Frontiers in adaptation science: Food security/natural environments

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Presentation to Climate Adaptation Conference, June 2010, Copyright CSIRO
The food security and environmental challenges before us

Increasing food production by ~70% by 2050 given

- population growth
- per capita consumption growth (in some nations)
- adapting to climate changes
- emission-reduction needs
- increasing input constraints (fuel, N, P, water)
- degradation status of terrestrial/marine resources
- biodiversity status and threatening processes
- lower R&D expenditure
- increased volatility incl. through a range of governance issues etc etc
Has the science more broadly adapted?

- Narrow disciplinary and institutional perspectives have provided few practical options for policymakers dealing with the complex and interacting goals of adaptation
  - climate-centric not human-centric
  - identify the problem but not solutions
  - pressure to reduce policy goals to fit the scientific methods and agendas
- Instead, we argue the nature of the problem should determine the relevance of the science that is available
More relevant, legitimate information

- move away from the climate-centric focus
  - to a decision-centric, outcomes focus
- provide information at the timescale of need
- at the spatial scale of need
  - e.g. don’t use a farm model nested in a GCM running on a supercomputer to look at farm level options
- decision-scale information and delivery
- integrating climate variability and climate changes and these with other key decision issues
  - context is (almost) everything
Overcoming a Panglossian view of climate

Ecosystem status/services

Increased risk of drought, wind erosion, carbon loss, lower production etc

Climate changes

Increased flooding, salinisation risk, N leaching, erosion, pest and disease risk etc
Framing of the issue: session abstracts
Progressive adaptation and opportunities

- Varieties, planting times, spacing
- Stubble, water, nutrient and canopy management etc
- Production chain approaches
- Climate change-ready germplasm
- Diversification and risk management
- Transformation from landuse or distribution change
- New products such as ecosystem services

Climate change benefits from adaptation

Varieties, planting times, spacing
Stubble, water, nutrient and canopy management etc

(Howden et al. 2010)
An extra 52000ha cropped: Nidumolu (2010)
Progressive adaptation

Varieties, planting times, spacing
Stubble, water, nutrient and canopy management etc

Production chain approaches
Transformation from landuse or distribution change
New products such as ecosystem services

Climate change-ready germplasm
Diversification and risk management

Varieties, planting times, spacing
Stubble, water, nutrient and canopy management etc

(Howden et al. 2010)
Risk-return frontier

- Improved genetics and value chain approaches
- Improved risk management
- Improved agronomy

(modified from Carberry and Keating 2010)
Expectations: a psycho-climatic barrier?

- **Ecosystem status/services**
  - Increased risk of drought, wind erosion, carbon loss, lower production etc

- **Climate changes**
  - Increased flooding, salinisation risk, N leaching, erosion, pest and disease risk etc
Attachment to the past climate

‘Spewful climber treely’
– Afferbeck Lauder (‘Let’s speak Strine’)

‘It’s a beautiful climate really’
– translated into English

• Some things are best learnt by doing
• ‘Doing’ adaptation means decision-makers need to be involved
Engagement with decision-makers and the final front-ear

- Adaptation scientists need this third ear too, specifically for *listening* to the decision-makers we want to influence.
- Top-down analyses tend to exclude from the process those who want the information.
- Perpetuates a long tradition of one-way information flow.
People don’t like the ‘knowledge injection’ model
Engagement: participatory action research

- Better define the questions
- Co-invest – build a bigger team
- Co-design research
- Pool knowledge
  - scientists often not the dominant knowledge holders
- Own the solutions, operate the ‘tools’
  - broader range of solution options
- Relevance, credibility and legitimacy
- Relevance and rigour

Cash and Buizer (2005)
Maximising learning from effective comparisons

• using the same methods in different locations
  OR
• using different methods in the same location
  – GCAFS (John Ingram, Global Change and Food Security)
  – Adapting farming systems project (Steve Crimp, Australia)
• effective monitoring and evaluation
Institutional and policy environment is critical in supporting adaptation

- Policy goals predefined
- Standard methods are chosen & applied by experts across all contexts
- Experts allocate resources informed by reductionist science
- Communities asked to comment on expert solution
- Policy implemented centrally across large areas

Goals simplified to fit methods

Policy adaptation avoided, difficult, with conflict

Nelson et al. 2009
Adaptive, cross scale models of governance

Negotiate goal intersection, resolve conflict, overarching principles

Transfer learning across local contexts

Policy trialled in local contexts

Design local policy

Build on local communication & governance (allocation, sanctions, monitoring, etc)

Integrate scientific & local knowledge

Biodiversity: methods matter

Dunlop and Brown (2009), Ferrier et al. (2010), e.g. Williams and Hilbert (2006)
## Revisiting conservation: objectives and values

"Manage the change to minimise the loss"

<table>
<thead>
<tr>
<th>Value</th>
<th>Inevitable change !!!</th>
</tr>
</thead>
<tbody>
<tr>
<td>Individual species or genes</td>
<td>Abundance, distribution and co-occurrence</td>
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- Align the methods to fit the goals not vice versa
- Rationale for social science in adaptation
Summary of frontiers

- many I have not raised……..
- decision and outcomes focus
- balance in framing risks/opportunities
- incremental thru to transformational change
- productivity-based research
- enhanced engagement and communication
- adaptive governance
- maximising learning
- aligning methods with values/goals
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Thank you

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