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Climate Change and Energy Impacts on Water and Food Scarcity

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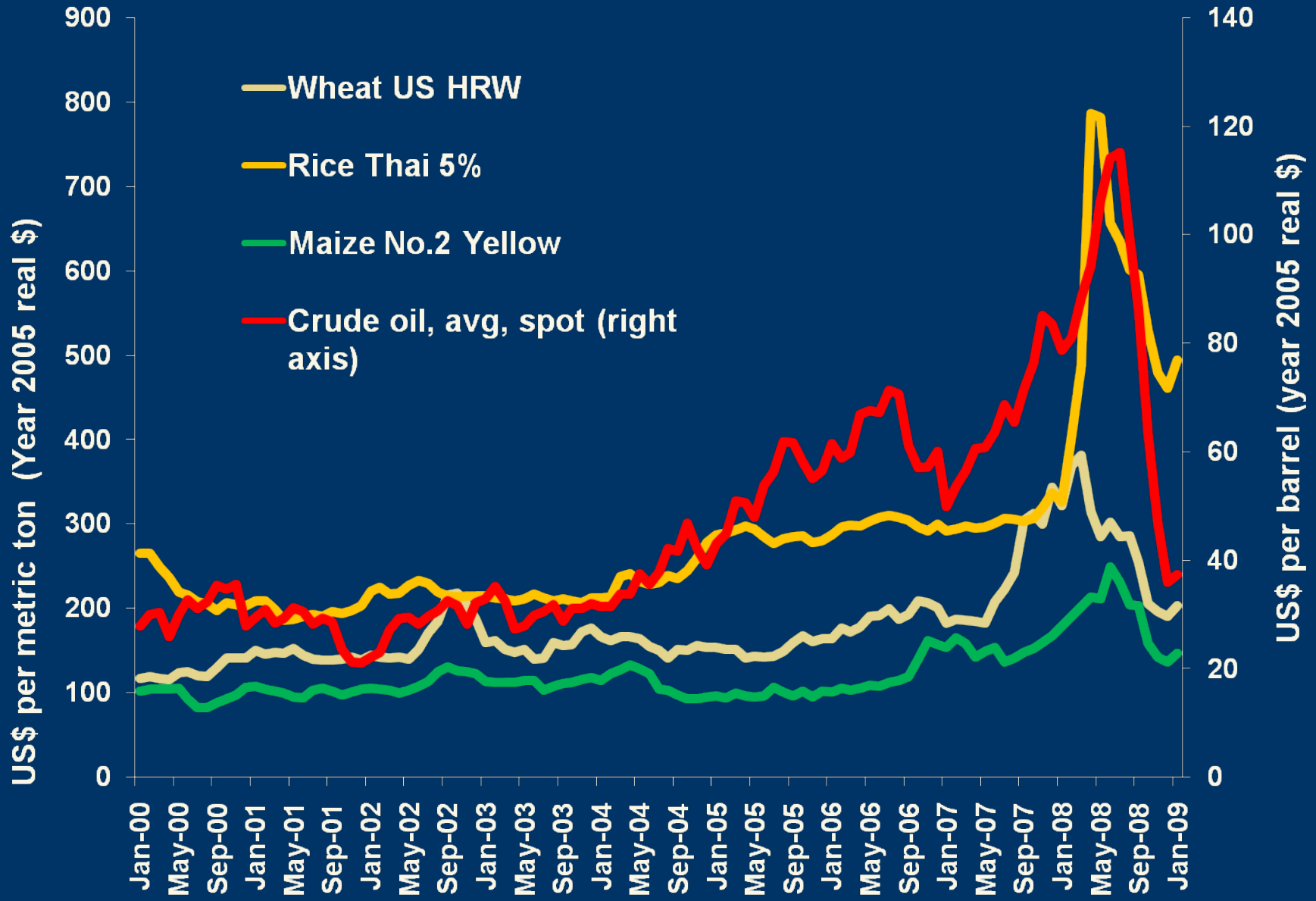
Outline

- Trends in Global Food and Energy Prices
- Contributing Factors to Food Scarcity and Price Rises: Past and Future
- Policy Recommendations for Pro-Poor Growth

Trends in Food and Oil Prices



Source: Data from WB 2009

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Contributing Factors to Food Scarcity and Price Rises: Past and Future

Contributing Factors to Food Price Rises

- Biofuels
- Rapid income growth
- Underinvestment in agricultural productivity and technology
- Water and land scarcity, production shocks (emerging climate change)
- High input and transport costs (energy price)
- Trade policy, low stocks, speculation, exchange rates

Implications of High Energy Prices: Water

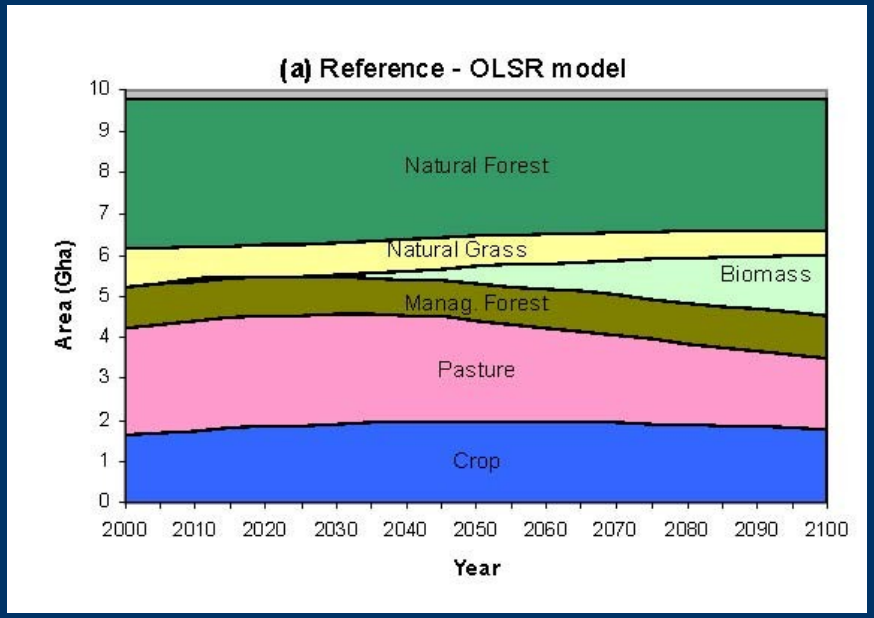
- Demand for biofuel increases demand for water
- Higher energy costs will increase the costs of water pumping, conveyance and desalinization
- Higher value of water will demand efficient allocation (markets) and conservation (precision technologies)
- Higher energy price will make water and power subsidies too costly

Source: Zilberman et al. 2008

Implications of High Energy Prices: Land

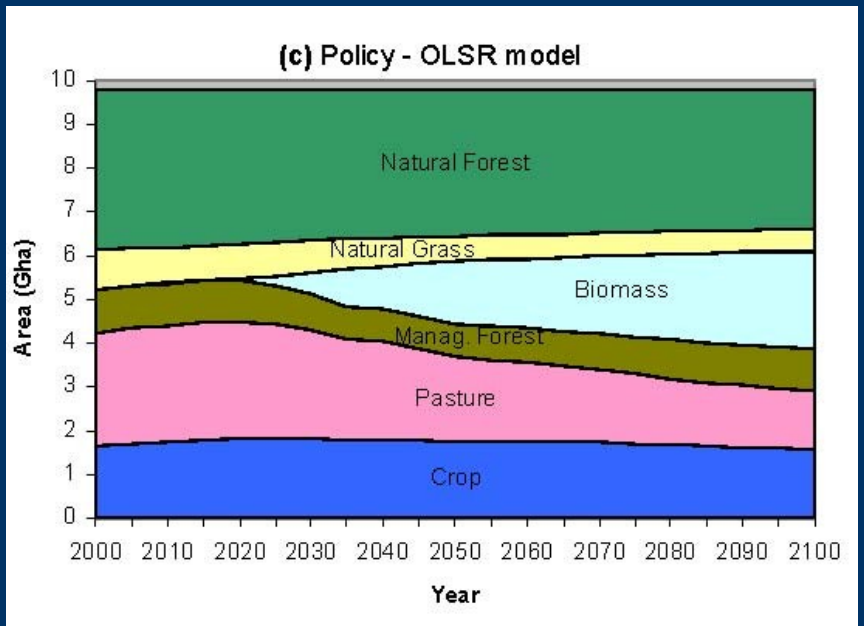
- Livestock market effects
  - Higher feed prices will cause livestock prices to go up and consumption to go down
  - Increased pressure on pasture land
- Increased demand for land will lead to less conservation and expansion of agricultural land base
  - Environmental pressure: bringing CRP land into production of energy crop
  - Future rapid expansion of biofuels for climate change mitigation

Reference Scenario: Biomass & Land Use



Reference scenario is BAU where there is no attempt to control GHG emissions. Biomass only enters when competitive with fossil fuels.

Emissions Mitigation Scenario

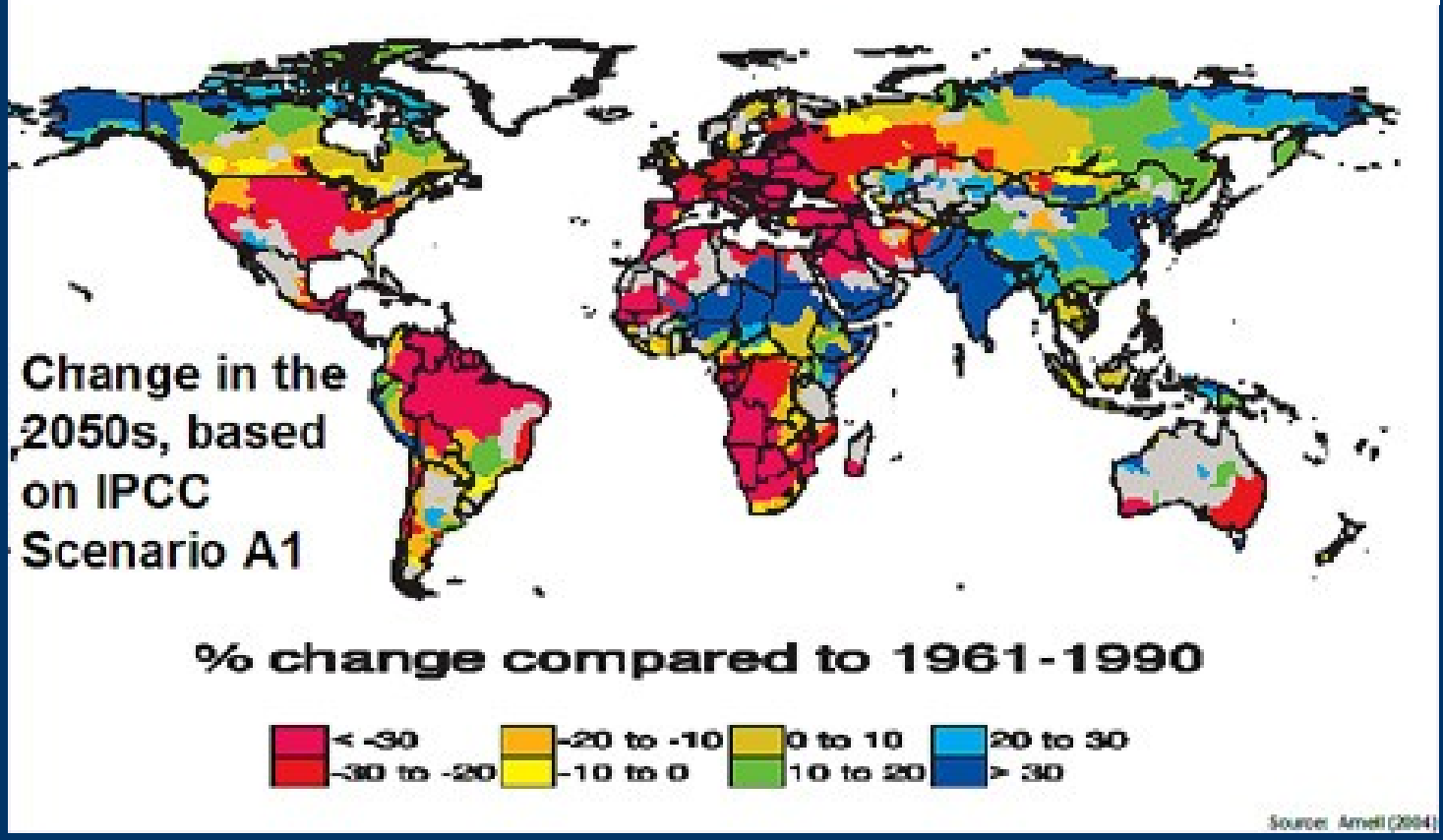


Policy Scenario includes a cumulative reduction of emissions of 40% from 2012 to 2100, where limits on fossil fuel usage spur biomass conversion.

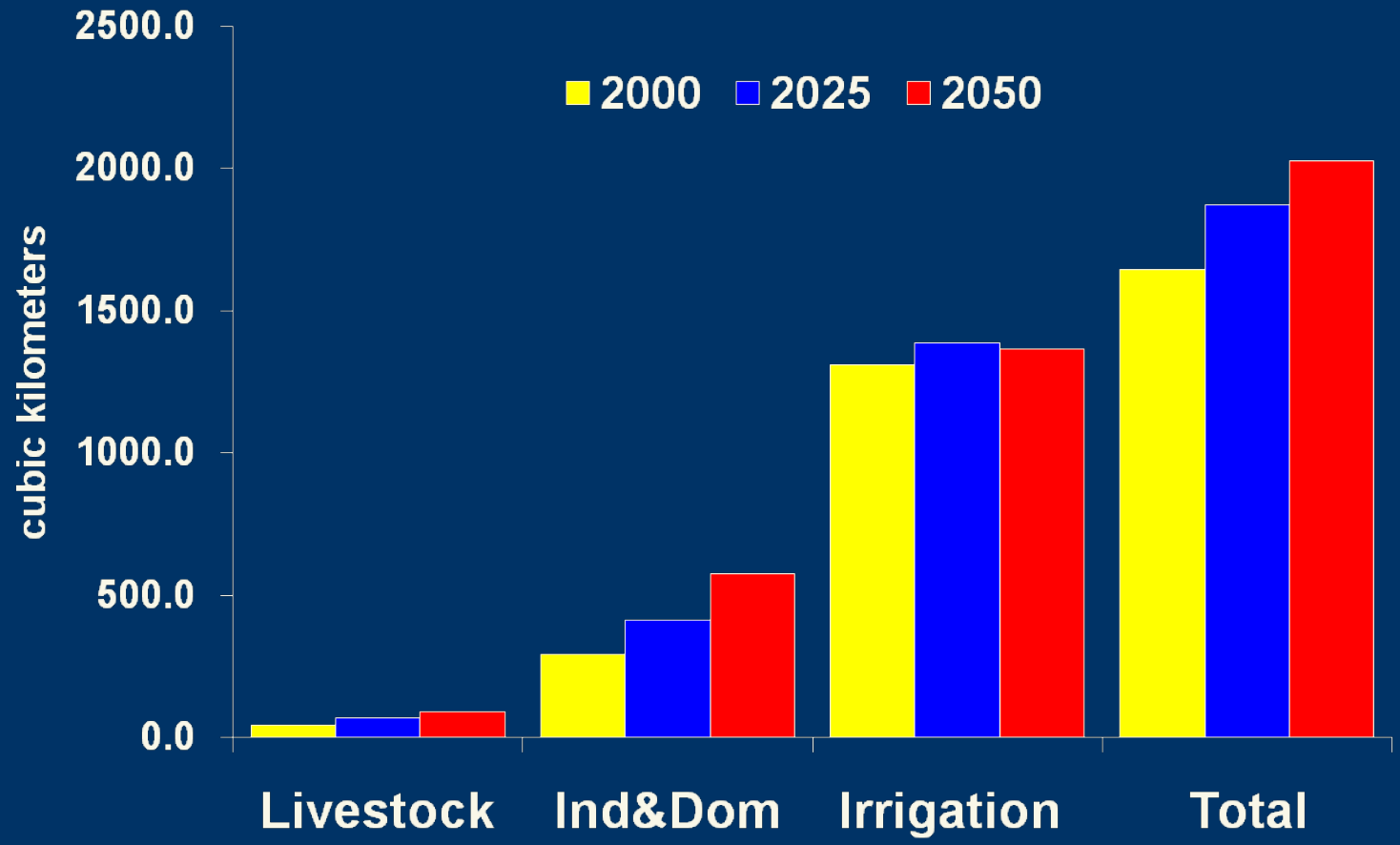
Source: Gurgel et al. 2007

Global Annual Run-off

Climate change will lead to major changes in water availability across the globe, with consequences for droughts and floods

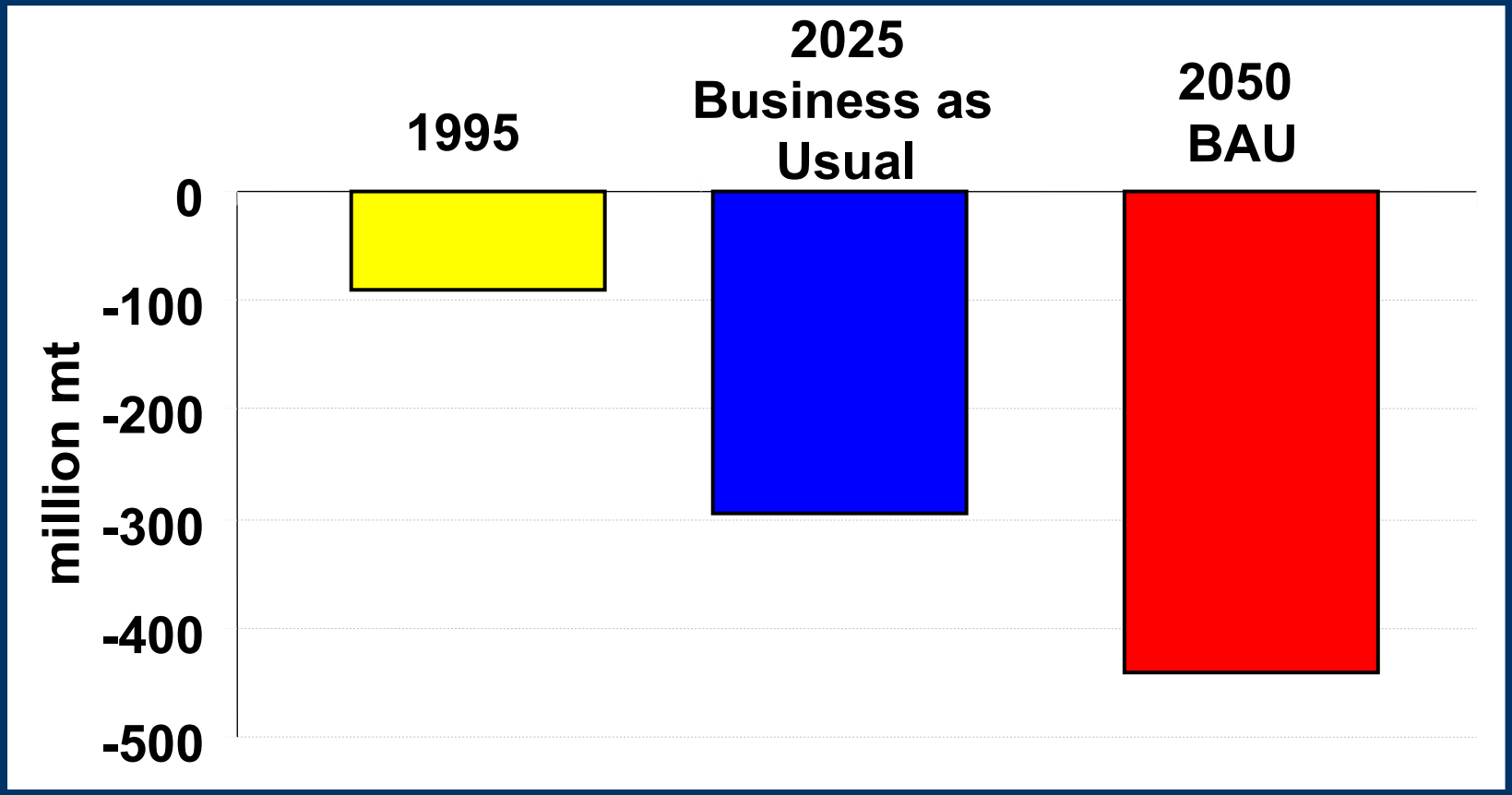


Projected water consumption by sector, 2000, 2025 and 2050



Source: IMPACT Model Projections

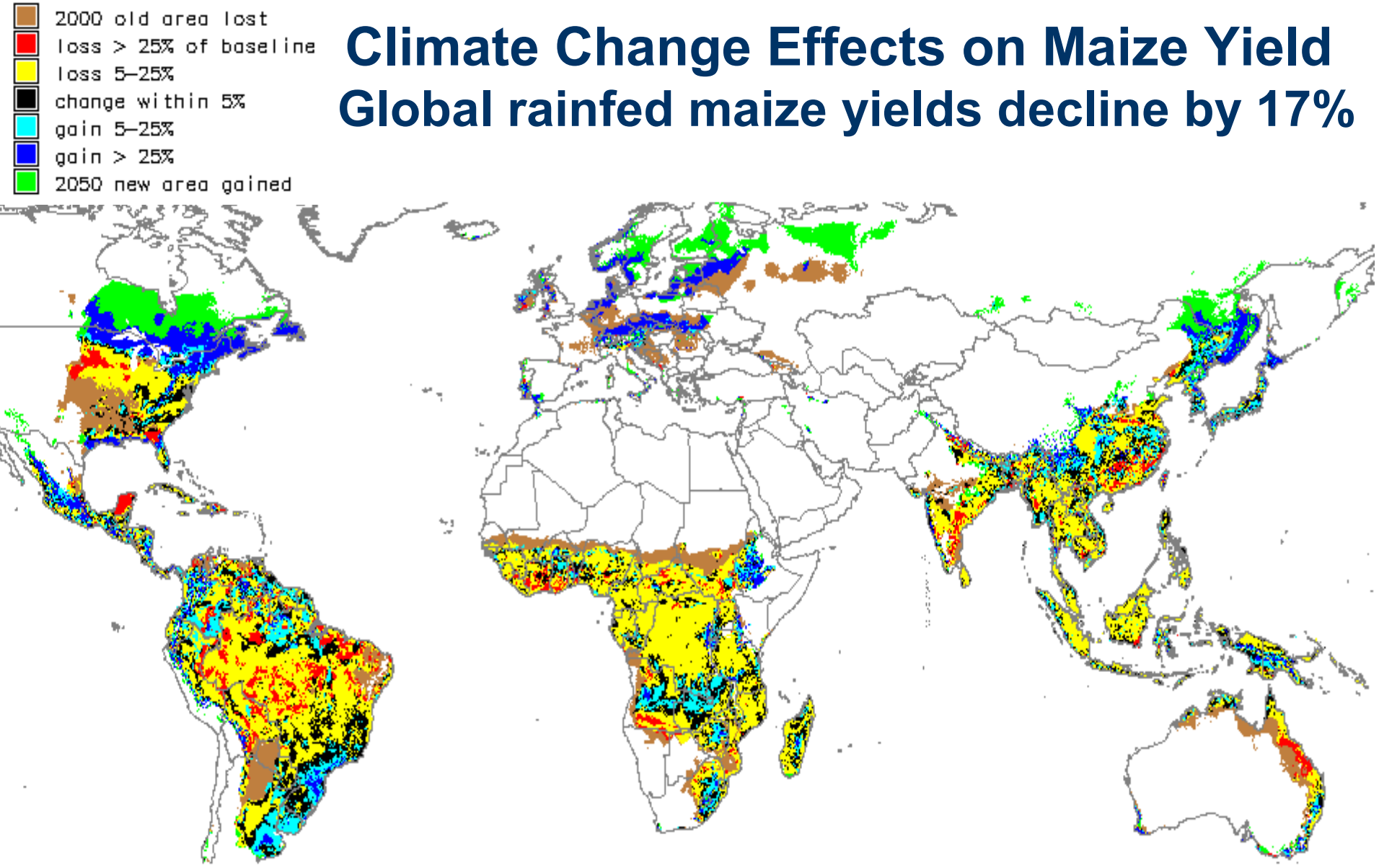
Loss of grain production due to water scarcity, developing countries



Source: Rosegrant et al. 2002. World Water and Food to 2025: Dealing with Scarcity; IFPRI IMPACT simulations, 2008

Climate Change Effects on Maize Yield

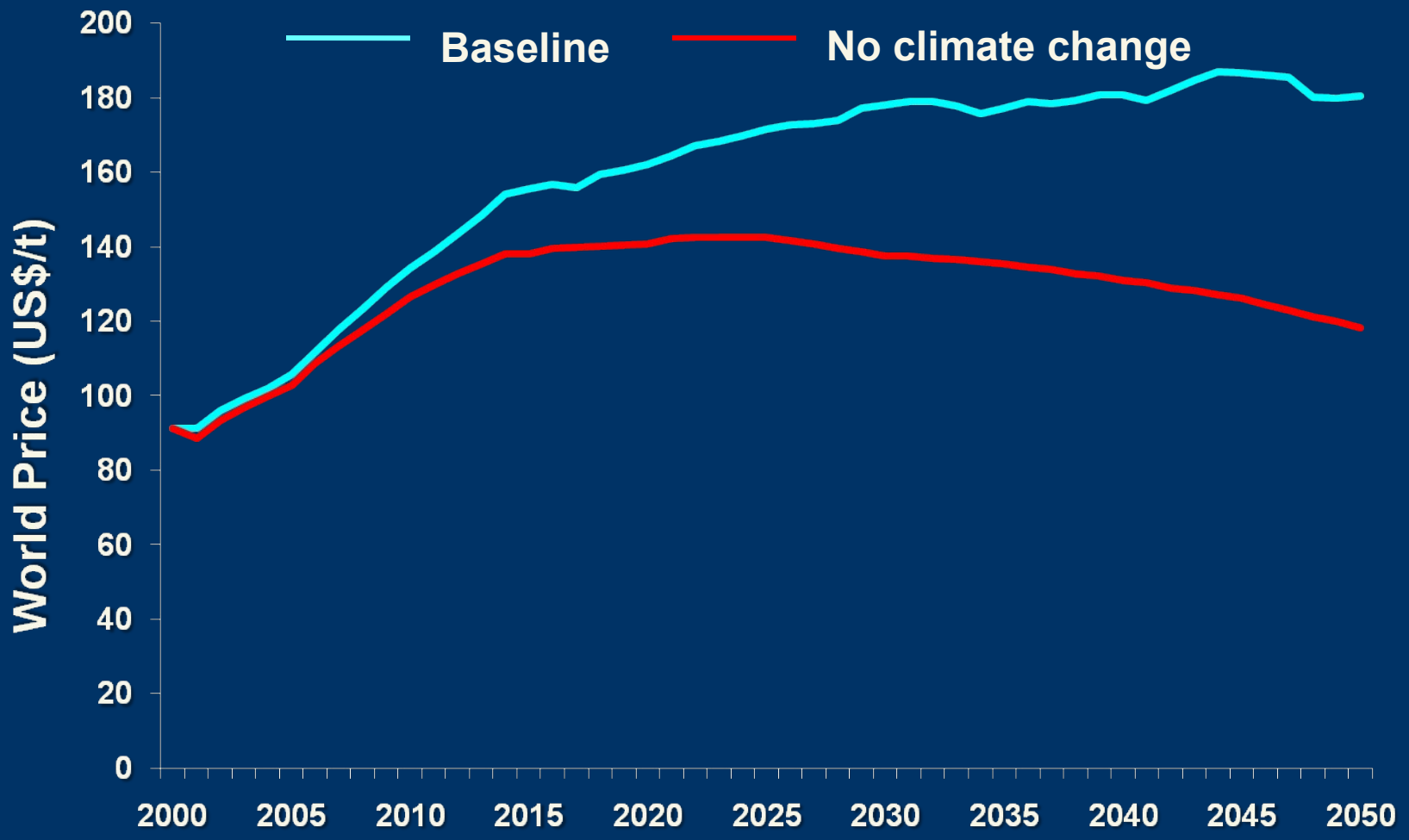
Global rainfed maize yields decline by 17%



Hadley GCM, SRES Scenario A2a, Maize Variety IB0041

Source: G. Nelson, J. Koo, R. Robertson, "Simulating the Yield Consequences of Climate Change: Combining Crop Models with Location-specific Climate and Physical Constraints", EPTD, IFPRI, in draft

Global Price of Maize: Baseline and Without climate change, 2000-2050



Source: IFPRI IMPACT simulations for HadCM3/SRES B2 scenario (with IMAGE temperature and CO2 fertilization effects, April, 2008)

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POLICY DIRECTIONS

Investments in Agricultural Research and Technology

- Increasing crop productivity: agricultural research, water management, and rural investment
  - Emphasis on crop breeding (including biotechnology) targeting abiotic and biotic stresses
  - Water harvesting, minimum tillage, integrated soil fertility management
  - Rural infrastructure investment to improve access to markets, risk insurance, credit, inputs

Integration of Energy and Climate, and Agricultural Growth Policies

- Need full integration of policies aimed at agricultural growth, biofuels and energy, climate change and carbon sequestration
- Dealing with competing demands for land and trade-offs with environment can only be met by bringing externalities into the growth equation

Create and Expand Markets in Natural Resources

- Establish economic incentives for water use
- Expand markets for environmental services (watershed management, biodiversity)
- Develop markets for agricultural and forest carbon, generating new value streams in rural areas through carbon mitigation