Virtual world technologies to enhance climate risk management on Australian sugar cane farms

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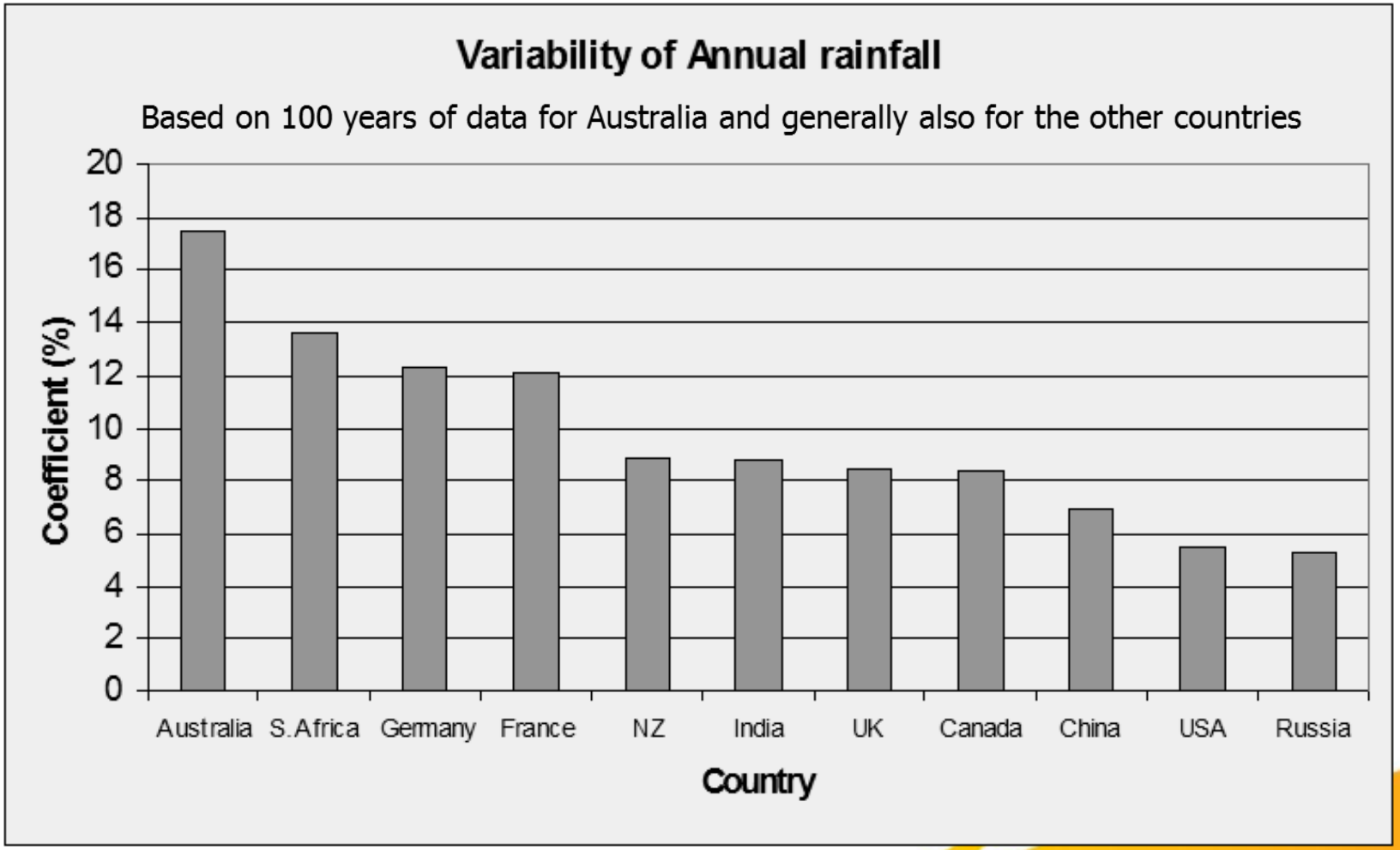
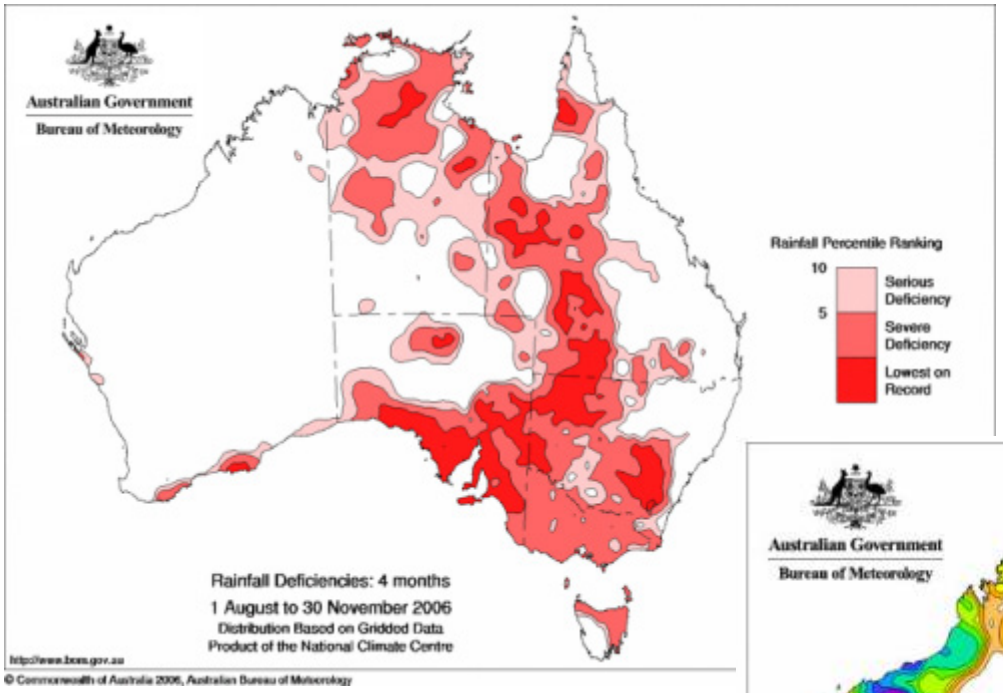
Australian farmers operate in a risky environment

- Highest level of year-to-year rainfall variability globally (Nicholls *et al*. 1997)



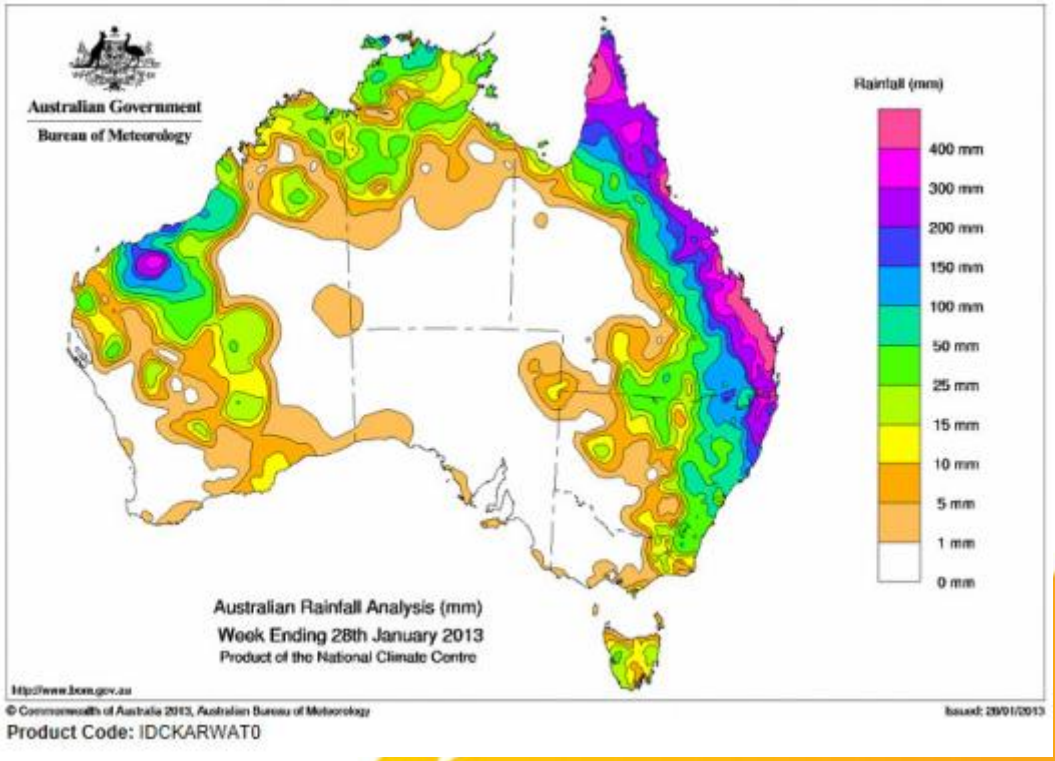
"… droughts and flooding rains …"



Source: Australia Bureau of Meteorolog
http://www.bom.gov.au/climate/drought/archiv

Millennium Drought, 1996-2009

Australia Day, 2013



Impacts on agriculture

Sources of climate variability

Climate phenomena	Frequency/Time scale
Weather patterns	Day/week
Madden-Julian Oscillation	Month/s
SOI phases based on El Nino-Southern Oscillation (ENSO)	Seasonal to interannual
Quasi-biennial Oscillation (QBO)	1-2 years
Antarctic Circumpolar Wave	Interannual (3-5 years)
Latitude of Subtropical Ridge	10.6 years
Interdecadal Pacific Oscillation (IPO)	13+ years
Decadal Pacific Oscillation (DPO)	13-18 years
Multidecadal rainfall variability	18-39 years
Interhemispheric thermal contrast (secular climate signal)	50 years
Climate change	

Issues

- Climate change and increasing climate variability pose real challenges to productivity and profitability of farming
- Improved climate risk decision-making and management in agriculture critical
  - well-being and long-term sustainability of farming communities
  - future global food security.
- Decision-making on farms based on assumptions about seasonal conditions and weather events over the cropping season.
- Calls on science to provide information to support complex decision making to manage climate and related risk

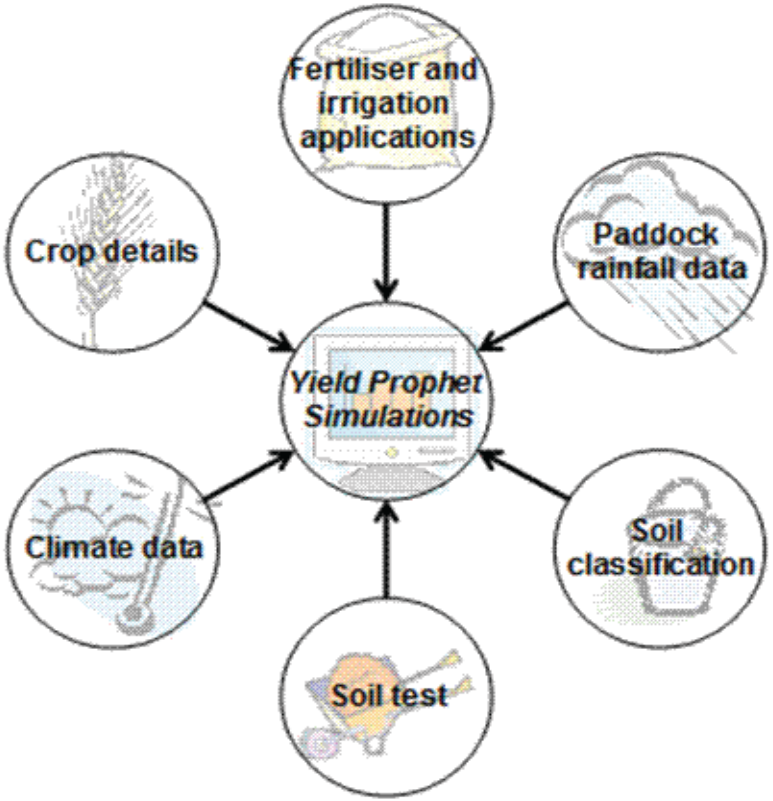
Climate information to support adaptation in agriculture

- Targeted climate forecasts to support adaptation
- Link to agricultural systems
  - real time, downscaled regionally-targeted climate information
  - focus on relevant climate variables (e.g. temperature extremes)
  - analysis of potential impacts of climate change
  - solutions for effective adaptation to a changing environment

"… climate information has no value unless it changes a management decision."

Decision Support Systems (DSS)

- Technical support to optimise yield and profitability
- but limited uptake (Lynch *et al*. 2000; Newman *et* al. 2000; Nguyen *et al.* 2006, Hochman *et al*. 2009)
- Need for decision support to:
  - focus on human elements of decision-making
  - inform/complement existing decision-making processes



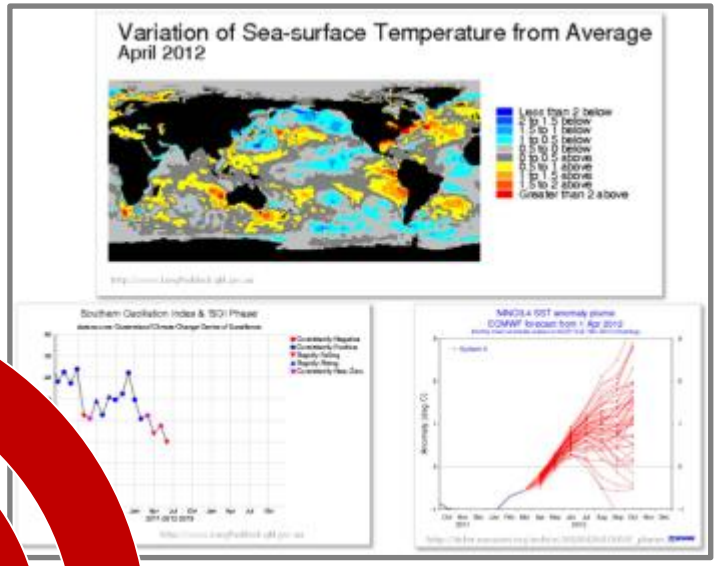
e.g. Yield Prophet (R)

From decision support to discussion support

- Farmers make management decisions which tradeoff risks and gains in the face of future uncertainty
- the main problem is knowing what the future will be, not how to respond to it (Stone & Hochman 2004)
- challenges and opportunities at the interface of 'hard' scientific analysis of biophysical systems and 'soft' approaches to intervention in social management systems (Keating & McCown 2001)
  - Kitchen table discussions (McCown *et al*. 2002)
  - But little progress in developing cost-effective approaches to facilitate and deploy interventions more widely

Targeted support for on-farm decision-making

Farming systems science & BMPs



Seasonal forecast modelling

Understanding decision-making and adoption behaviour

Digital Futures-Collaborative Research Network (DF-CRN) Project 3

"*Investigating the impact of a web-based discussion-support agricultural-climate information system on Australian farmers' operational decision making*"

- Digital technologies:
  - alternative for delivery & communication of agricultural information
  - complement and expand the reach of conventional ag extension
- Sophisticated digital platforms & application in learning environments offer new opportunities for knowledge exchange

Objective

- To develop digital tools for cost-effective delivery of timely, targeted, contextualised agri-climate information and knowledge services

Strategy

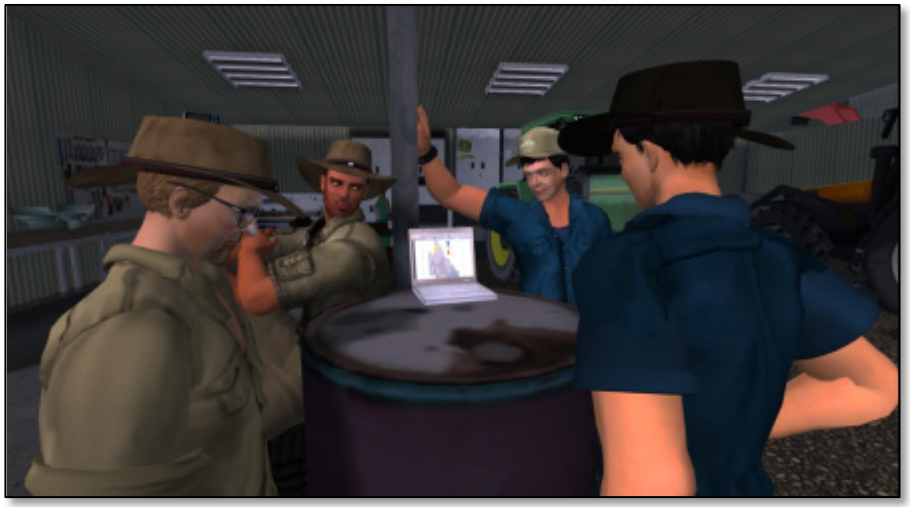
- **Create and trial a virtual discussion-support system** that integrates climate information with farm management decision-making.

- **Assess the effectiveness** of the virtual discussion-support system in building capacity for improved decision-making and effective climate change response in a target group of farmers

Second Life

- A virtual world
- User-created content and virtual marketplace
- Avatars can be customised & manipulated
- Machinima (animated video clips) created
  - storyboarding
  - scripted conversations
  - recorded soundtracks
  - screen capture software (e.g. FRAPS)
  - folio (background sounds)

“Sweet success” machinima



- Contextualized settings - Qld sugar cane farm & landscape
- Customised avatars – Australian sugar farmers
- Back stories – incorporate decision-making types (Jorgensen *et al*. 2007)
- Decision making scenarios
- Scripted conversations – incorporating industry BMPs

“Sweet Success” scenarios

- Four machinima developed:
  - Harvesting (v2)
  - Fertiliser application
  - Irrigation
  - Planning

Evaluation

1. Workshops (4), group discussions and semi-structured interviews (20-24 pre and post workshop) plus qualitative analysis

2. Online surveys – 300-400 canegrowers

   – Responses to machinima

   – Farming background

   – Approach to risk

   – Decision-making style

Research questions

- Potential for machinima to provide a relevant engaging technology rich learning environment?
- Effectiveness as a discussion support and capacity building tool?
- Readily adapted for different farming systems and locations by using culturally appropriate clothing, language and settings?
- Able to be disseminated widely and cost-effectively?
- Contribution to sustainable land management?

Future challenges

- Availability of suitable technology for dissemination into rural areas in Australia and elsewhere, including developing countries (~ 600 million farmers, globally)
- Ensuring the relevance of the system to diverse cultures, traditions, farming systems.
- Customising, in conjunction with stakeholders, to ensure acceptance by Australian & international farming communities
- Investigating whether such discussion support systems influence decision-making and result in measurable changes in terms of on-ground outcomes
- How best to deliver (e.g. WAMIS)

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Thank you

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