Climpag Climate Impact on Agriculture

TURKISH INDUSTRIALISTS' AND BUSINESSMEN'S ASSOCIATION

Climate Change: Turkish Agriculture and Food Industry
5 October 2007
Ceylan Intercontinental Hotel, Istanbul

Can we really believe climate change impact assessments on agriculture?

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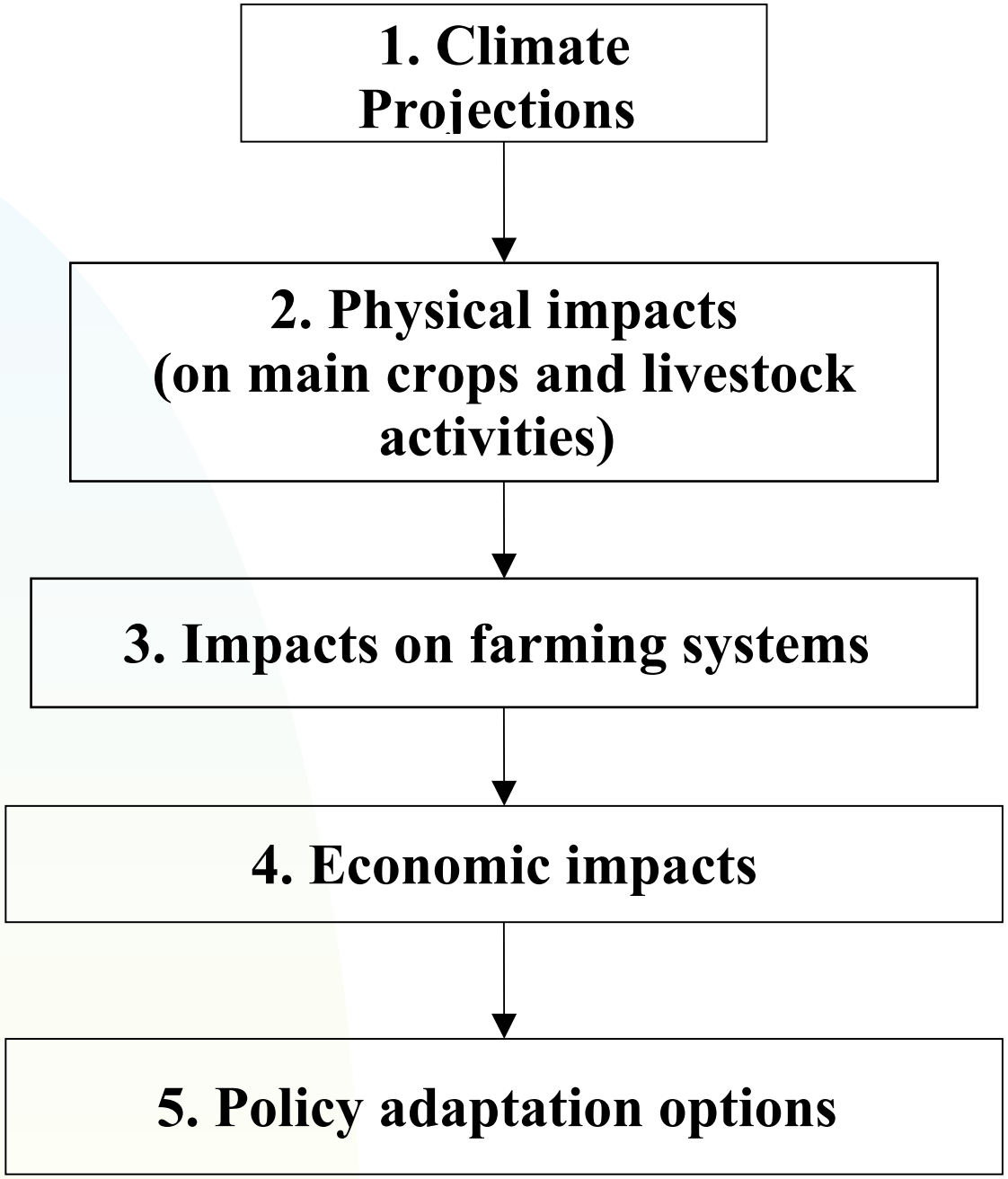
Environment, climate change and bioenergy division

TÜSİAD

Overall method and sources of errors

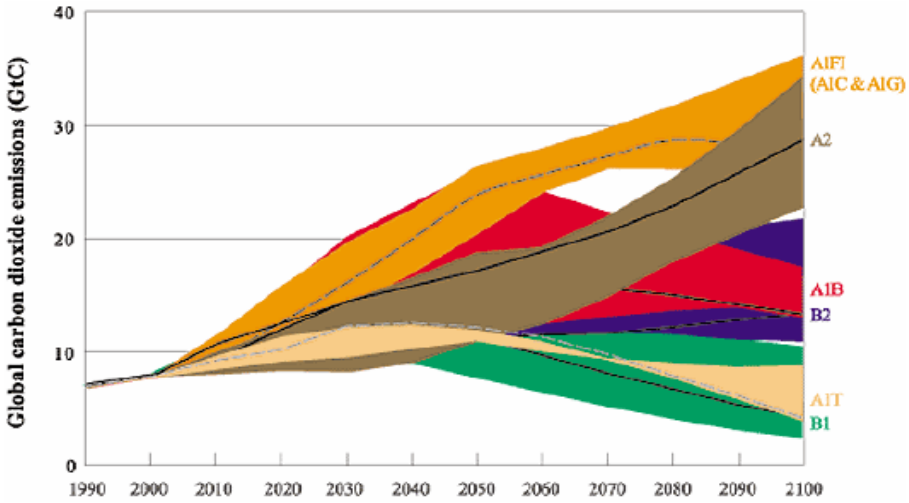


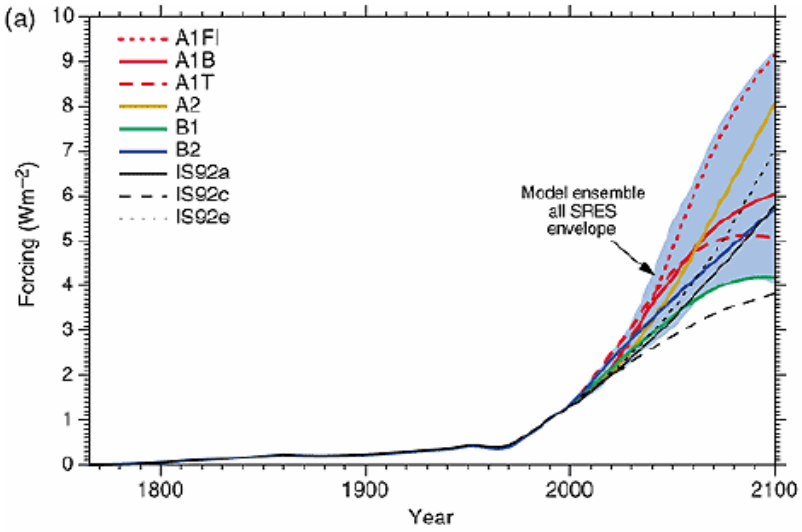
Source: the World Bank - Kingdom of Morocco: Adaptation to climate change in the agriculture sector
Concept Note
September 2007

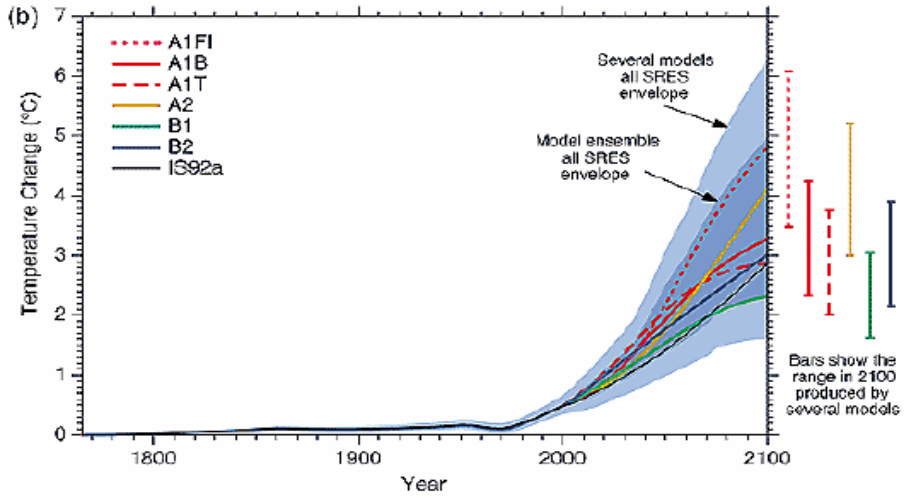
- Climate projections
- Physical impacts on main crops
- Impact on farming systems
- Economic impacts
- Policy

Climate projections

Scenario Causal Chain





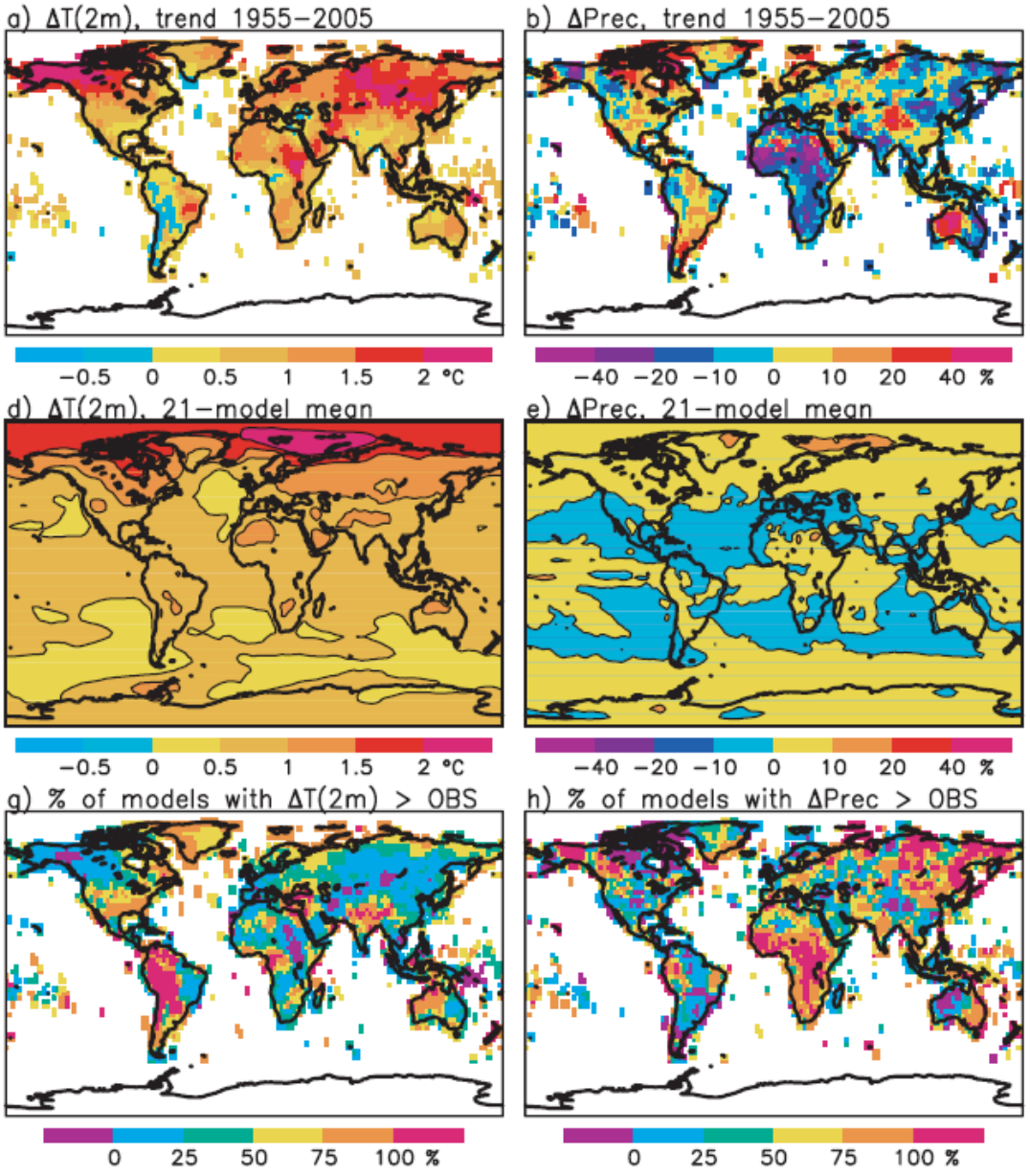


Source: IPCC, TAR

Secondary source: de la Chesnaye, US/EPA, 2007

IPCC scenarios (IPCC, 2000)

- A1- very rapid economic growth
  - population peaks in mid-century and declines thereafter
  - rapid introduction of new and more efficient technologies
- A2 - very heterogeneous world
  - continuously increasing global population
  - regionally oriented economic growth that is more fragmented and slower than in other storylines.
- B1 same global population as in A1 but
  - rapid changes toward a service and information economy
  - reductions in material intensity
  - introduction of clean and resource-efficient technologies
- B2 emphasis is on local solutions to economic, social, and environmental sustainability, with continuously increasing population (lower than A2) and intermediate economic development

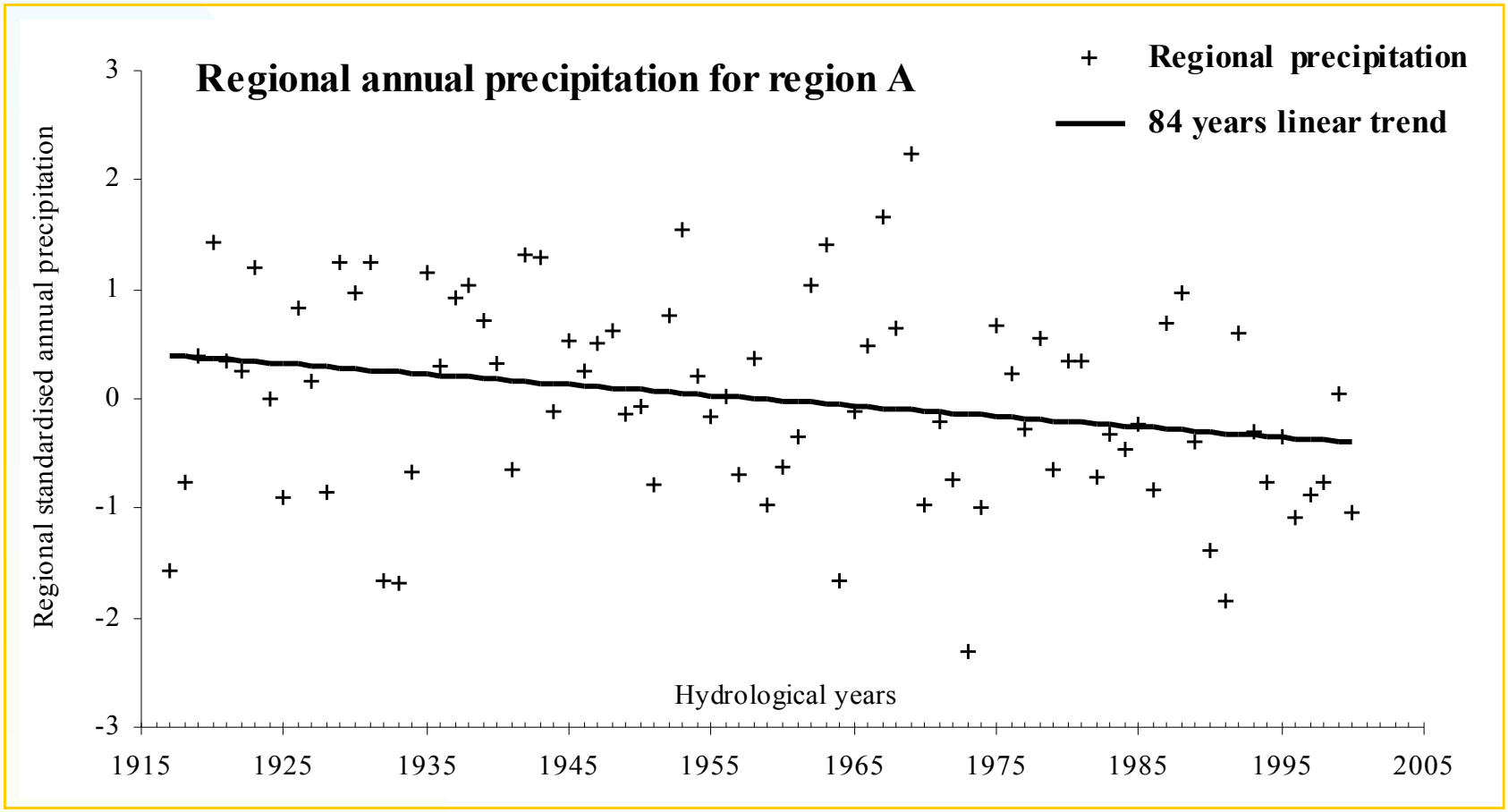


How reliable are climate models?

Performance of 21 GCMs

Räisänen, 2007. Tellus (2007), 59A, 2–29

Rainfall trend in Cyprus (1915-2000)



TCP/CYP/8921, F. Rossel (2001): Reassessment of the island's water resources and demand

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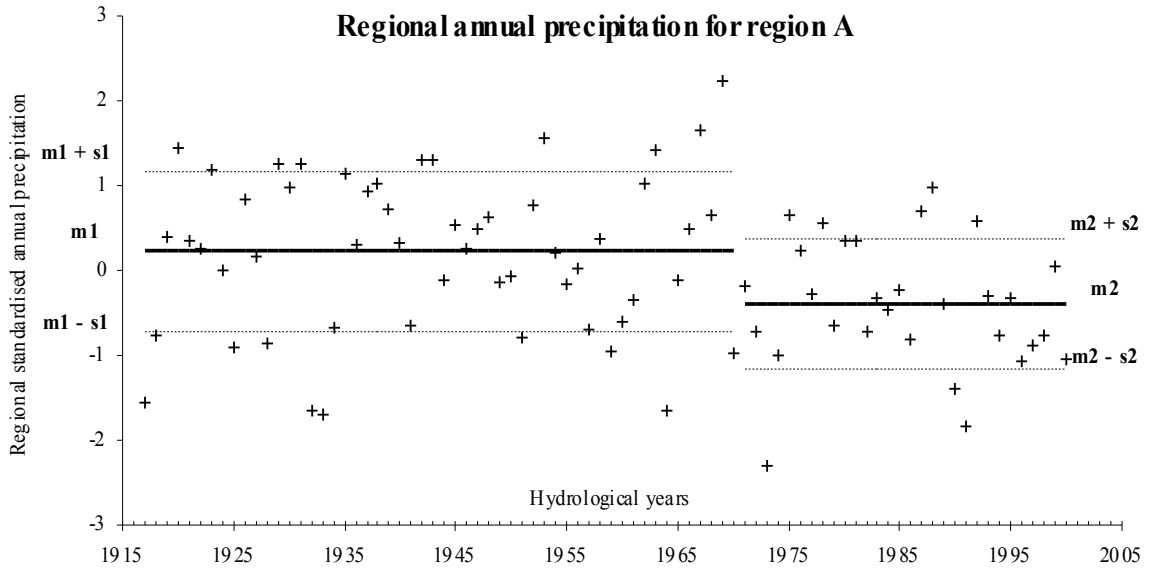

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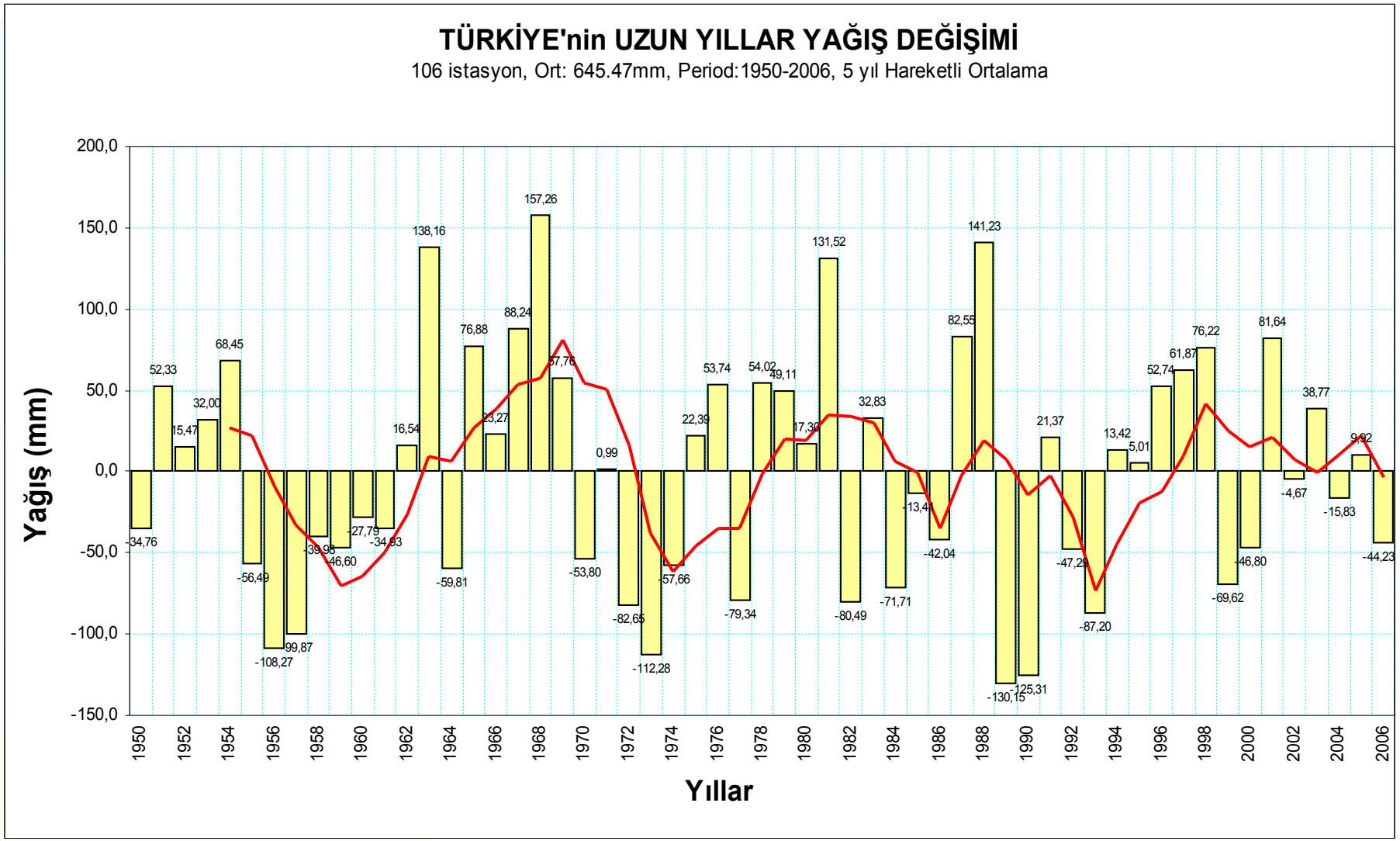

Source: TARIM VE KÖYİŞLERİ BAKANLIĞI
TÜRKİYE TARIMSAL KURAKLIK EYLEM PLANI (TAKEP), ANKARA – 2007

In a nutshell:

- Emission scenarios are based on socio-eco-political assumptions about the future
- GCMs (21 of them!) generate smooth curves of future climate, without weather, over large areas (typically 100 km x 100 km)
- Weather is local. Future weather is produced by adding “stochastic weather” to the smooth climate
- “stochastic weather” generators are calibrated against an “arbitrary length” of current weather

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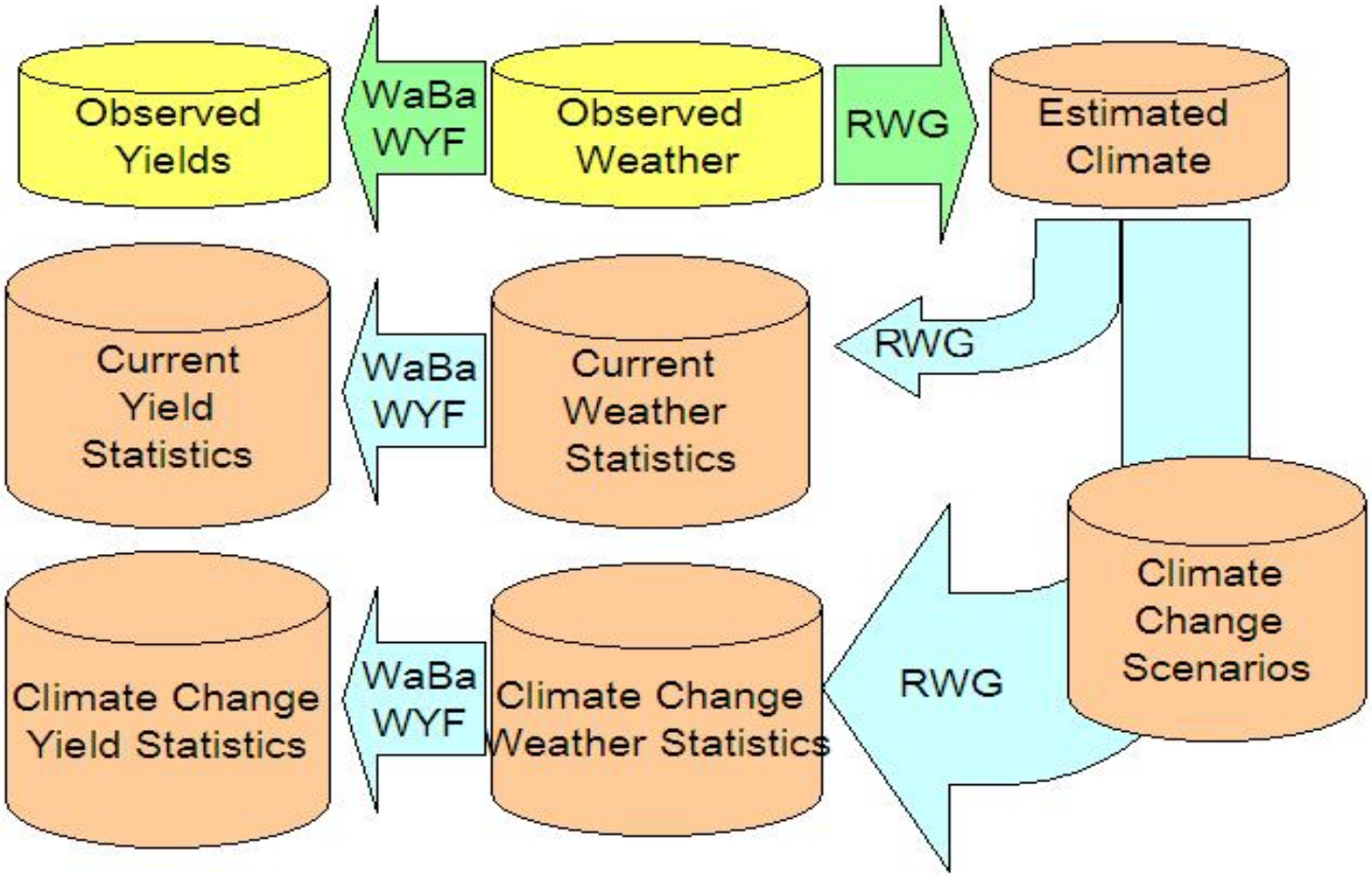
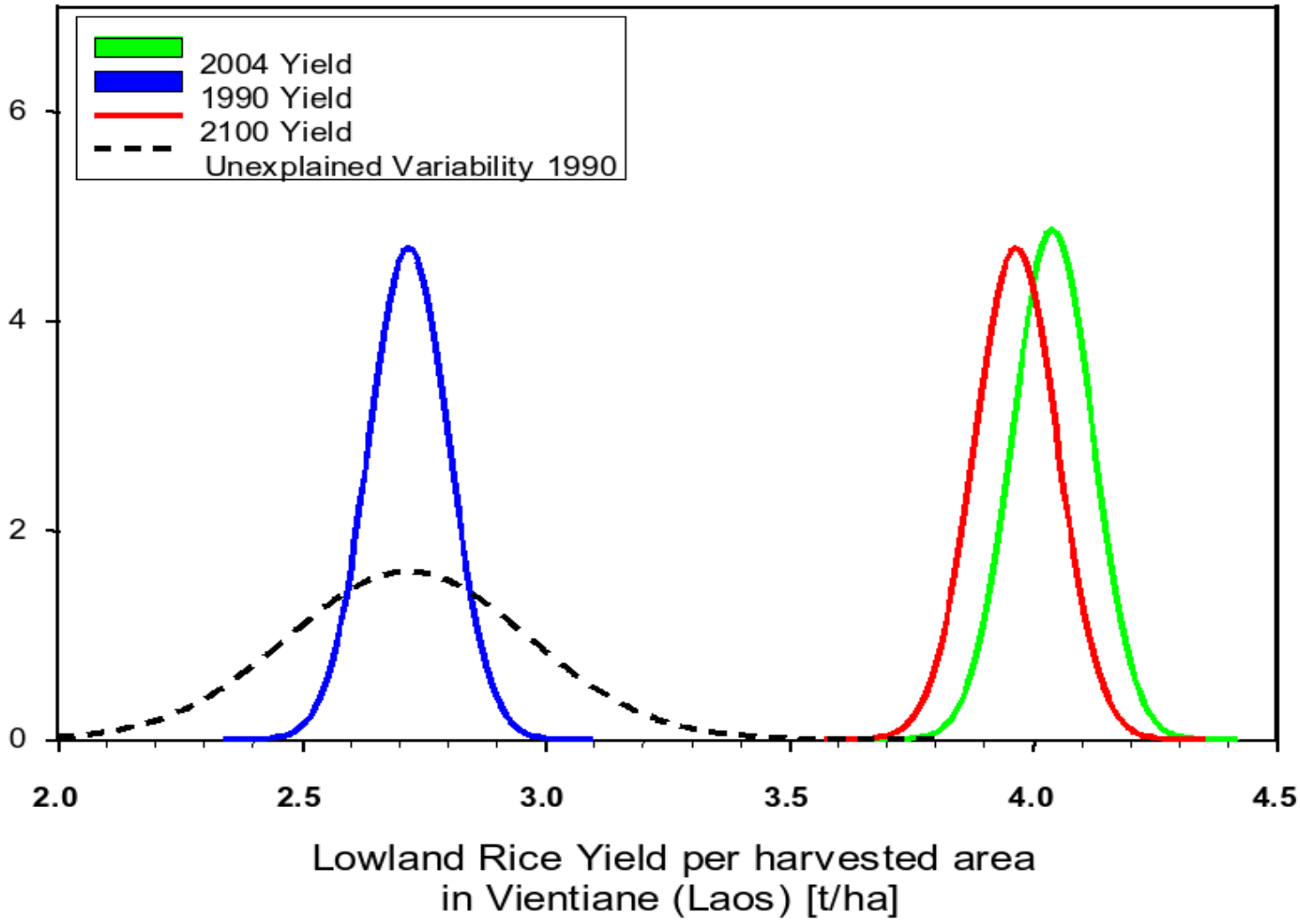
Physical impacts on main crops

FAO yield impact methodology



Statistical distribution of future yields



Climpag
Climate Impact on Agriculture

In a nutshell:

- Several methods exist to assess impact of climate/weather on crops
- Some like the FAO approach, worsen over time, but they are good now, and tomorrow
- Classical simulation models are “time constant” (equally bad or good throughout, by unknown factors)

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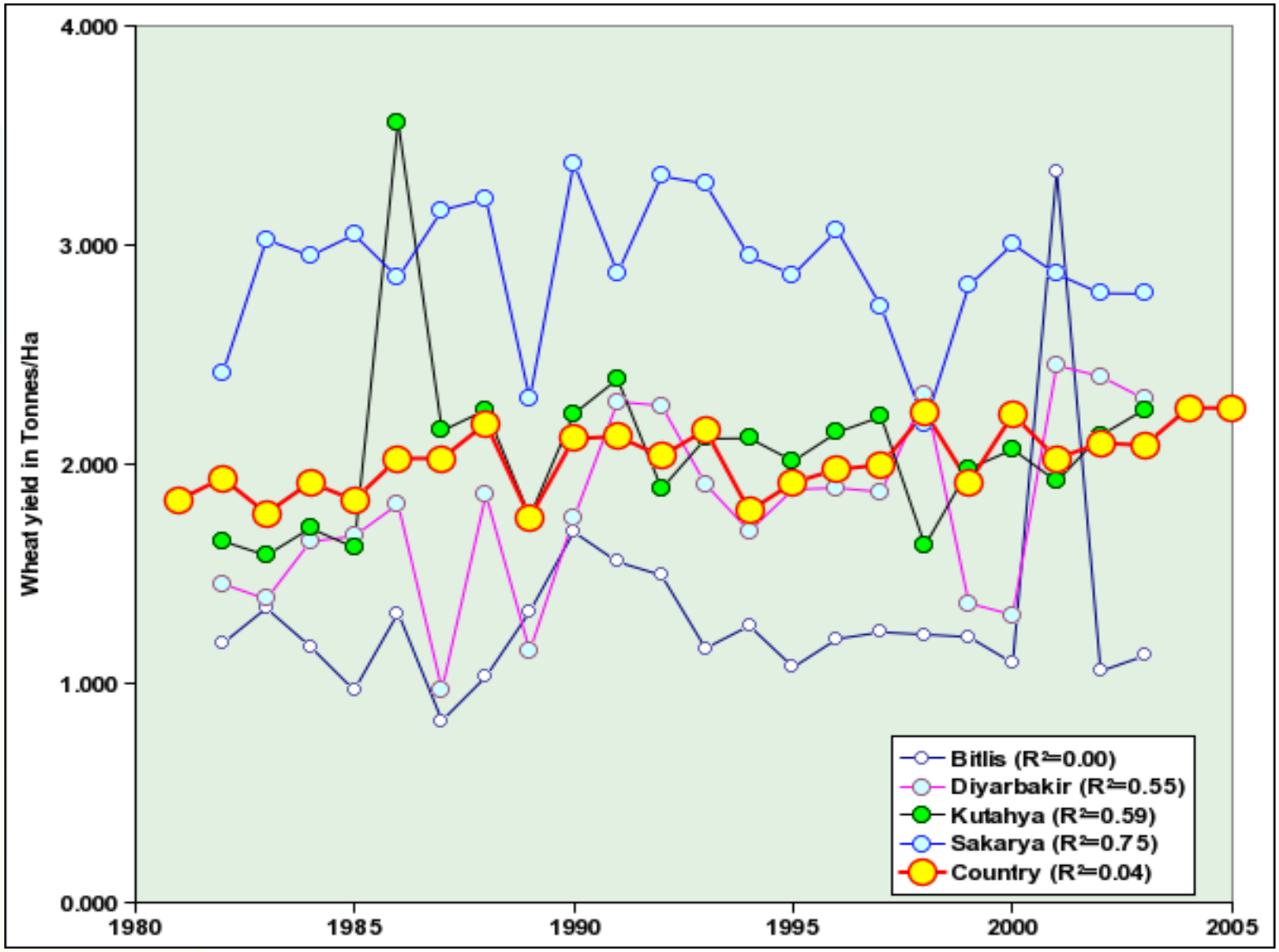
Impact on farming systems

Non-crop factors play a part...

- Typical fuzzy variable: yield trends
- Adaptation
- Changing crop suitability patterns
- Extreme factors

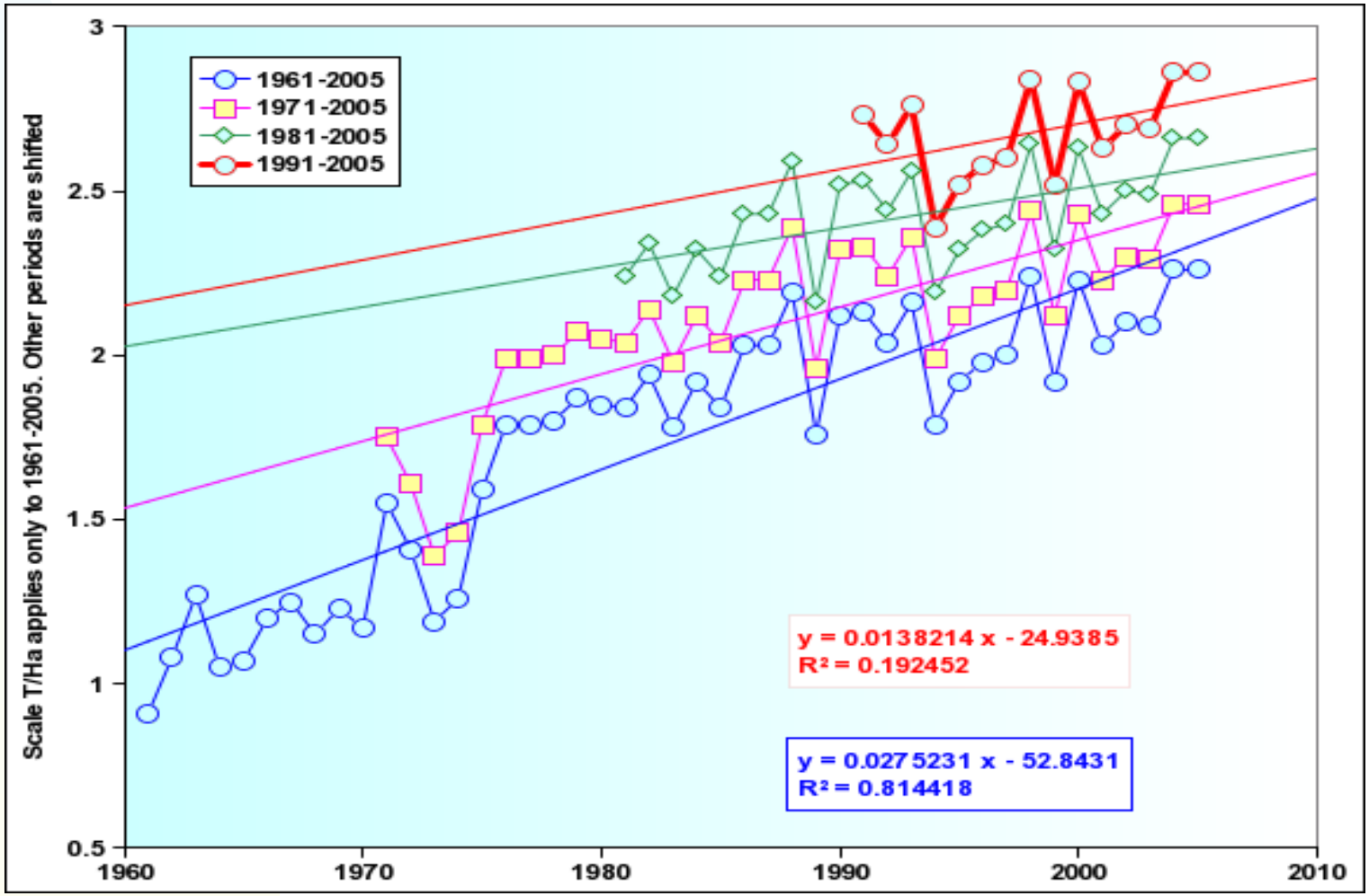
Step 1: select your spatial scale

(wheat yield in Turkey)



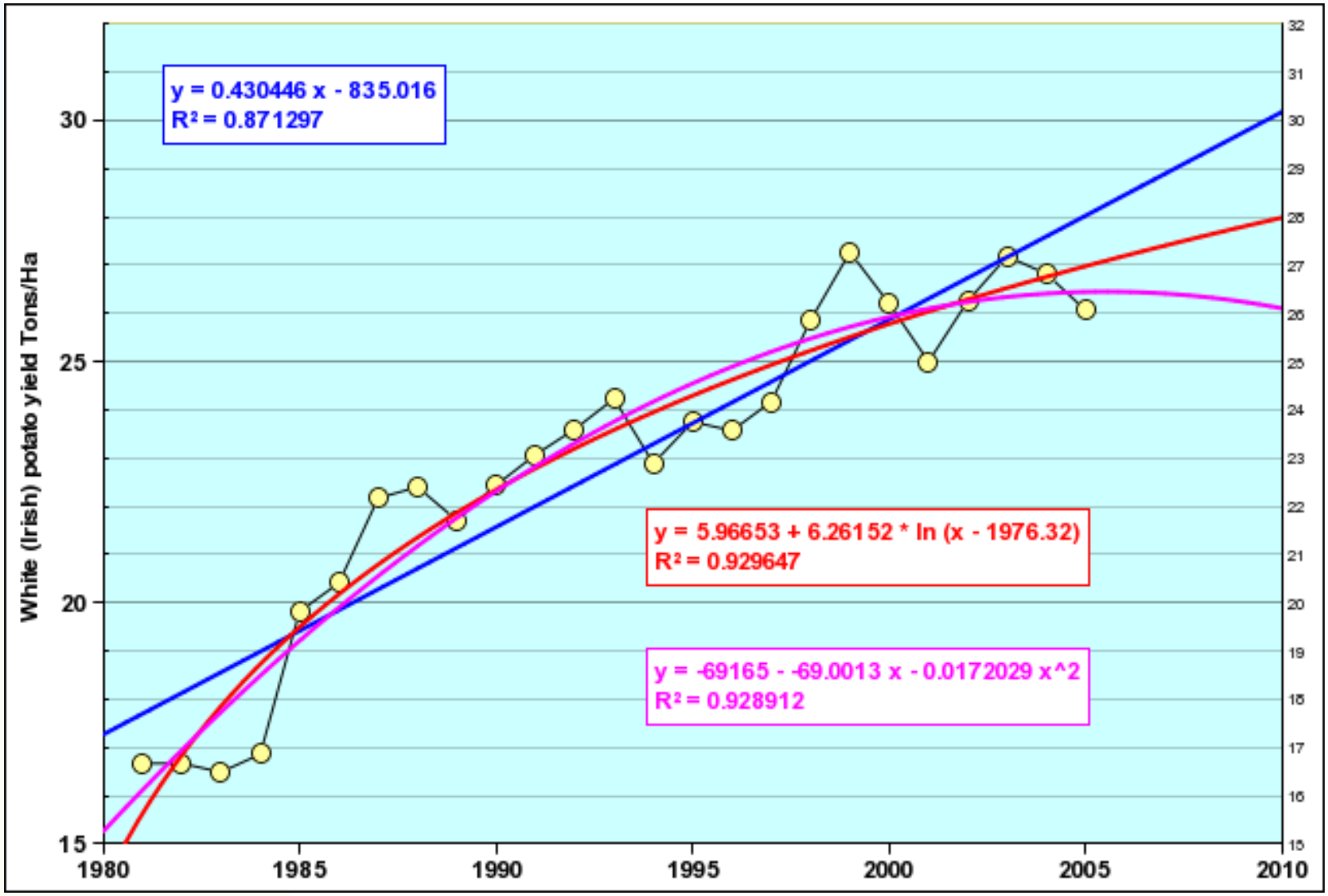
Step 2: select reference period

(Wheat in Turkey)

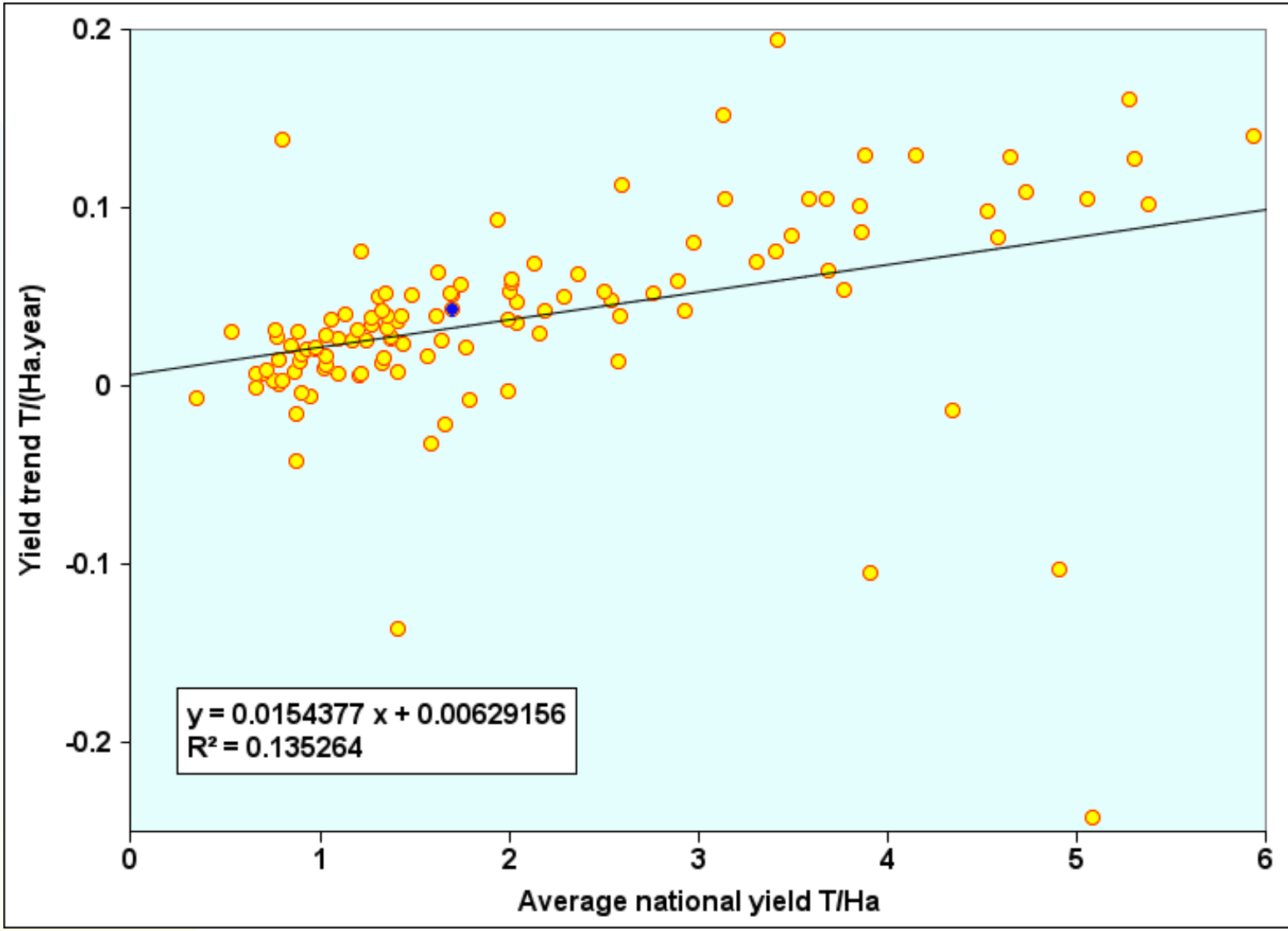


Step 3: chose your trend!

(Potato yields in Turkey)



National wheat yield (1961-93)



Adaptation (to CC)...

- is an iterative process
- assumes farmers are rational
- has many non-climatic components
- operates at different scales (individuals, governments)
- is not instantaneous
- many innovations are not so new...

Adaptation Options

- Possible at various levels - farmer, economic agent, macro
- Potential and costs of adaptation - possibly through historic analysis of technology penetration
- Reilly and Schimmelpfennig (1999) show the relative speed of adoption of various measures:

Adaptation Measure	Adjustment Time (years)
Variety Adoption	3-14
Dams and Irrigation	50-100
Variety Development	8-15
Tillage Systems	10-12
Opening New Lands	3-10
Irrigation Equipment	20-25
Fertilizer Adoption	10

In a nutshell:

- We don't know what the crops of the future will be
- We have to make assumptions about several trends
- The mechanisms of adaptation are poorly understood
- Future climatic suitability of crops is relatively easy and accurate
- The relevance of extreme events in CC impacts is grossly exaggerated

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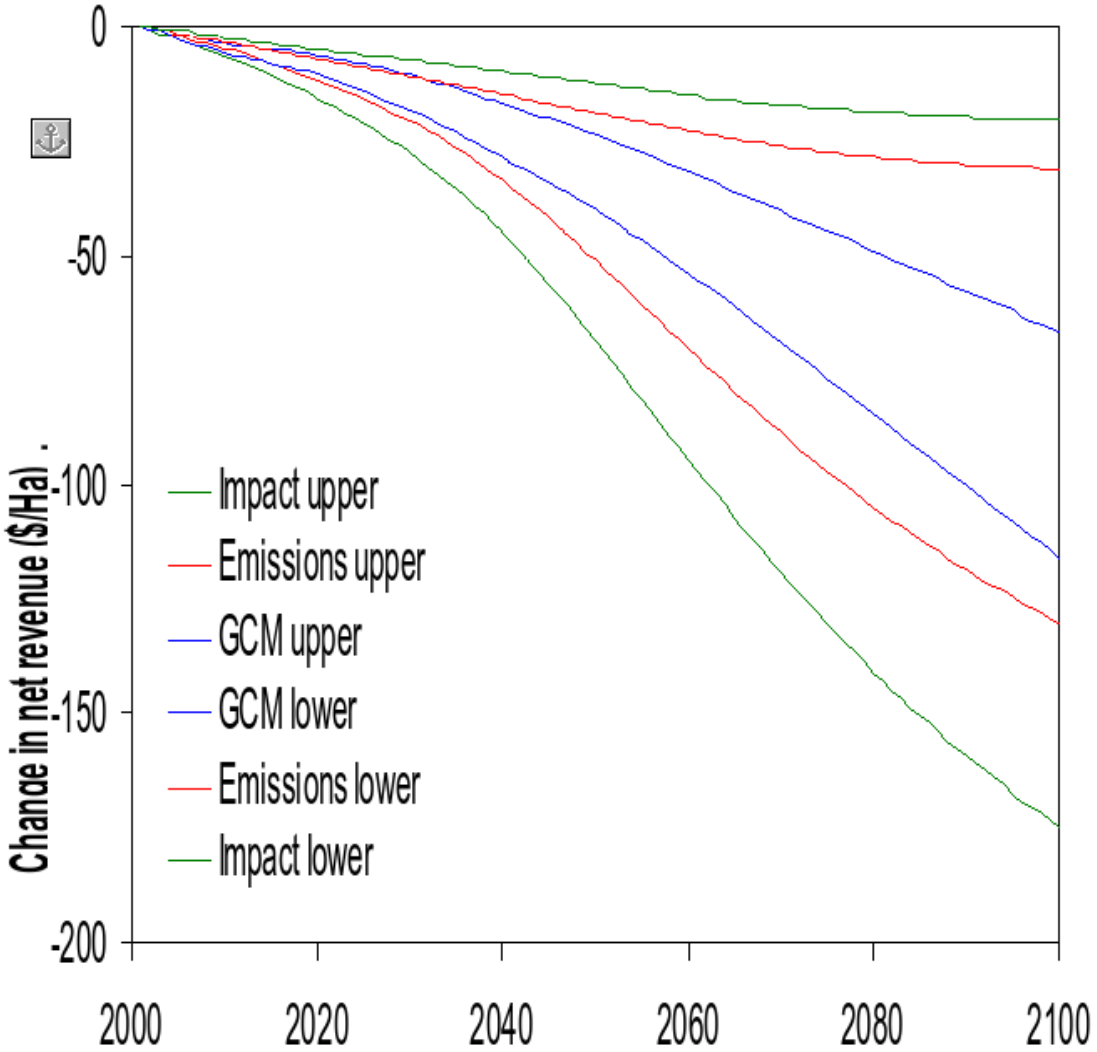
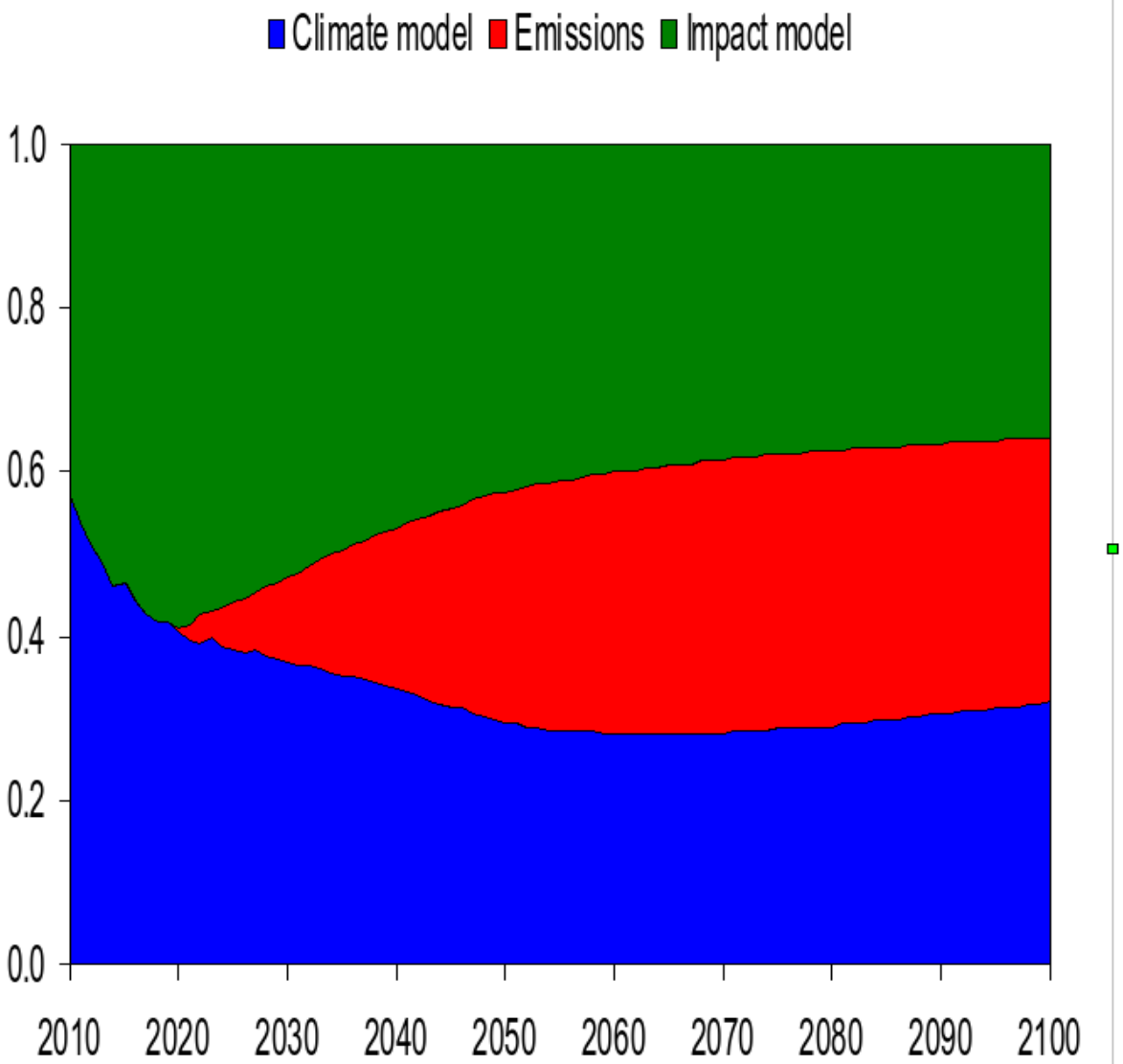
Economic impacts Policy

Ricardian model of smallholder farm incomes in Sri Lanka



Source: Rob. Wilby, 2007. Personal communication

Ricardian model of smallholder farm incomes in Sri Lanka



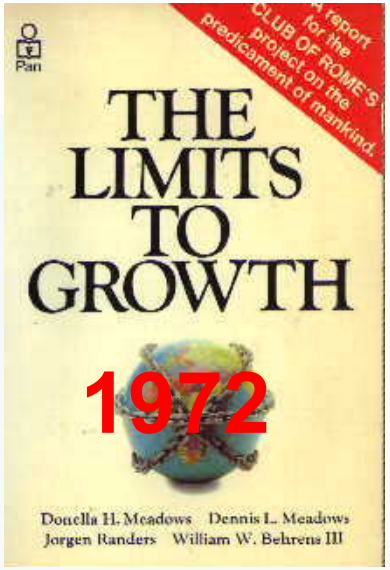
Source: Rob. Wilby, 2007. Personal communication

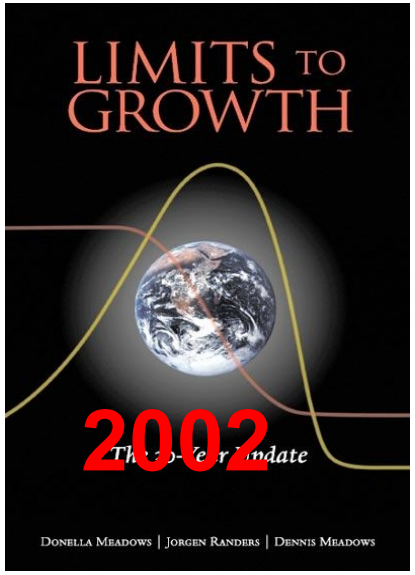
Conclusions

- There are many uncertainties about impacts of CC on agriculture
- The uncertainties increase over time and with the depth of simulations
- Many uncertainties are linked with lack of elementary “back-ground data”
- We should focus on intermediate scales (<2025)

Global futures cannot be predicted because of three types of indeterminacy: ignorance, surprise, volition.

From: Great transition, the promise and lure of the times ahead, Raskin et al., 2002, SEI


A report for the CLUB OF ROME'S project on the predicament of mankind
THE LIMITS TO GROWTH
1972
Donella H. Meadows Dennis L. Meadows
Jorgen Randers William W. Behrens III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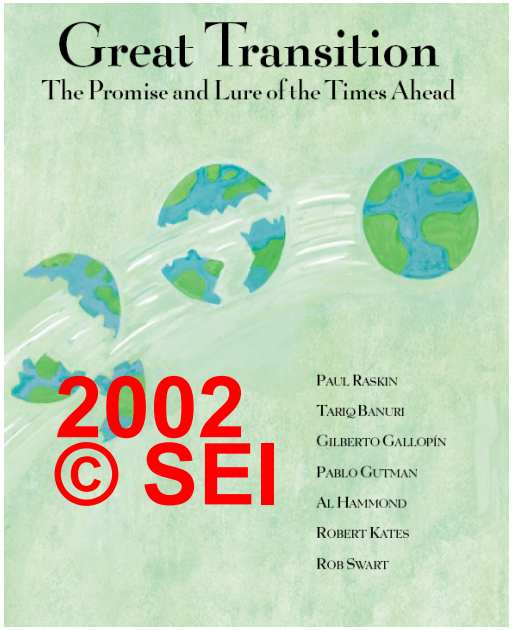
Great Transition
The Promise and Lure of the Times Ahead
2002
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Paul Raskin
Tariq Banuri
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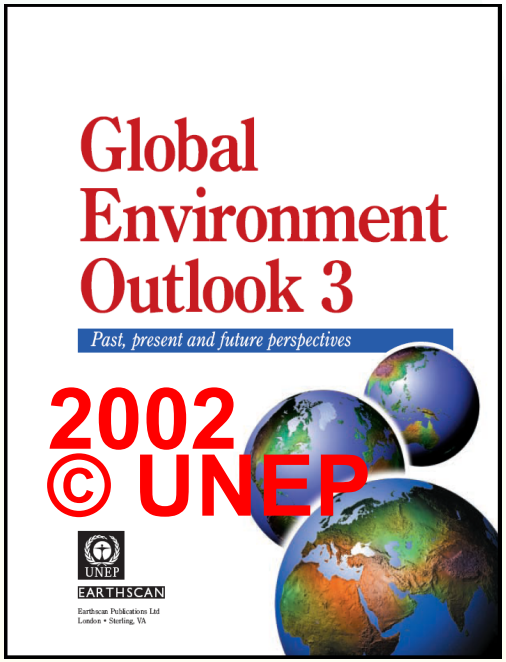
Robert Kates
Rob Swart


Global Environment Outlook 3
Past, present and future perspectives
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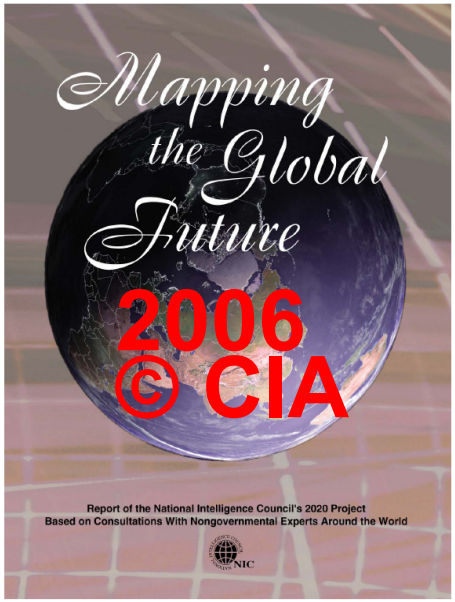
London • Sterling, VA


Mapping the Global Future
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Report of the National Intelligence Council's 2020 Project
Based on Consultations With Nongovernmental Experts Around the World
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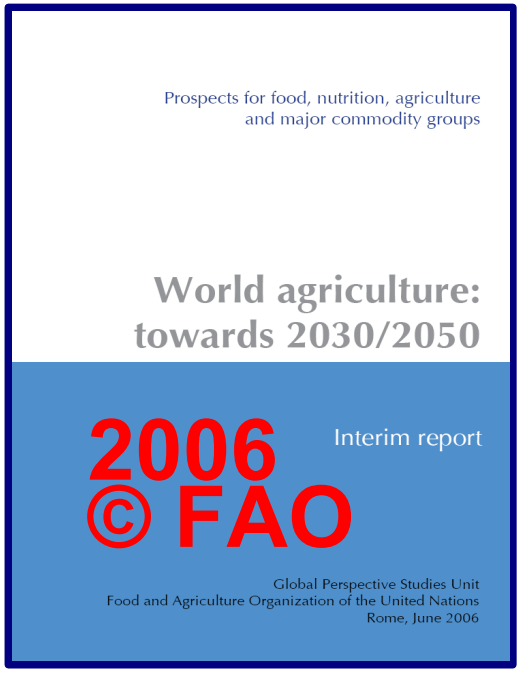
Prospects for food, nutrition, agriculture and major commodity groups
World agriculture: towards 2030/2050
2006
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Interim report
Global Perspective Studies Unit
Food and Agriculture Organization of the United Nations
Rome, June 2006

Thank you!

Source of farmers: 1634 etching by Rembrandt (Het Rembrandthuis Museum, Amsterdam)