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# Climate Change, Water, and Food Security

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(SAIS) & Center for Strategic & International Studies (CSIS)  
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# Outline

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- **Drivers of Agricultural Growth**
- **Impacts of Climate Change on Agriculture and Food Security**
- **Policy Directions**



# Drivers of Agricultural Growth

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- **Demand drivers**

- Demand and prices for food, feed, energy (biofuels)
- Emissions mitigation and carbon sequestration
- Urbanization and income and population growth
- Non-market ecosystem services
- Biodiversity

- **Supply drivers**

- Science and technology policy
- Investment in agricultural research
- Climate change
- Water and land scarcity



# Implications of High Energy Prices: Water

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- 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

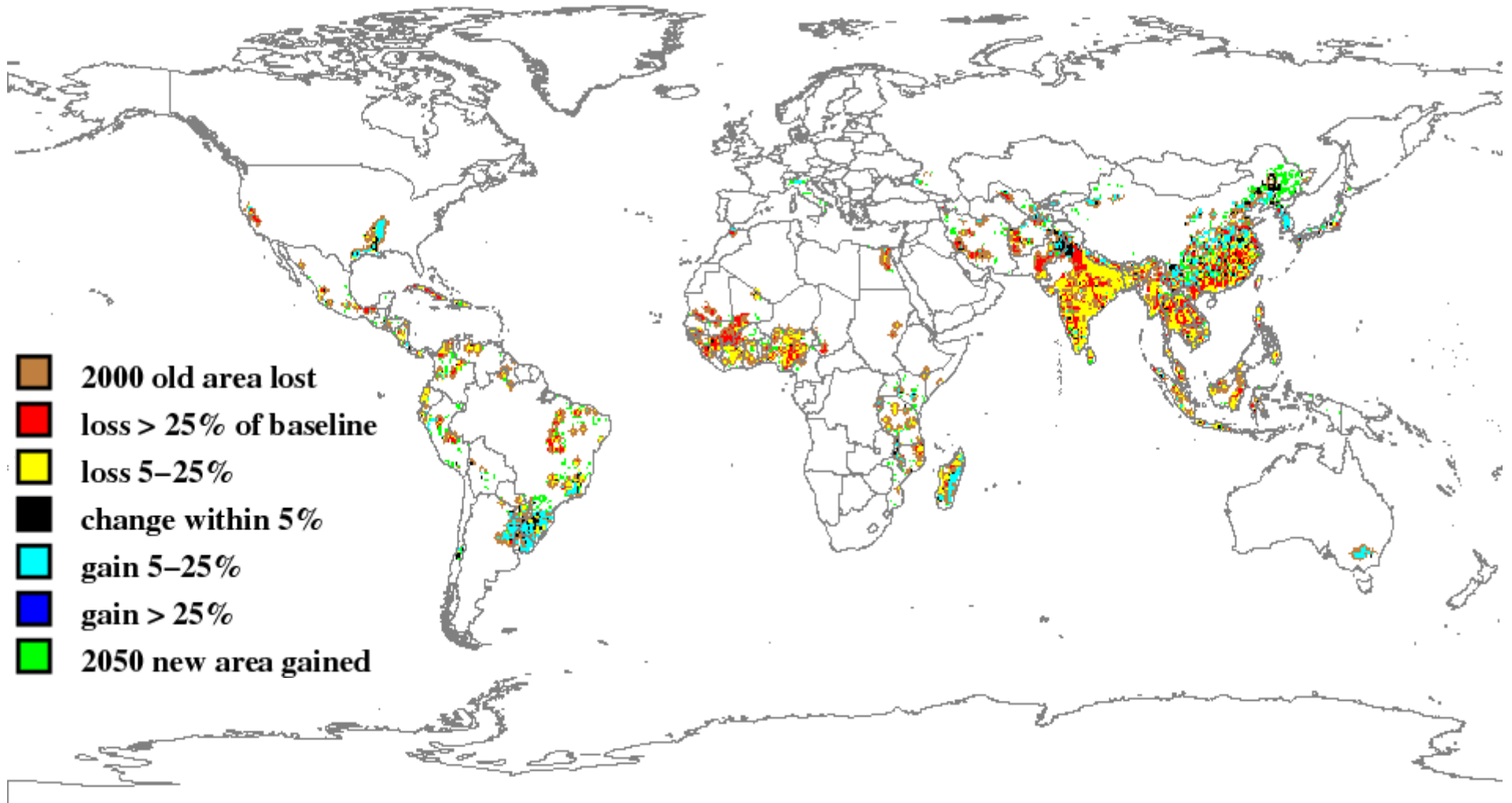




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# IMPACTS OF CLIMATE CHANGE ON AGRICULTURE AND FOOD SECURITY

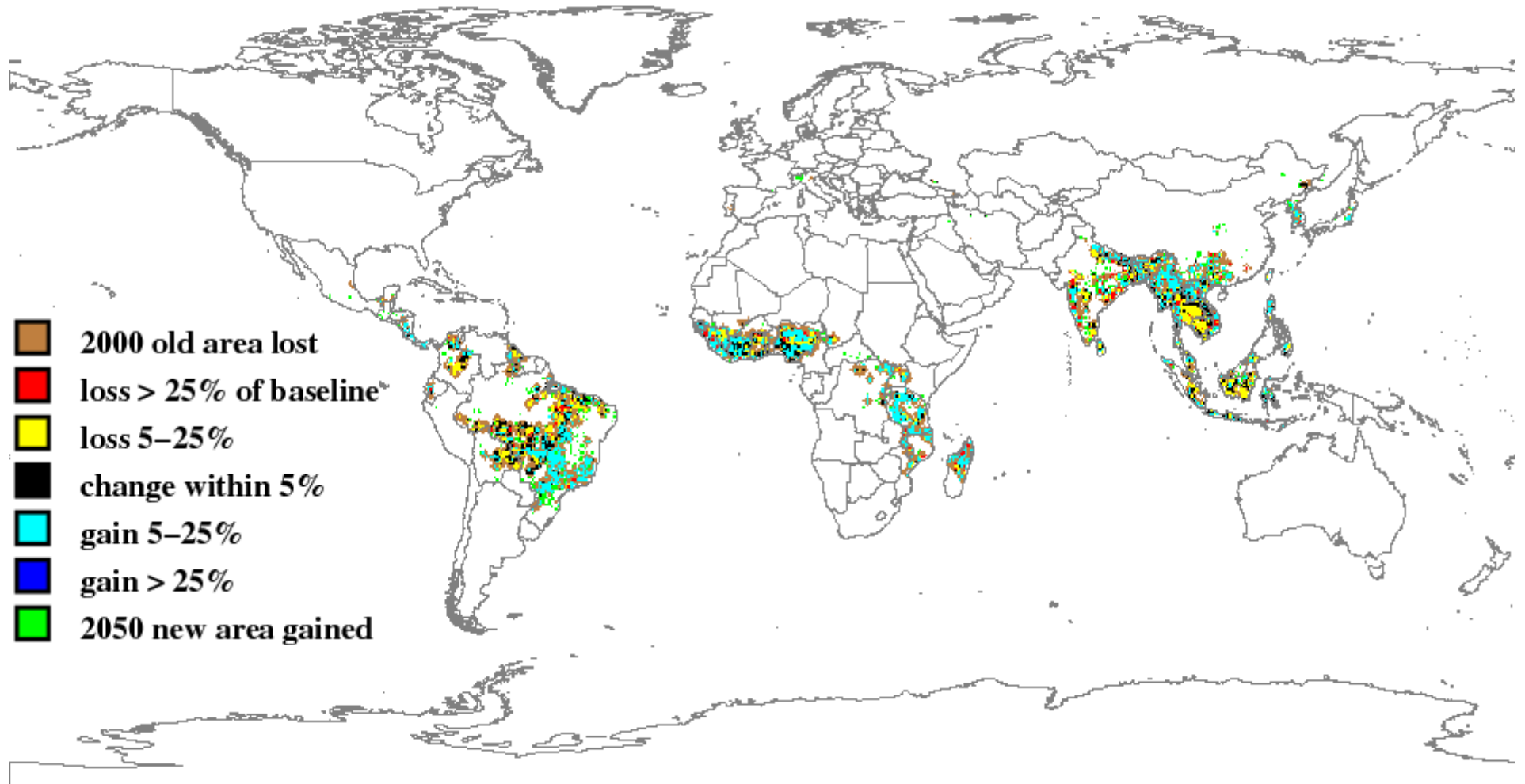
# Climate induced percentage change in production in 2050: **Irrigated Rice**



**Global production = -27%**

**NCAR A2**

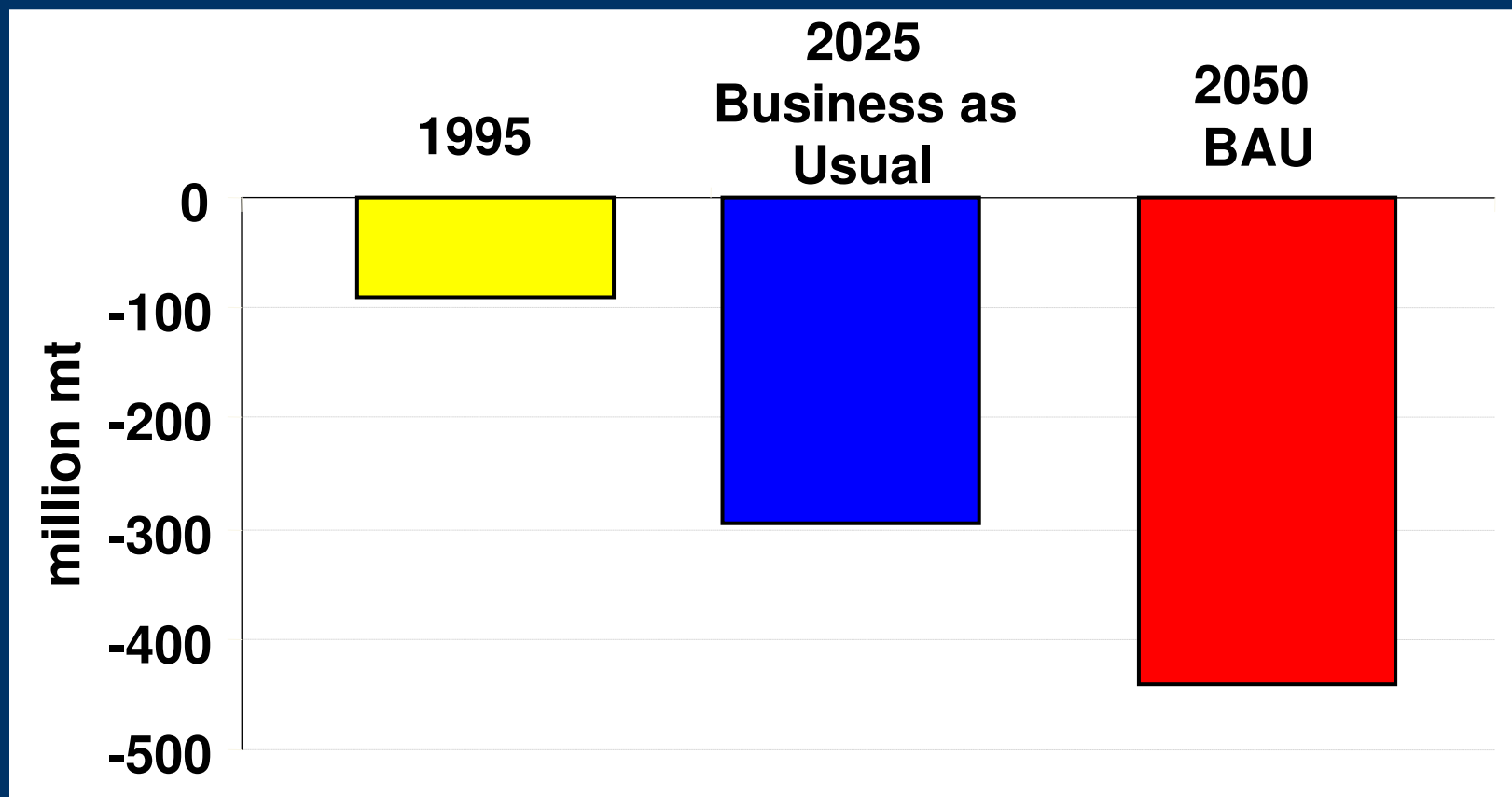
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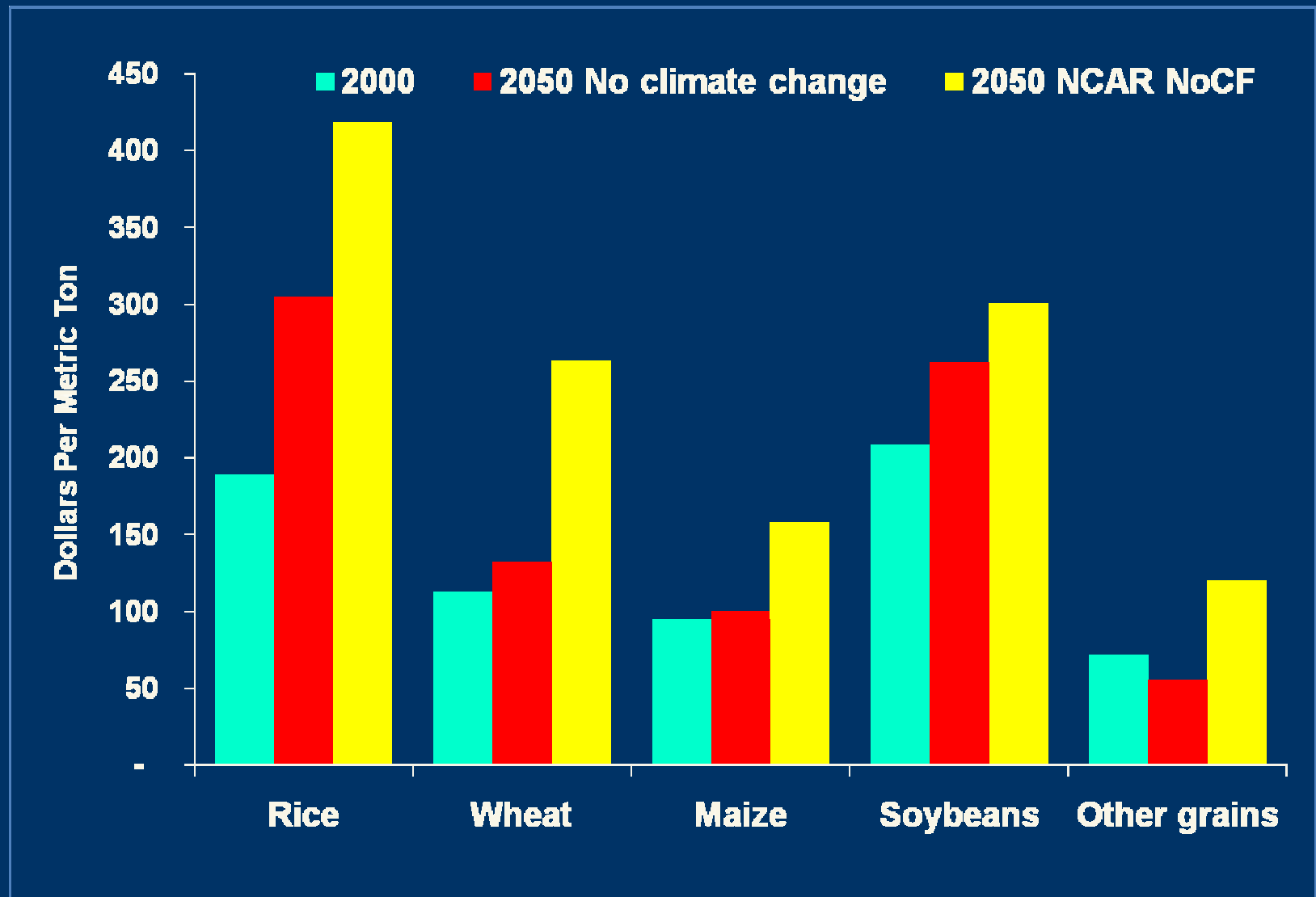
# Loss of grain production due to water scarcity, developing countries



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



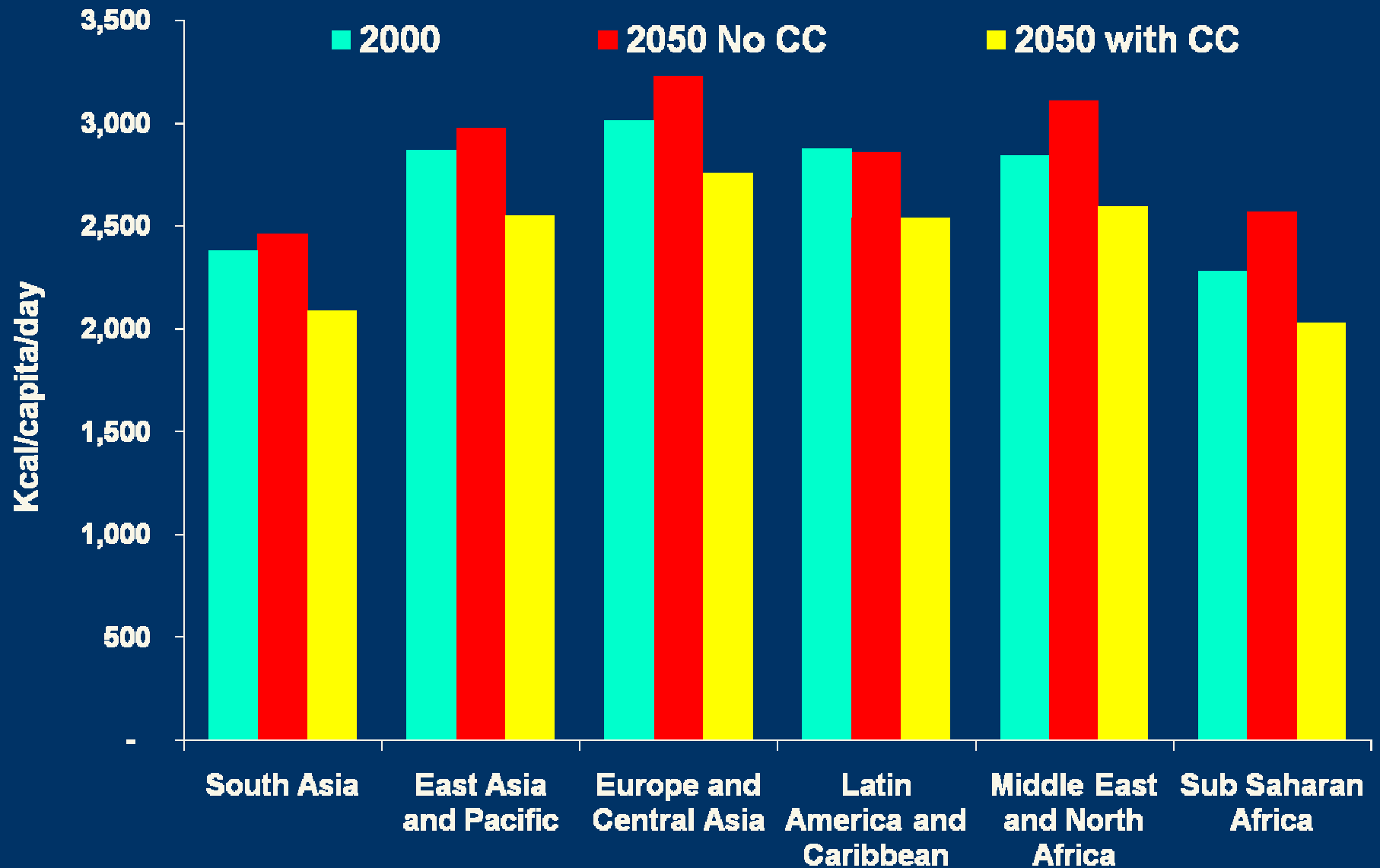
# Impact on International Food Prices



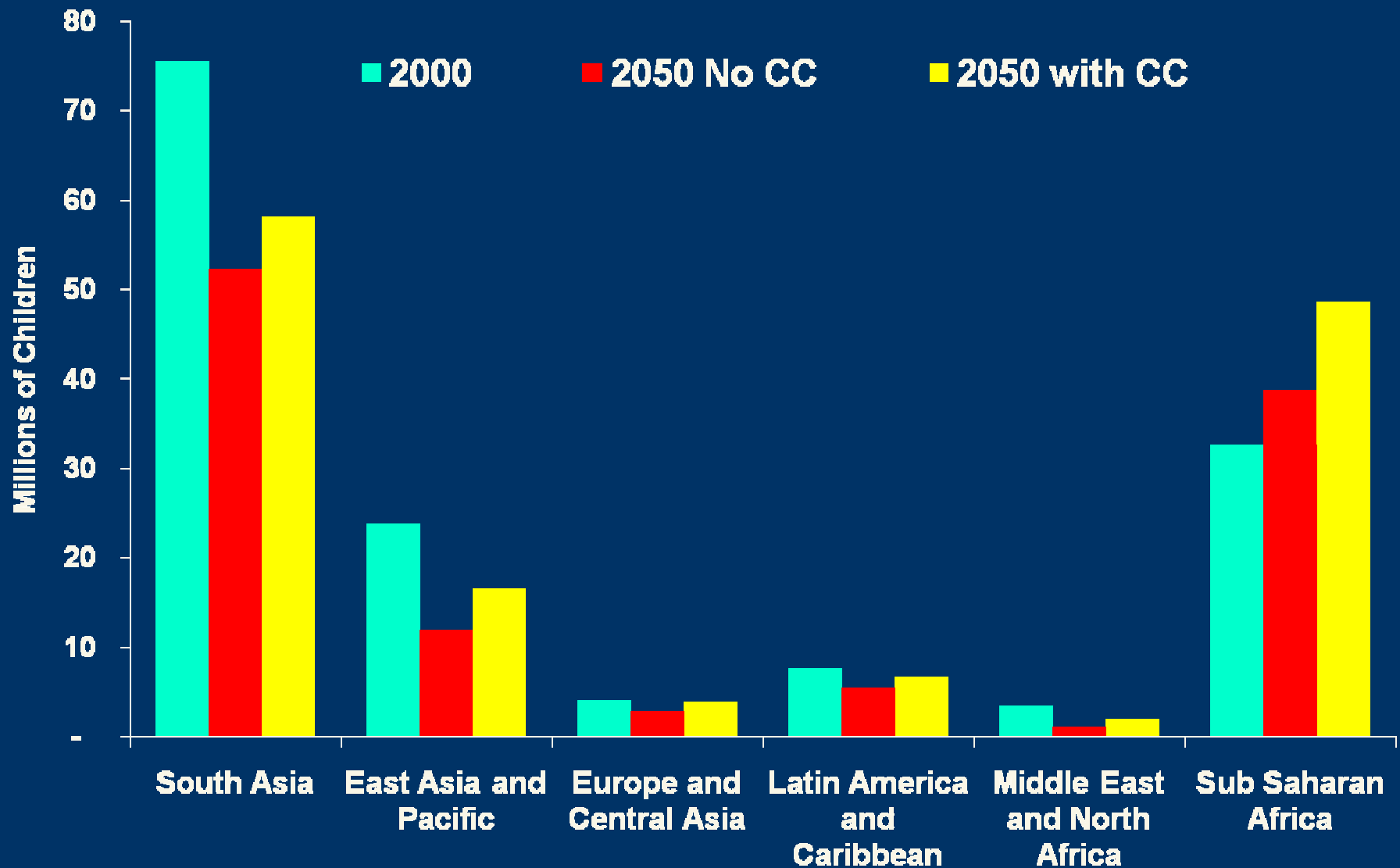
IFPRI

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# Impact on Calorie Availability



# Impact on Childhood Malnutrition





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# POLICY DIRECTIONS

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# Investments in Agricultural Research and Technology

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



# Water and Irrigation Investment

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- **Increased investment in household water supply and sanitation**
- **Selective investments to expand and improve irrigation, drainage and storage**
  - **Technological development (drip, micro-sprinkler, real-time management)**
  - **High financial and environmental costs, but some expansion necessary**
- **Increasing profitability of storage means expanded opportunities**



# **Create and Expand Markets in Natural Resources**

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- **Integrate policies aimed at agricultural growth, biofuels and energy, climate change and carbon sequestration**
- **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**

