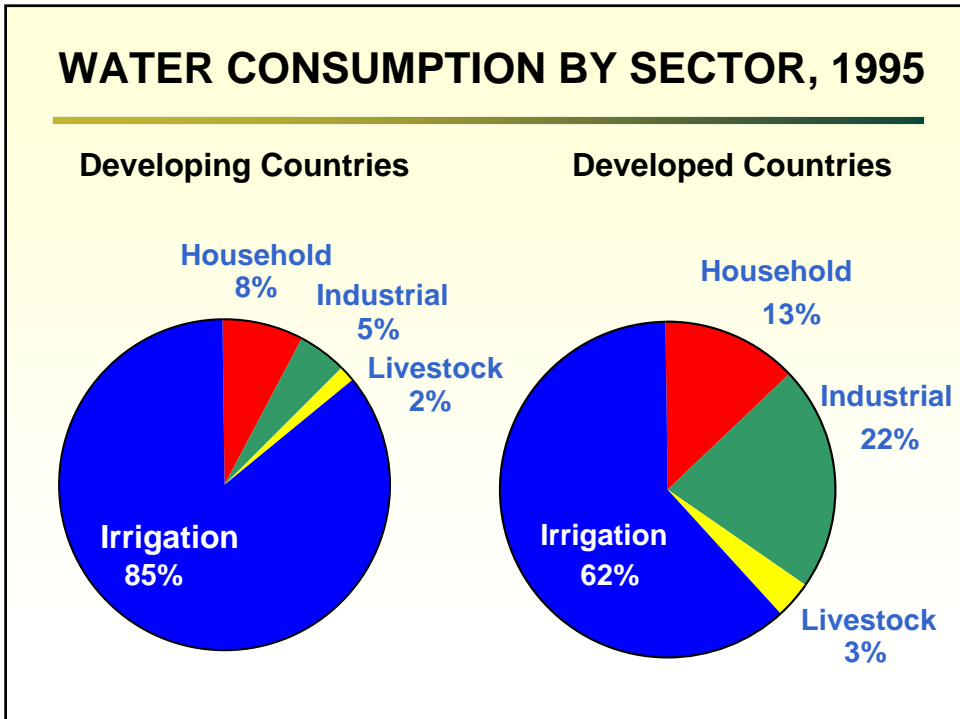
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OUTLINE

- Role/s of irrigated agriculture
- Future water demands and implications for food production
- Ensuring agricultural water supplies – two options out of many
- Conclusions

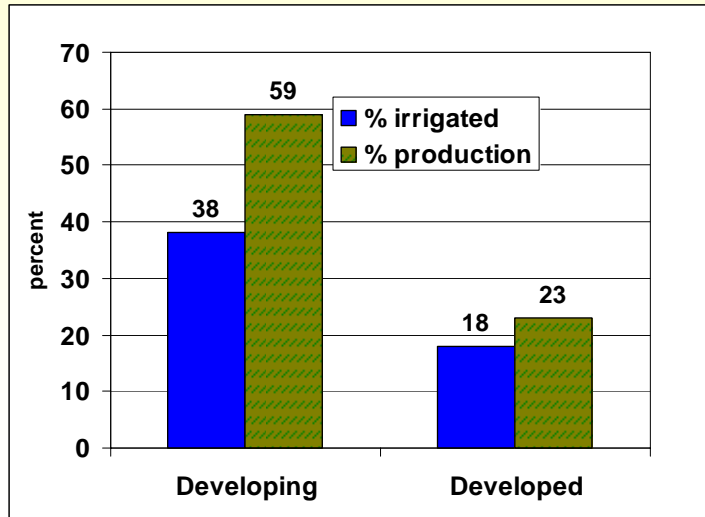


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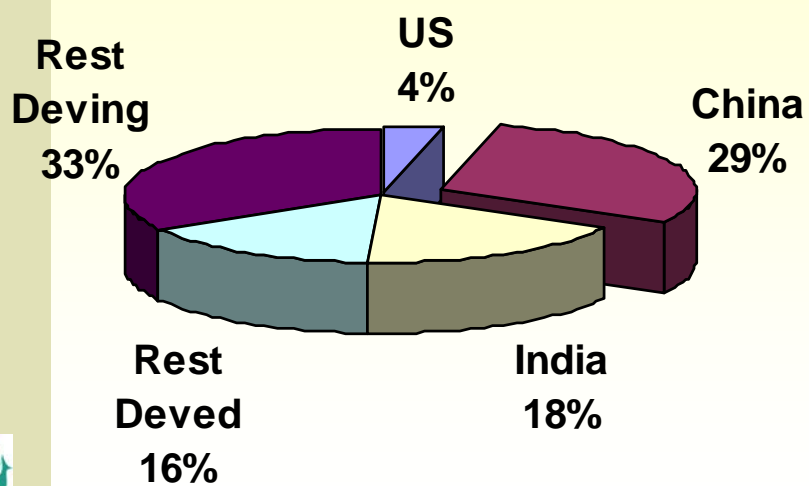
IRRIGATED CEREAL HARVESTED AREA AND PRODUCTION, 1995



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IRRIGATED CEREAL HARVESTED AREA, 1995 AND 2025



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Slow Growth: from 213 Mha/1995 ha to 237 Mha/2025



IMPACT OF IRRIGATION

- Increased crop yields [green revolution package]
- Stabilization of food production, and support for crop diversification
- Important for poverty alleviation [although mixed results]
- Reduction of food prices [most poor are food consumers]
- Irrigation water is used in rural domestic water supply, household gardens, livestock, fish ponds, recreation, and other enterprises
- However, irrigation has caused excessive water depletion, water pollution, and ecosystem degradation



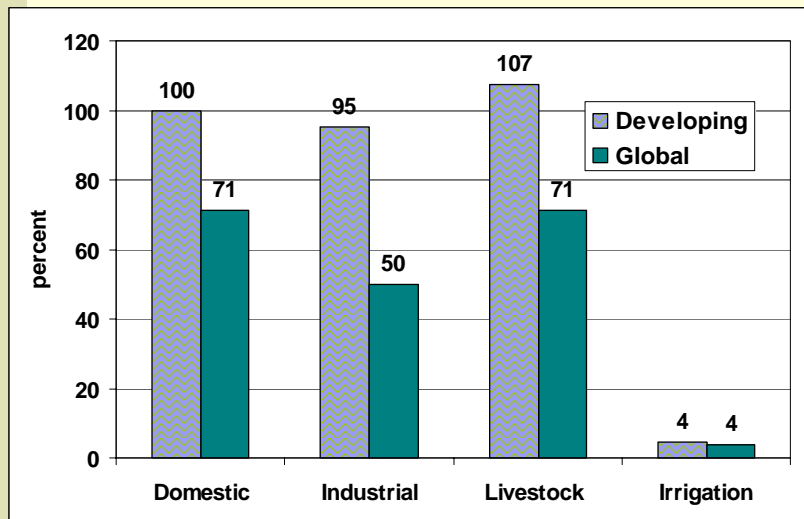
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FUTURE WATER DEMANDS AND IMPACTS ON FOOD PRODUCTION



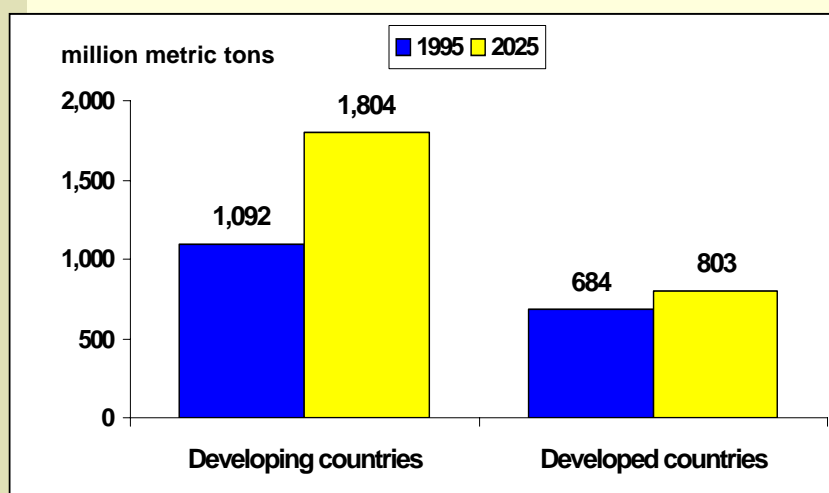


INCREASE IN WATER CONSUMPTION, 1995-2025, BAU



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CEREAL DEMAND 1995 and 2025 BASELINE

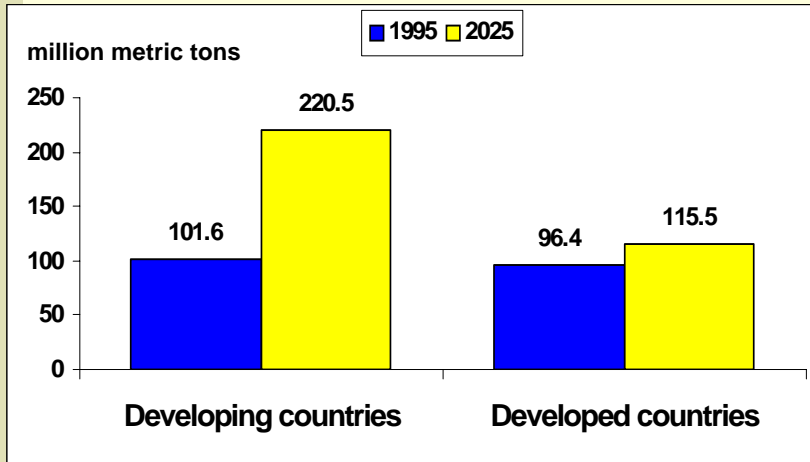


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Source: Rosegrant et al. 2002. World Water and Food to 2025: Dealing with Scarcity



MEAT DEMAND 1995 and 2025 BASELINE

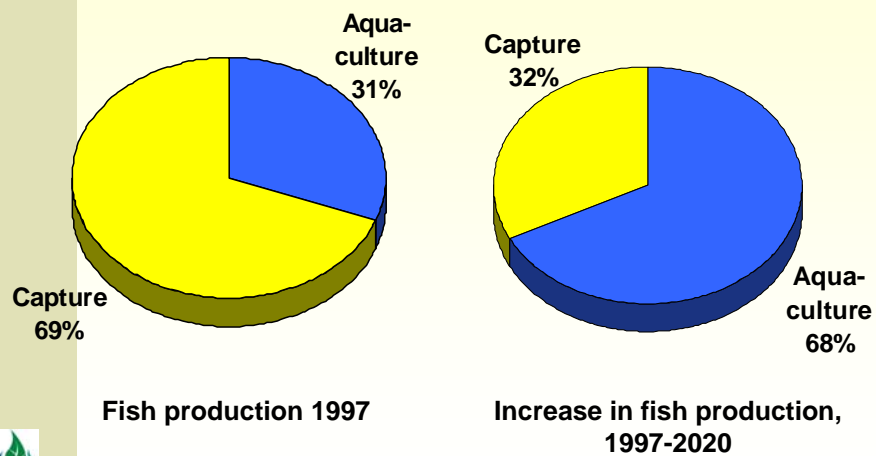


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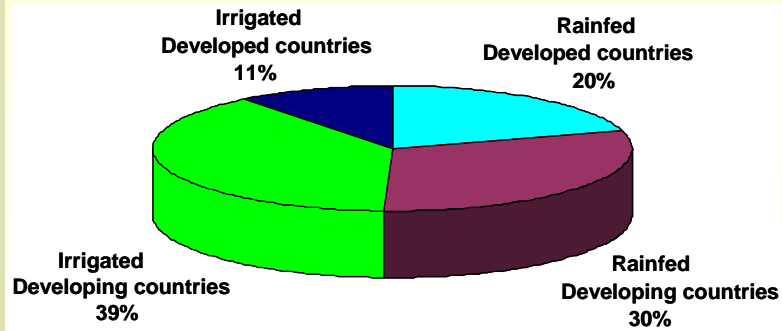
AQUACULTURE % IN FISH PRODUCTION 1997 AND INCREASE 1997-2020



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SHARE OF IRRIGATION AND RAINFED IN CEREAL PRODUCTION INCREASE, 1995-2025

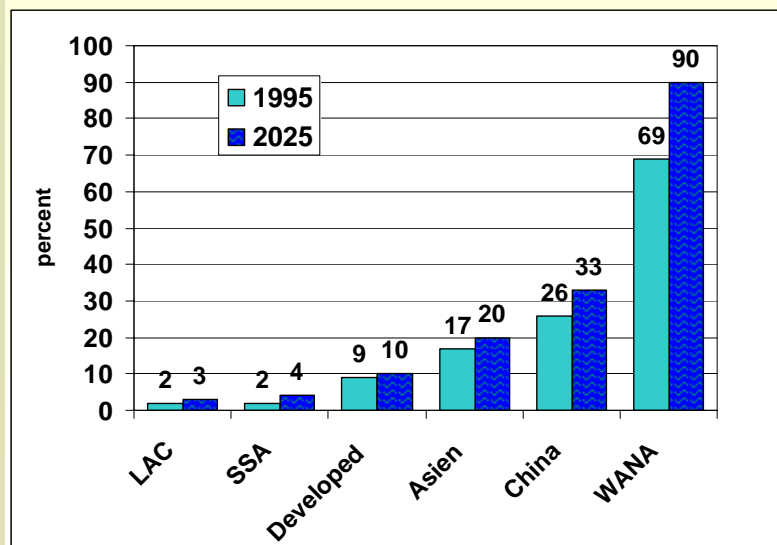


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Source: Rosegrant et al. 2002. World Water and Food to 2025: Dealing with Scarcity



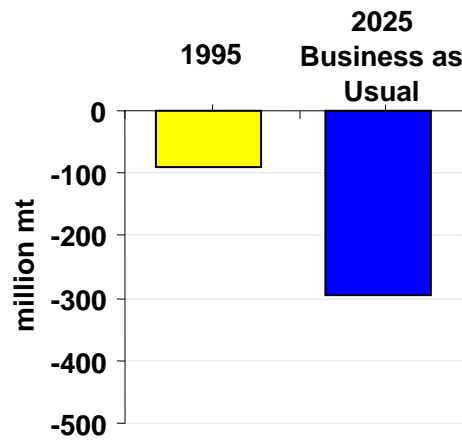
WATER WITHDRAWAL AS A SHARE OF RENEWABLE WATER RESOURCES



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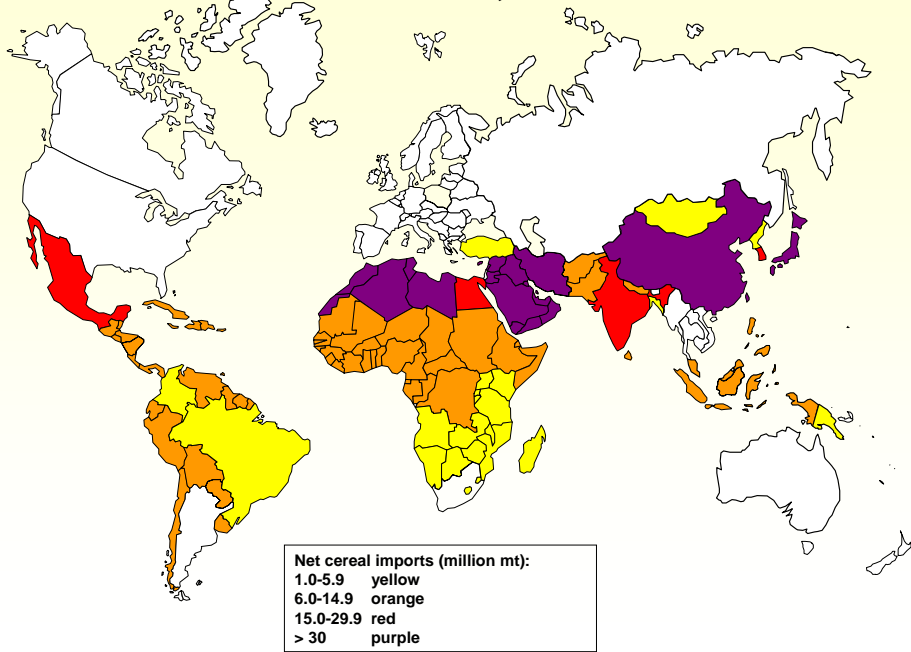
LOSS OF GRAIN PRODUCTION DUE TO WATER SCARCITY, DEVELOPING COUNTRIES



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Source: Rosegrant et al. 2002. World Water and Food to 2025: Dealing with Scarcity

CEREAL NET IMPORTS, PROJECTED 2025





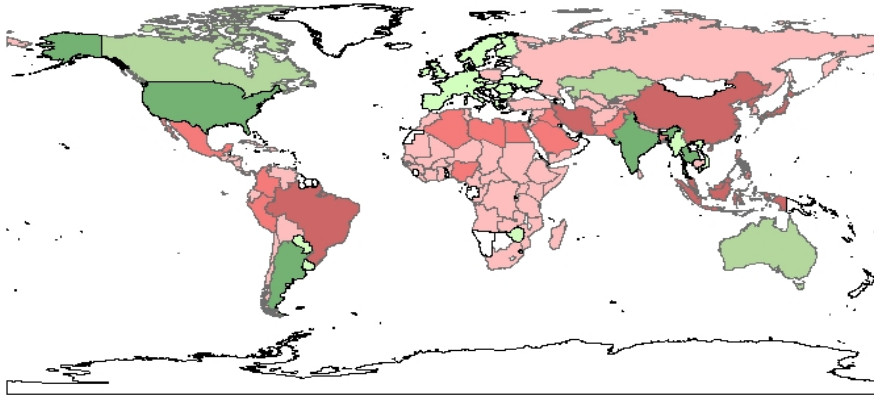
TRADE IN VIRTUAL WATER

- Virtual water = the amount of water used in the production of agricultural commodities—and in other sectors
- Food importing countries indirectly purchase water resources from exporting countries , thereby saving water
- Global water savings occur when exporters are more water efficient than importers
- Global irrigation water savings occur when exporters produce under rainfed conditions, while importers would have used irrigation otherwise



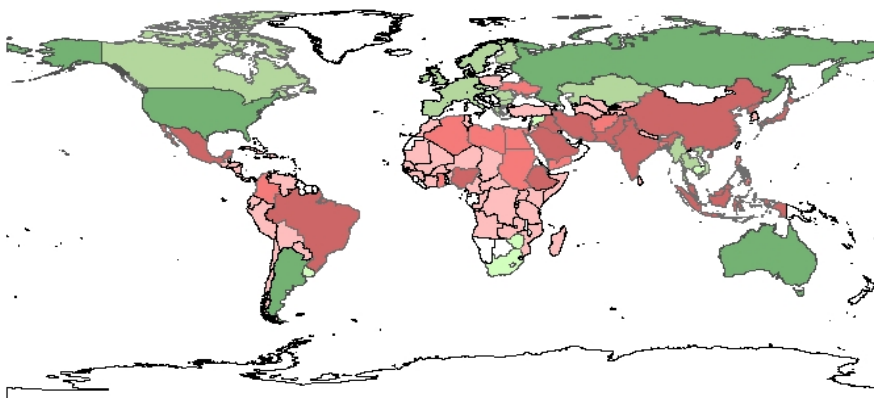
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VIRTUAL WATER FLOWS (1995) measured in crop ET, cereals



Source: DeFraiture et al. 2002

VIRTUAL WATER FLOWS (2025) measured in crop ET, cereals



Source: DeFraiture et al. 2002



TRADE IN VIRTUAL WATER

- In 1995, 7% of total crop evaporation and 5% of irrigation water depletion was used to produce cereal crops for export
- In 2025 this will rise to 8% and 5%, respectively
- Trade saves limited (irrigation) water: cereal water use would only be 6% higher without virtual water trade & ca. 20% of cereal trade may be water related – thus water scarcity currently plays a modest role in trade pattern - expected to rise to 38% by 2025 for cereals
- Instead other factors, like subsidies, and trade arrangements determine trade outcomes



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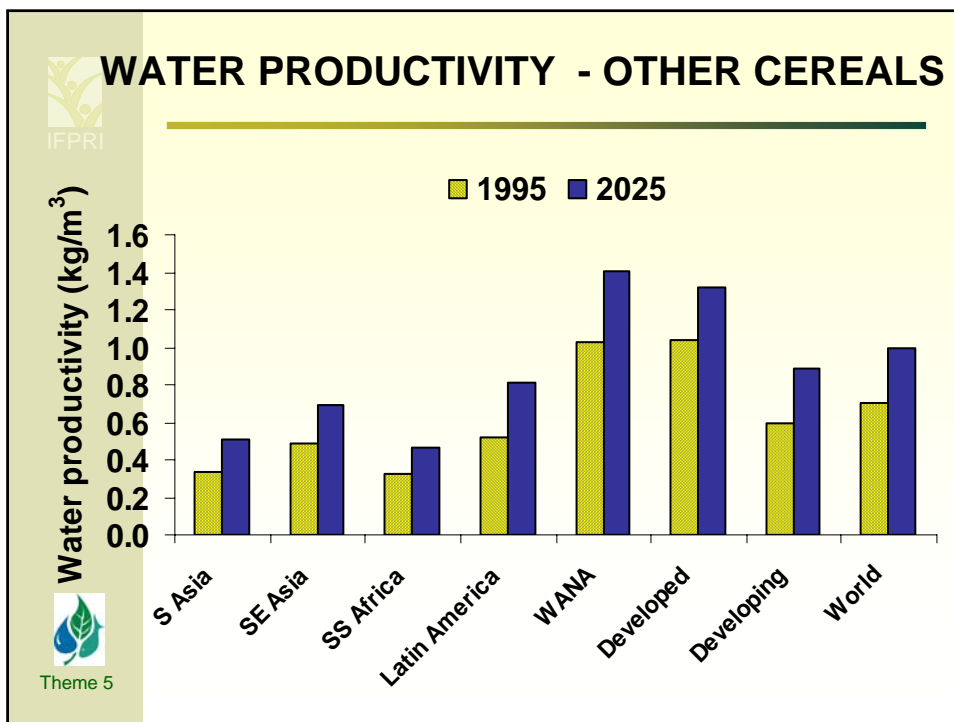
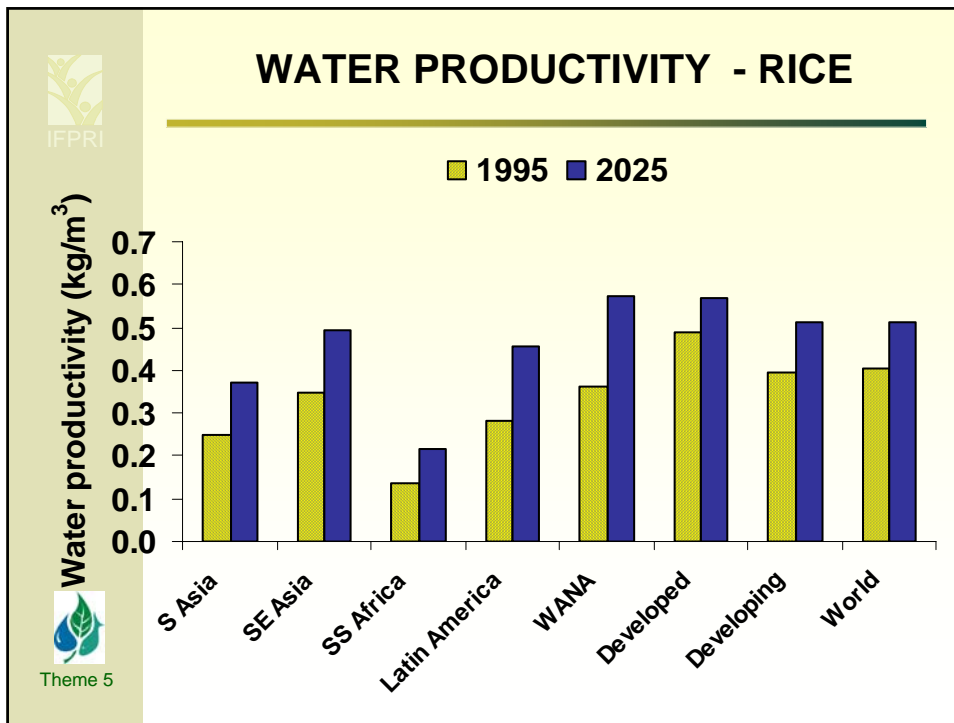
DEFINITION OF WATER PRODUCTIVITY

$$WP_{(kg/m^3)} = \frac{P_{(kg)}}{WC_{(m^3)}}$$

WP water productivity
P crop production
WC water consumption



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ENSURING AGRICULTURAL WATER SUPPLIES

Estimated Cereal ET total:

- 2622 km³ (1995)
- 2758 km³ (2025)

Savings due to trade:

- 190 km³ (1995)
- 355 km³ (2025)

Savings due to water productivity (⊙IE) improvement over the period 1995-2025:

- 1215 km³

→ Water productivity improvements are more important than trade



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CONCLUSIONS

- Growing nonagricultural water demand slows growth in agricultural water supplies
- Most future food production growth will need to be met through yield increases while conserving water
- Reduction in agricultural water supplies will increase food production costs



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CONCLUSIONS

- Virtual water trade has a limited role in ensuring additional (indirect) agricultural water supplies
- Increasing water productivity –through better management practices & institutions, and yield growth more important, particularly for poorer countries



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INVESTMENTS NEEDED IN

- Invest in developing countries, public supply / wastewater, & irrigation [including large dams]
- Establish well-defined water rights, flexible enough to allow trading
- Design water pricing mechanisms to pay irrigators to use less water
- Eliminate power subsidies to groundwater pumping
- Invest in crop breeding for drought, heat, and saline tolerance
- Invest in research on water management, including low tillage, rainwater harvesting



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