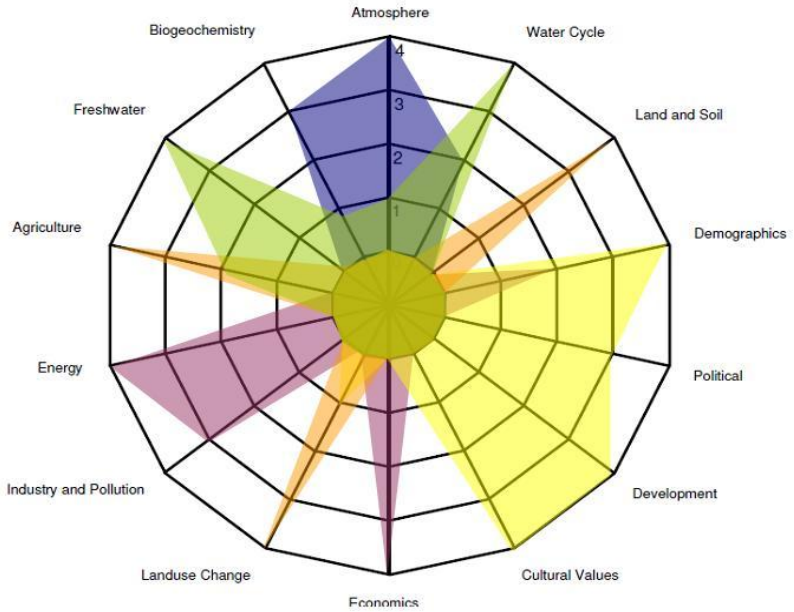

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The effects of variation in agriculture sector response to climate change

Bob Scealy, David Newth, Don Gunasekera and John Finnigan
CSIRO Marine and Atmospheric Research
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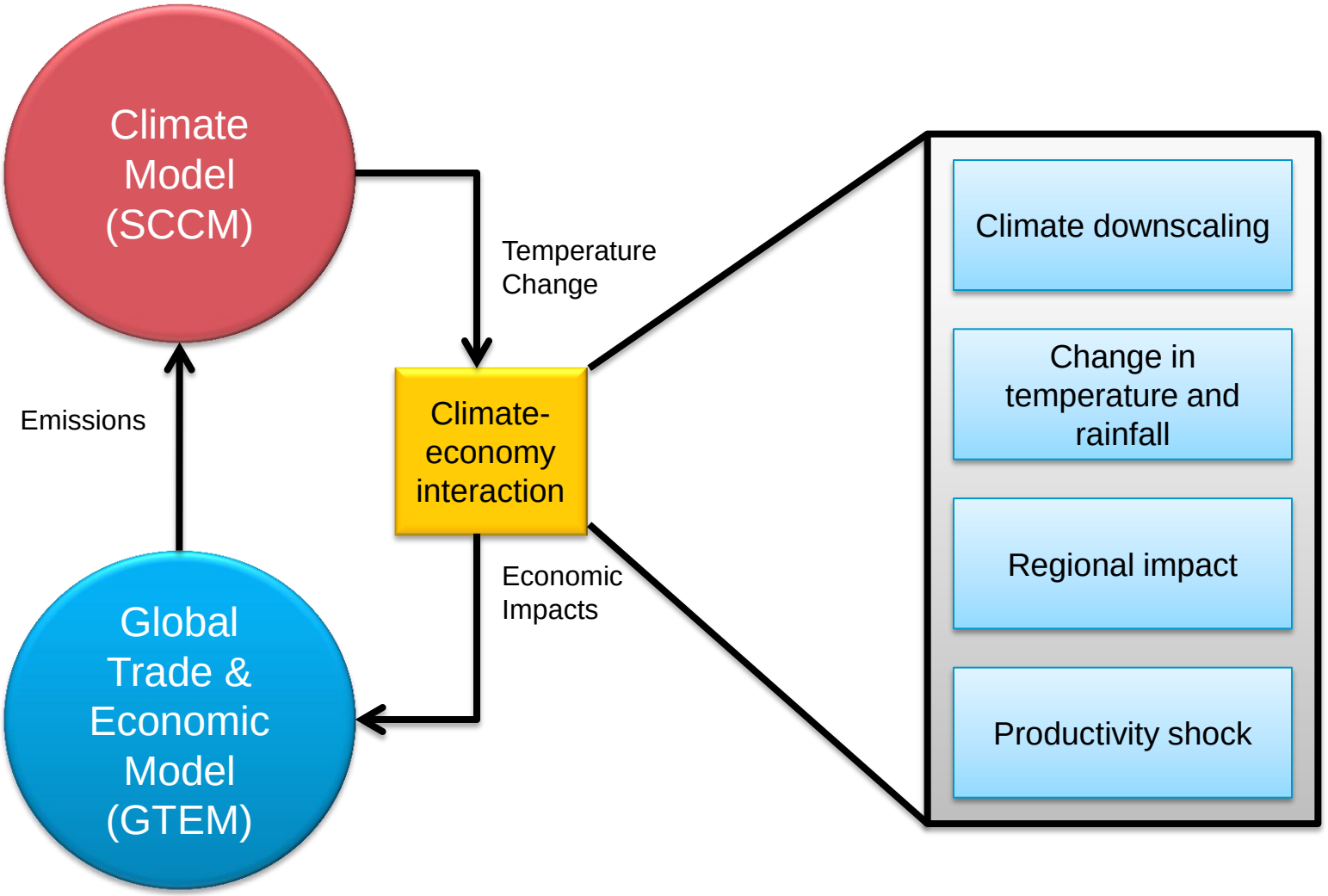
CSIRO

Overview

- **Preliminary analysis of impacts of climate change on:**
  - **a range of plausible agricultural productivity outcomes**
  - **implications for food security and international trade**
- **Use GIAM (Global Integrated Assessment Model) model:**
  - **coupled model of a global economic module (GTEM) and a climate module (SCCM)**
- **Two illustrative scenarios:**
  - **Reference case – world without climate change impacts**
  - **CC scenario – impacts of 1˚C warming globally by 2030 on agricultural productivity**
- **Discussion of results and implications**

Analytical framework: GIAM



Agricultural productivity shocks

	Prescribed productivity change (%) due to climate change (calibrated against 1°C increase)		
	low	medium	high
USA (wheat)	-10	2	14
China (rice)	-12	0	12
Canada (wheat)	-5	7	19
Indonesia (rice)	0	7	14

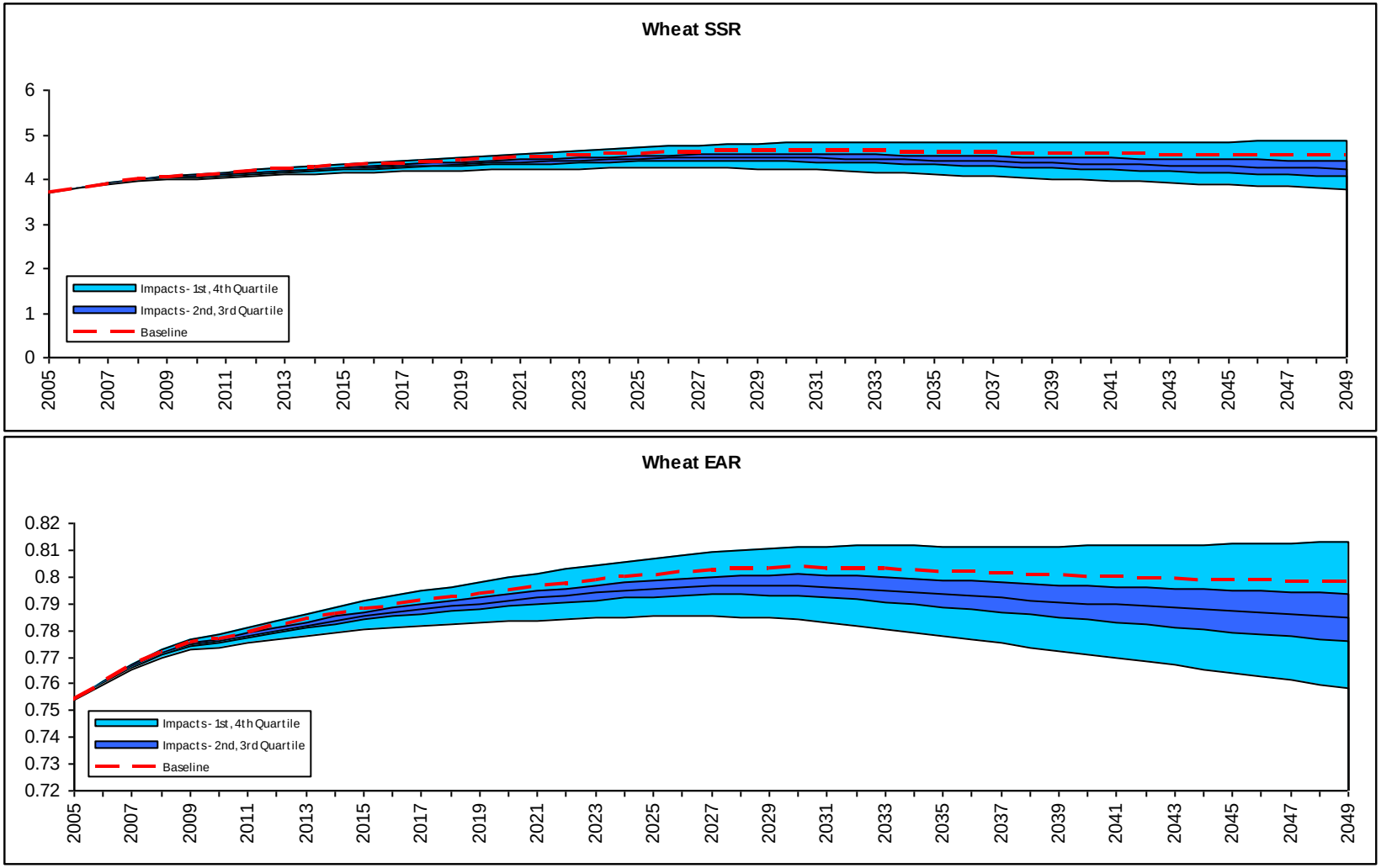
Source: Hertel,T. W., Burke, M. B. & Lobell, D. B (2010)

Experimental Design	
Parameter	Configuration
Projection period	2005-2050
GIAM Configuration	13 regions, 19 industries
Agriculture shocks	For each region, shock is selected from the above ranges
Ensemble runs	110

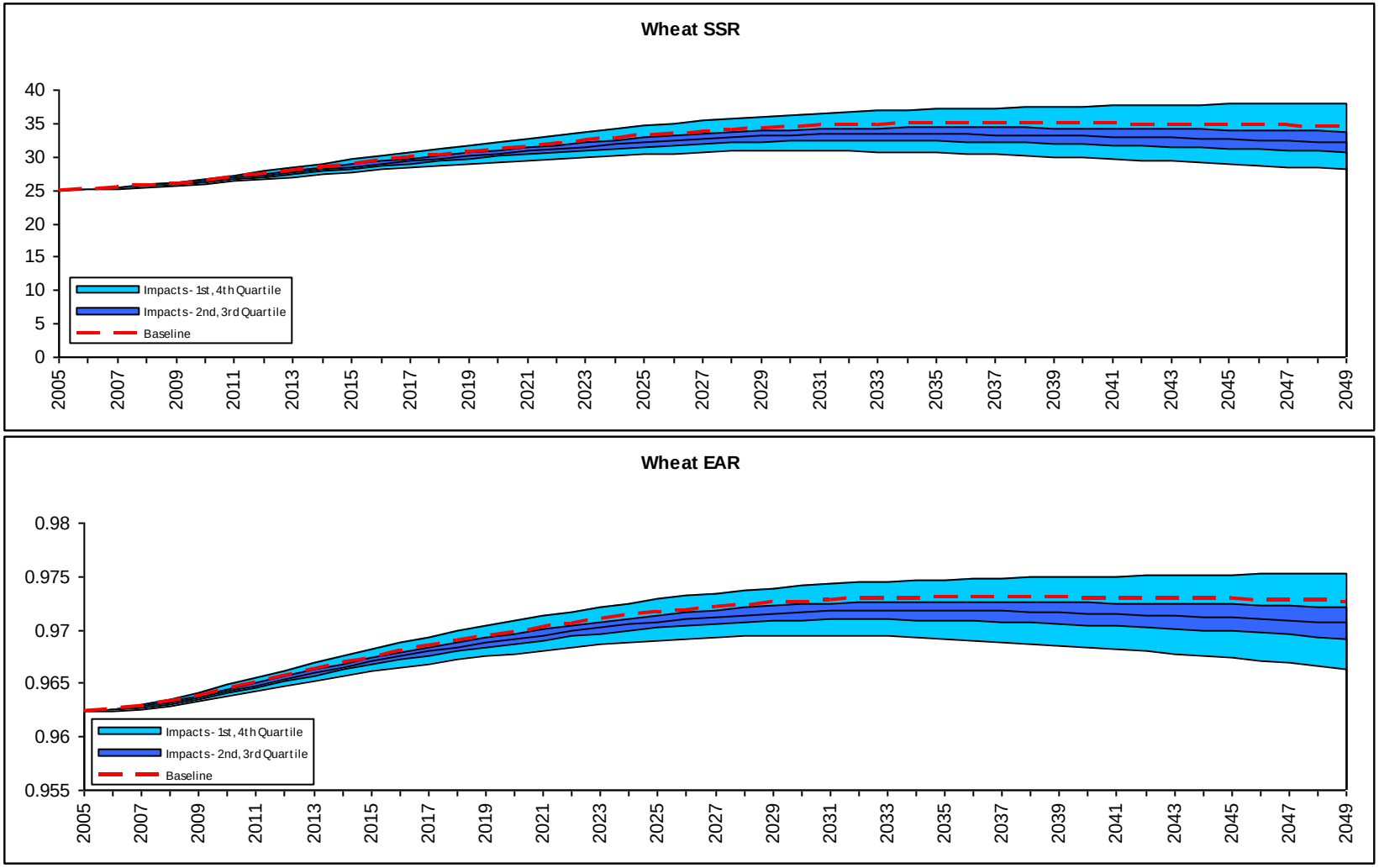
Full list of agricultural productivity shocks in GIAM

	Productivity Shock (%)		
	low	medium	high
USA (wheat)	-10	2	14
EU25 (wheat)	-5	7	19
China (rice)	-12	0	12
FSU (wheat)	-5	7	19
Japan (rice)	2	9	16
India (rice)	-15	-5	4
Canada (wheat)	-5	7	19
Australia (wheat)	-5	7	19
Indonesia (rice)	0	7	14
South Africa (coarse grains)	-42	-25	-8
Other Asia (rice)	-10	-3	4
OPEC	0	0	0
ROW (coarse grains)	-22	-10	2

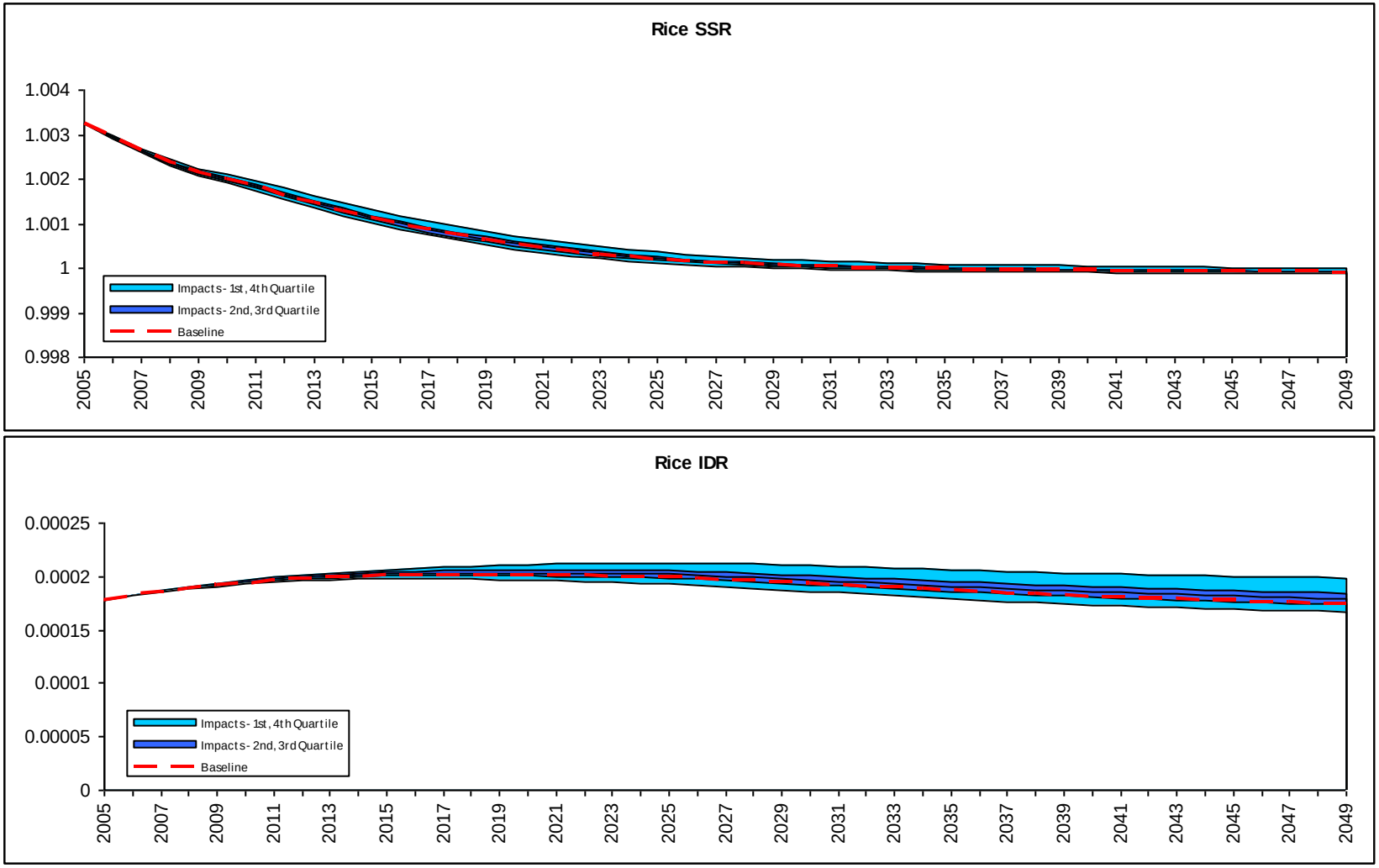
Change in food self sufficiency and export availability: US



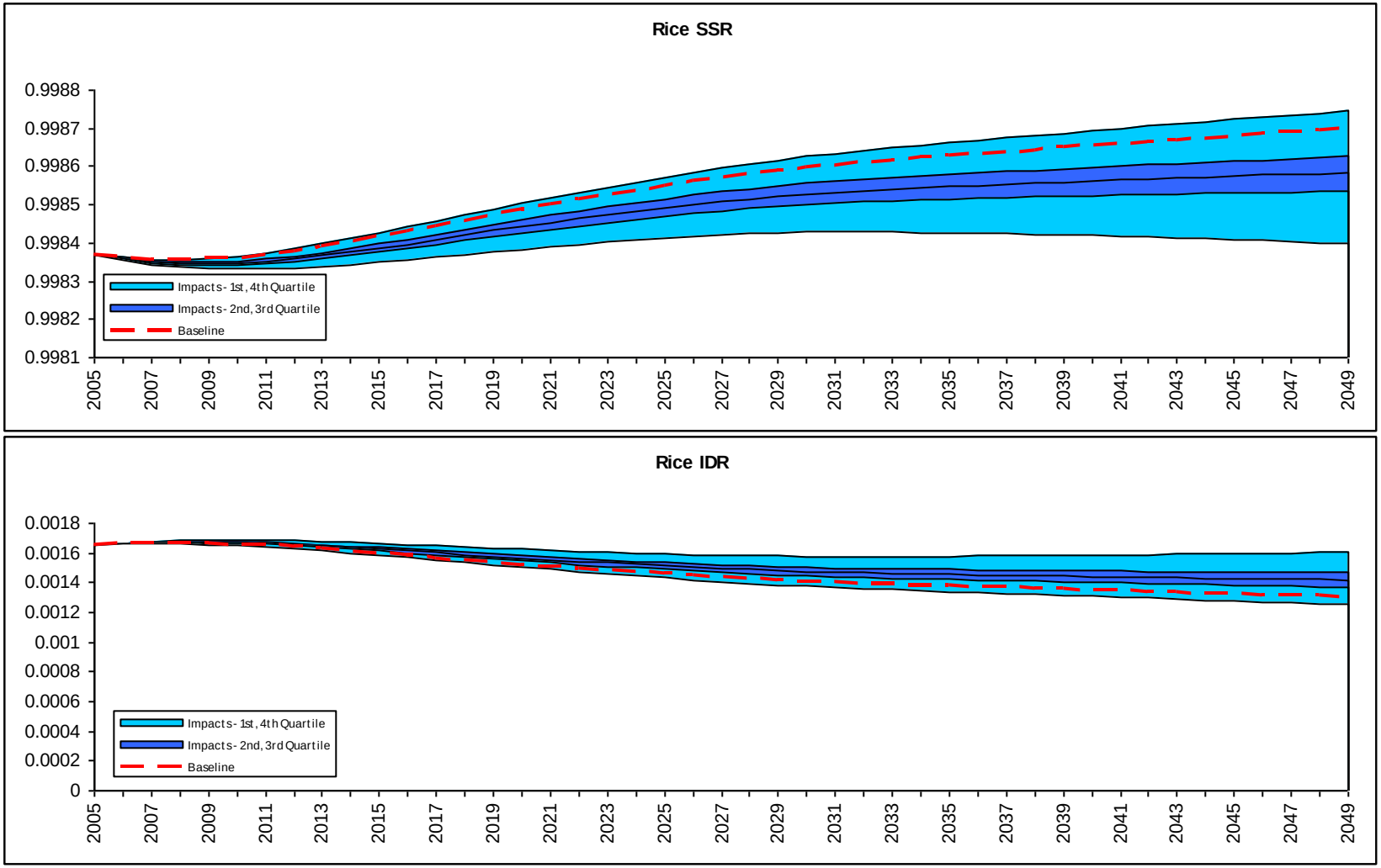
Change in food self sufficiency and export availability: Canada



Change in food self sufficiency and import dependency: China



Change in food self sufficiency and import dependency: Indonesia



Key messages and way forward

- Major strengths of the GIAM framework:
  - Takes account of the interactions between economy and climate
  - Incorporates a range of plausible agricultural productivity outcomes due to climate change
  - Accommodates the changes in domestic and international production, consumption, trade and prices within an economy-wide framework
  - Flexible enough to undertake a range of ensemble based scenario analysis to assess the impacts of climate change
- These results are preliminary and illustrative only:
  - Considerable variation in impacts at the tails of the distribution of climate change impacts
  - Unrestricted global trade could be a useful mediator between regions influenced differently by climate change
  - Minimising the uncertainty in climate change impacts on agriculture should be a high priority for research

Additional Material – Temperature Profile