

**Climate Resilient Societies and  
Global Food Security: developing an  
interdisciplinary research  
programme**

## Wheat prices

# Field events

**Volatile wheat prices are as much a cause for alarm as are high prices**

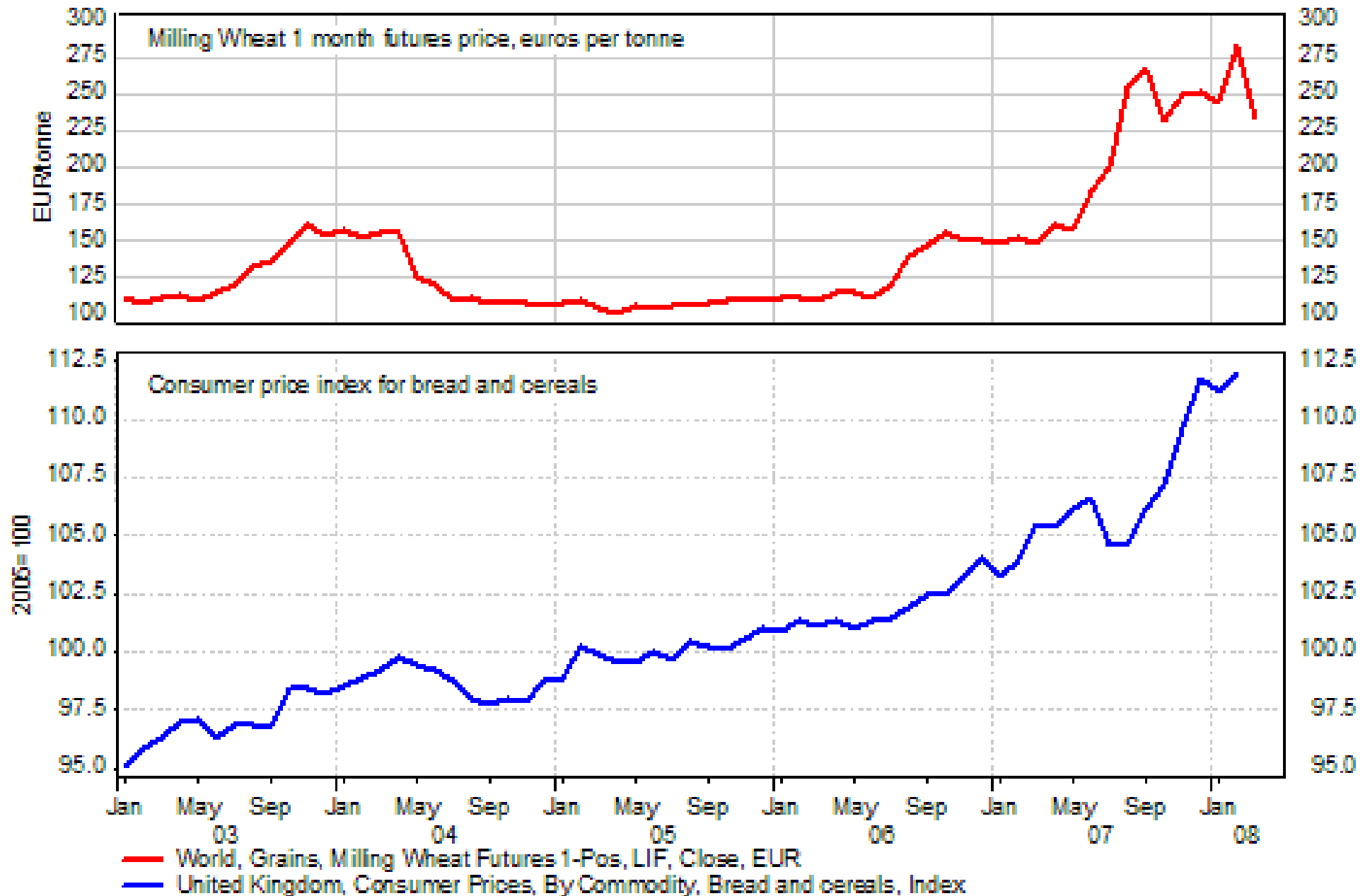
Sep 9th 2010



FEW rural pleasures match seeing a golden field of grain, rustling and ripe for reaping. But the harvest season in the northern hemisphere is being marked by turmoil on global wheat markets.

A big reason is to be found in one of the world's largest wheat exporters, Russia. Hit by fires and drought which have wiped out a third of the grain crop, the authorities there have banned exports, first temporarily and now until next year's harvest. As a result,

## Milling Wheat Prices and CPI for Bread and Cereals



Source: Reuters EcoWin

## World faces 'perfect storm' of problems by 2030, chief scientist to warn

Food, water and energy shortages will unleash public unrest and international conflict, Professor John Beddington will tell a conference tomorrow

Ian Sample, science correspondent  
guardian.co.uk, Wednesday 18 March 2009 17.19 GMT  
[Article history](#)



Food and water shortages as a result of climate change and growing populations are likely to trigger mass migration and unrest. Photograph: AFP/Getty

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If your staff need  
be on the move,



This leads to a question (or rather a series of questions)...

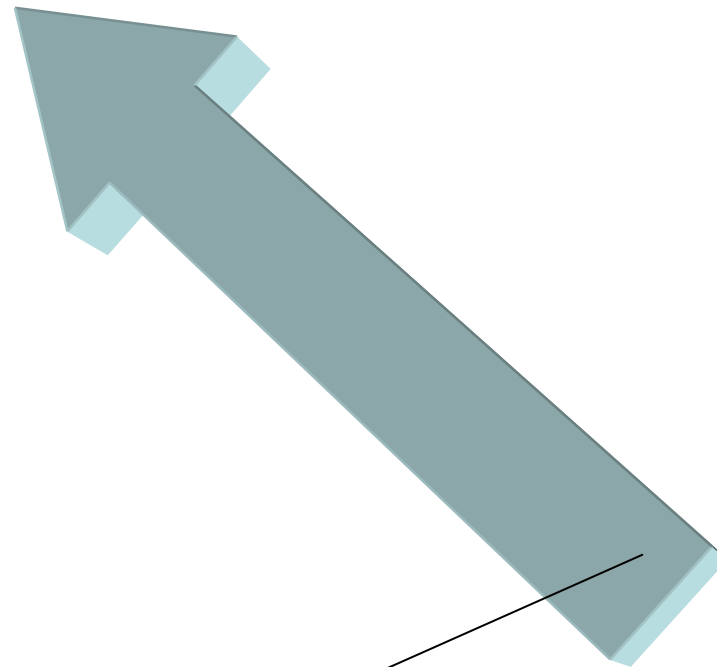
- Will we have enough food to eat in the future?
- Will climate change destroy the world's food supply?
- Will we starve?

# Approaching these questions as research...

- Statistical methods used from the top-down.
- Bottom up and more qualitative methods.
- Using history as an analogy.

# Statistical “top-down” and quantitative methods

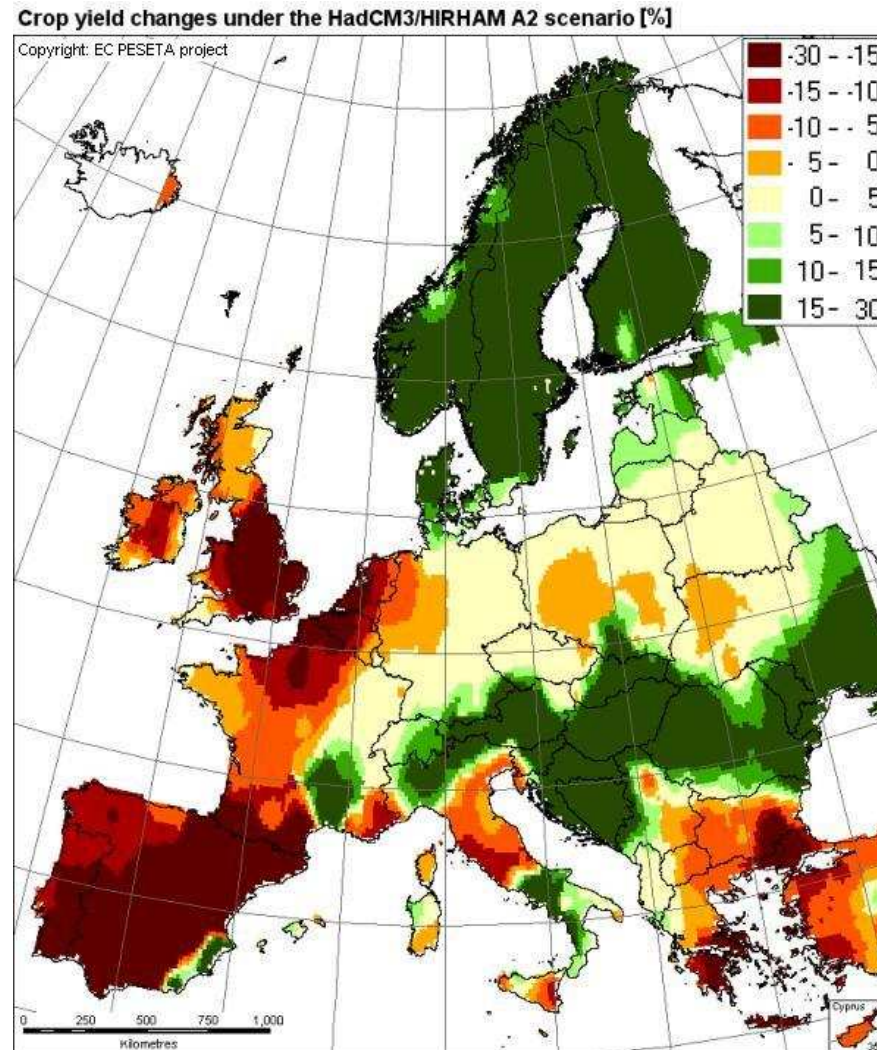
# Progress in modelling climate impacts on food crop production



1980s: Crop models run for different climate scenarios to assess changes in yield



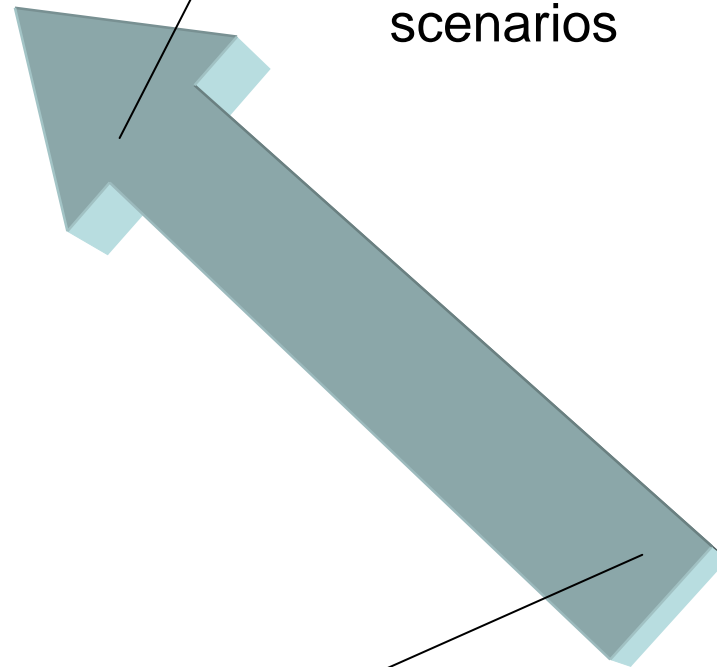
- Crop yield changes by 2080s relative to 1961-1990
  - Based on a high emission scenario (A2) & for climate model HadCM3/HIRHAM



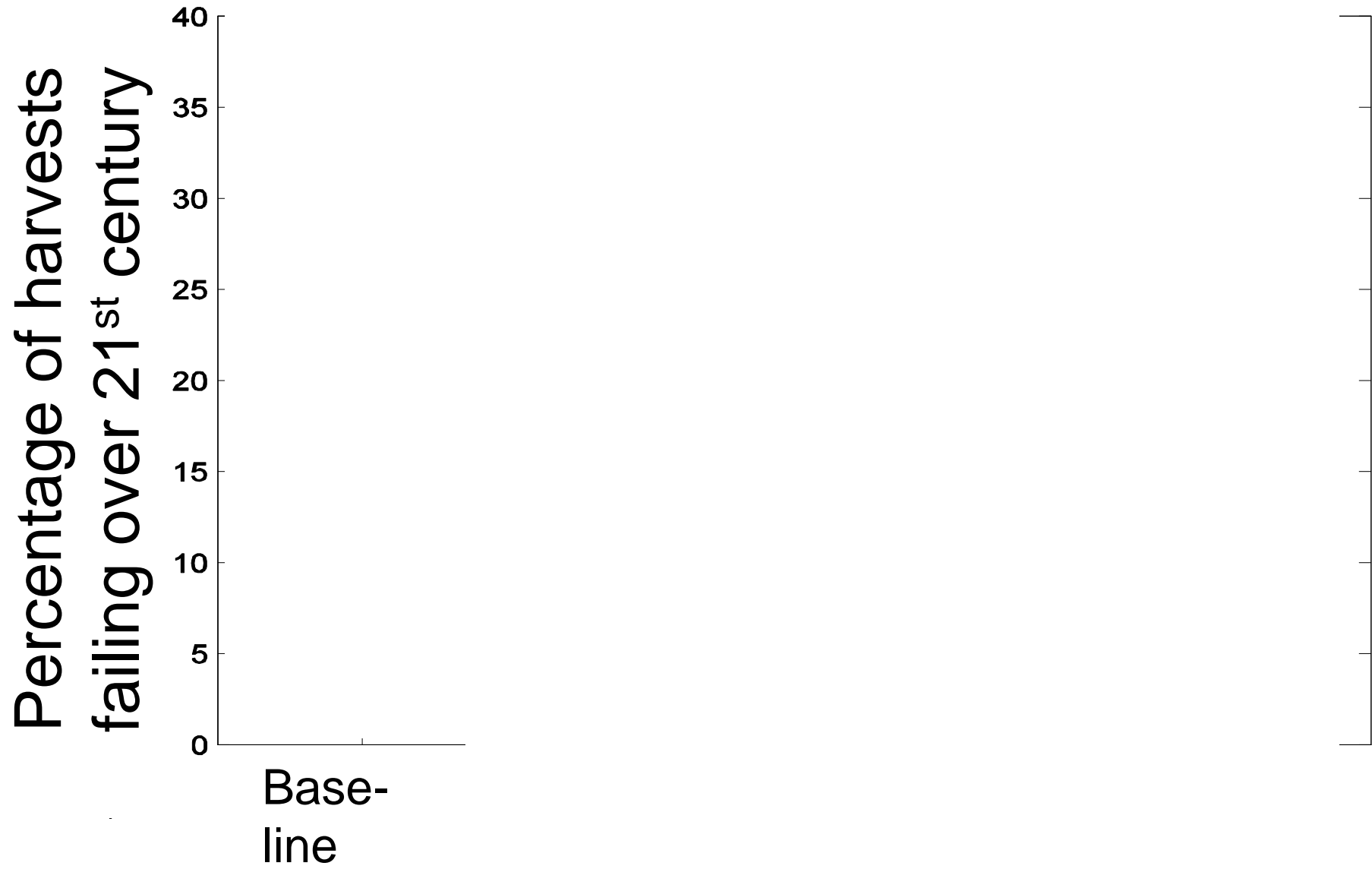
European Commission (2009). The PESTA Project. Available at <http://peseta.jrc.ec.europa.eu/docs/Agriculture.html>

# Progress in modelling climate impacts on food crop production

2000s: Running ensembles to create a range of projections & for socio-economic scenarios



1980s: Crop models run for different climate scenarios to assess changes in yield

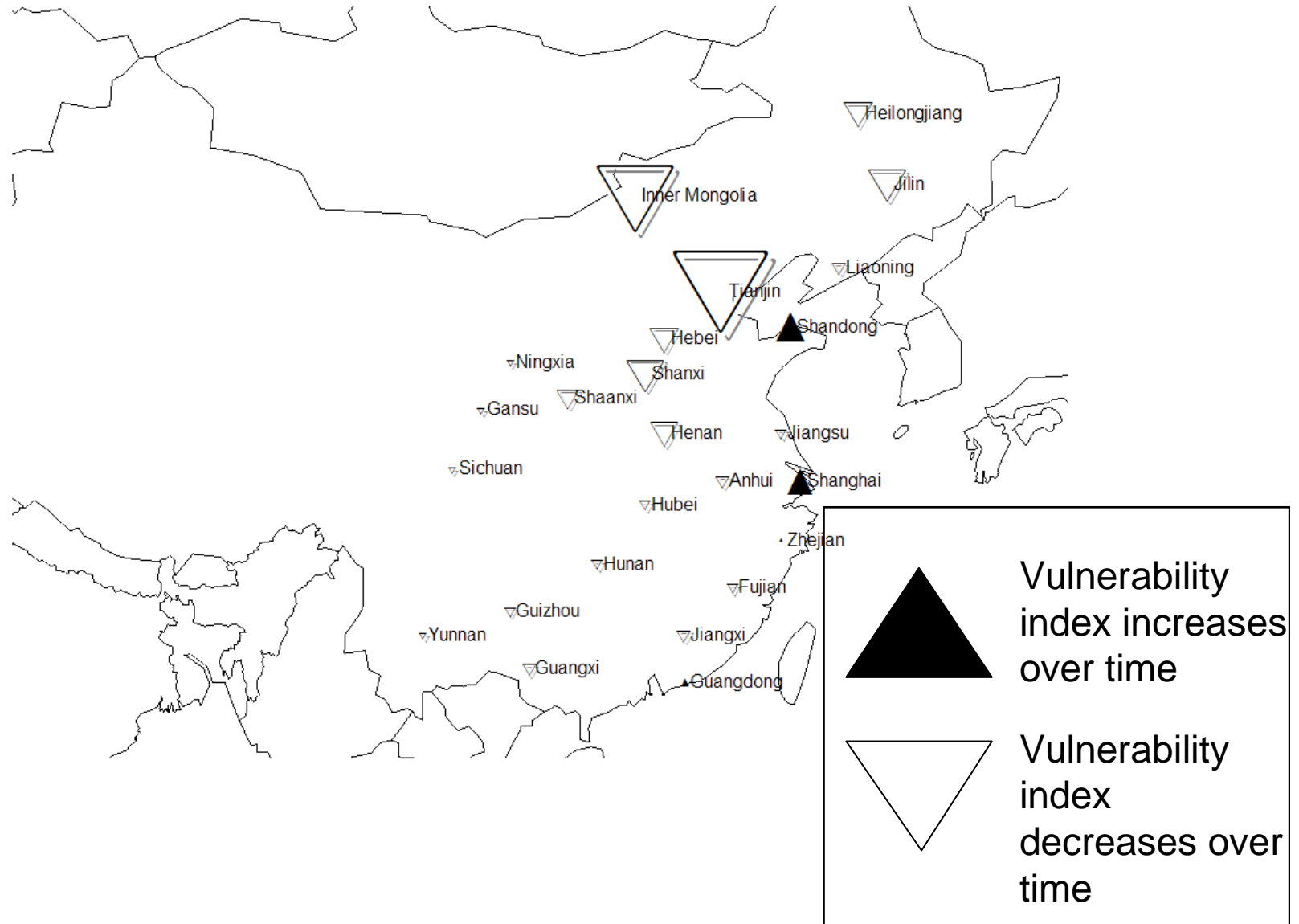


Adaptation Strategy

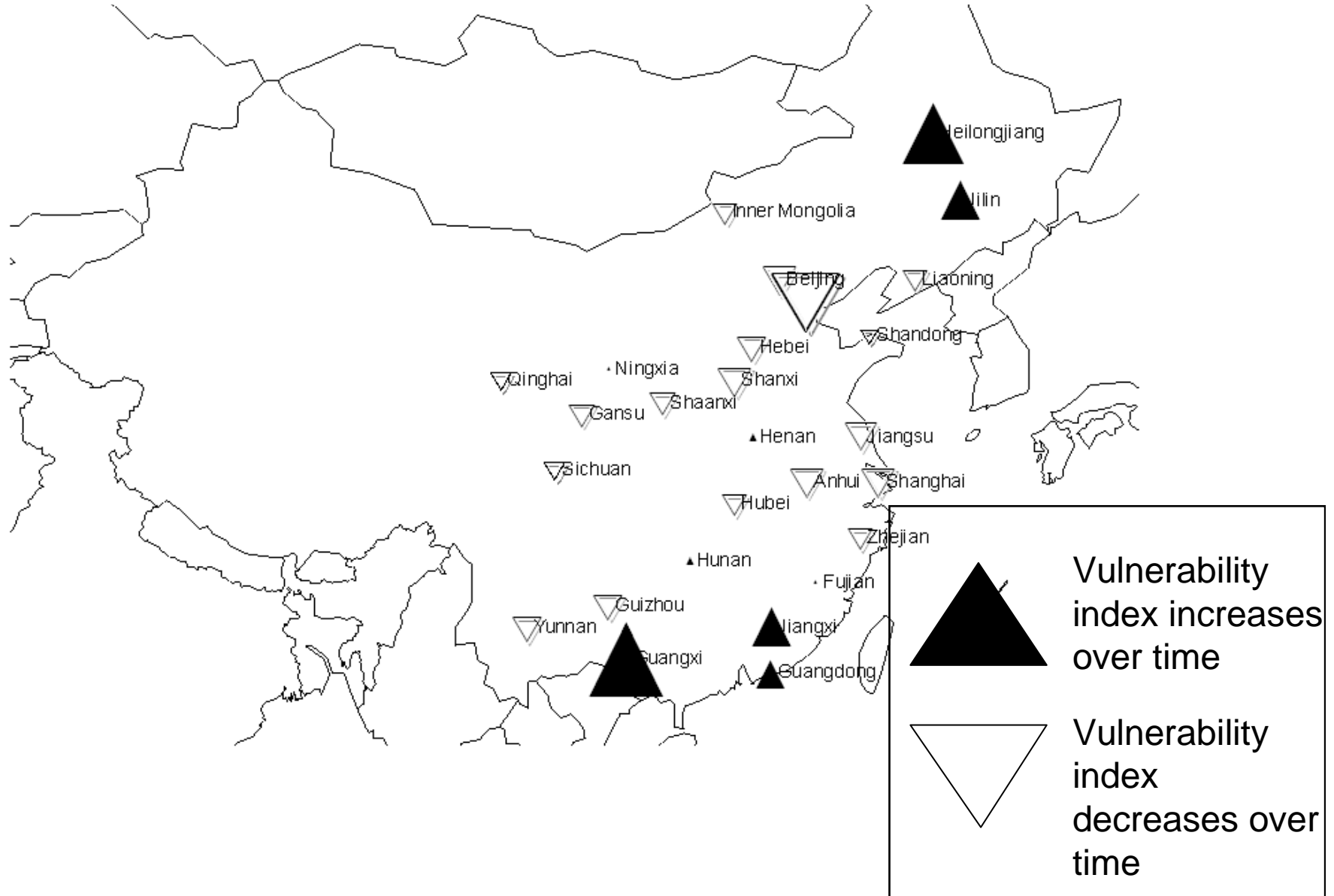
# Identifying sensitivity to drought



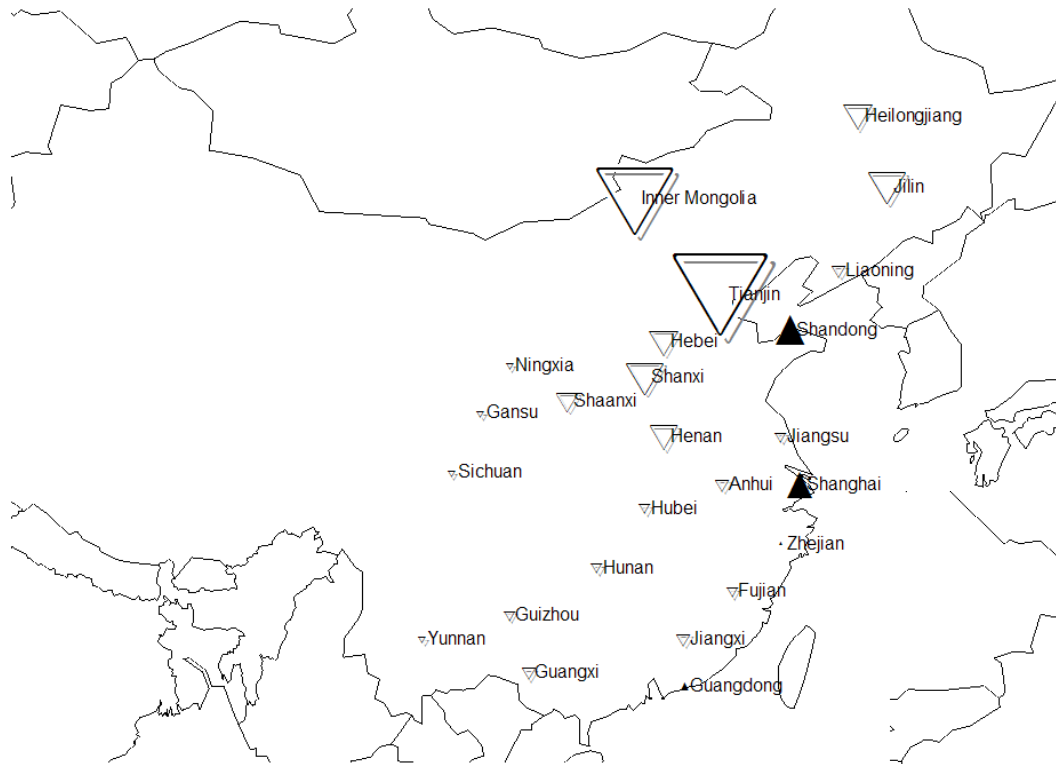
# Vulnerability trends in China's Rice Harvest 1961-2001



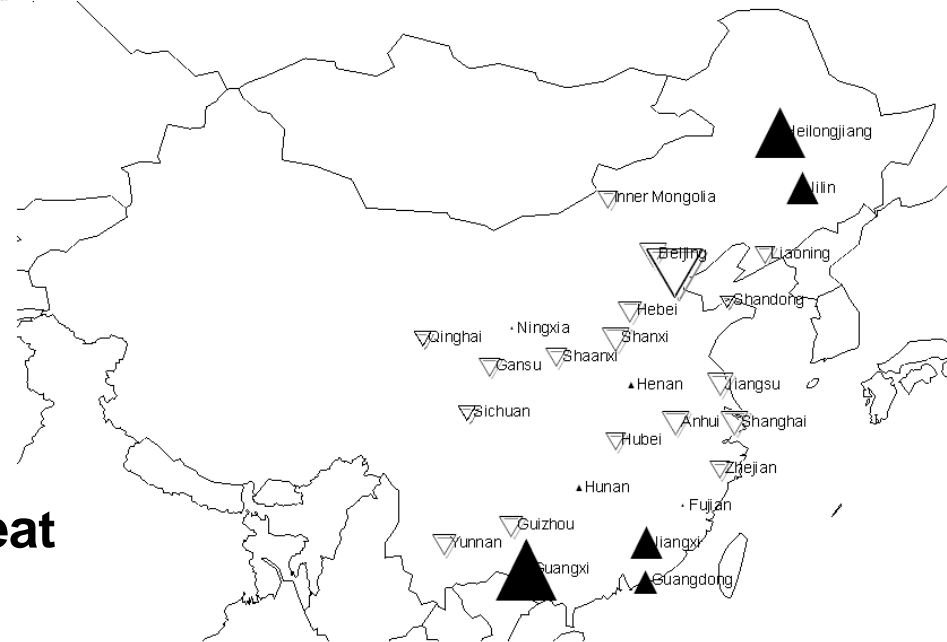
# Vulnerability trends in China's Wheat Harvest 1961-2001



# Vulnerability trends 1961-2001



**rice**



**wheat**

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Significant socio-economic indicators	Vulnerability relation	Index (direction of)
	Rice Paddy	Wheat

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Labour

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Land

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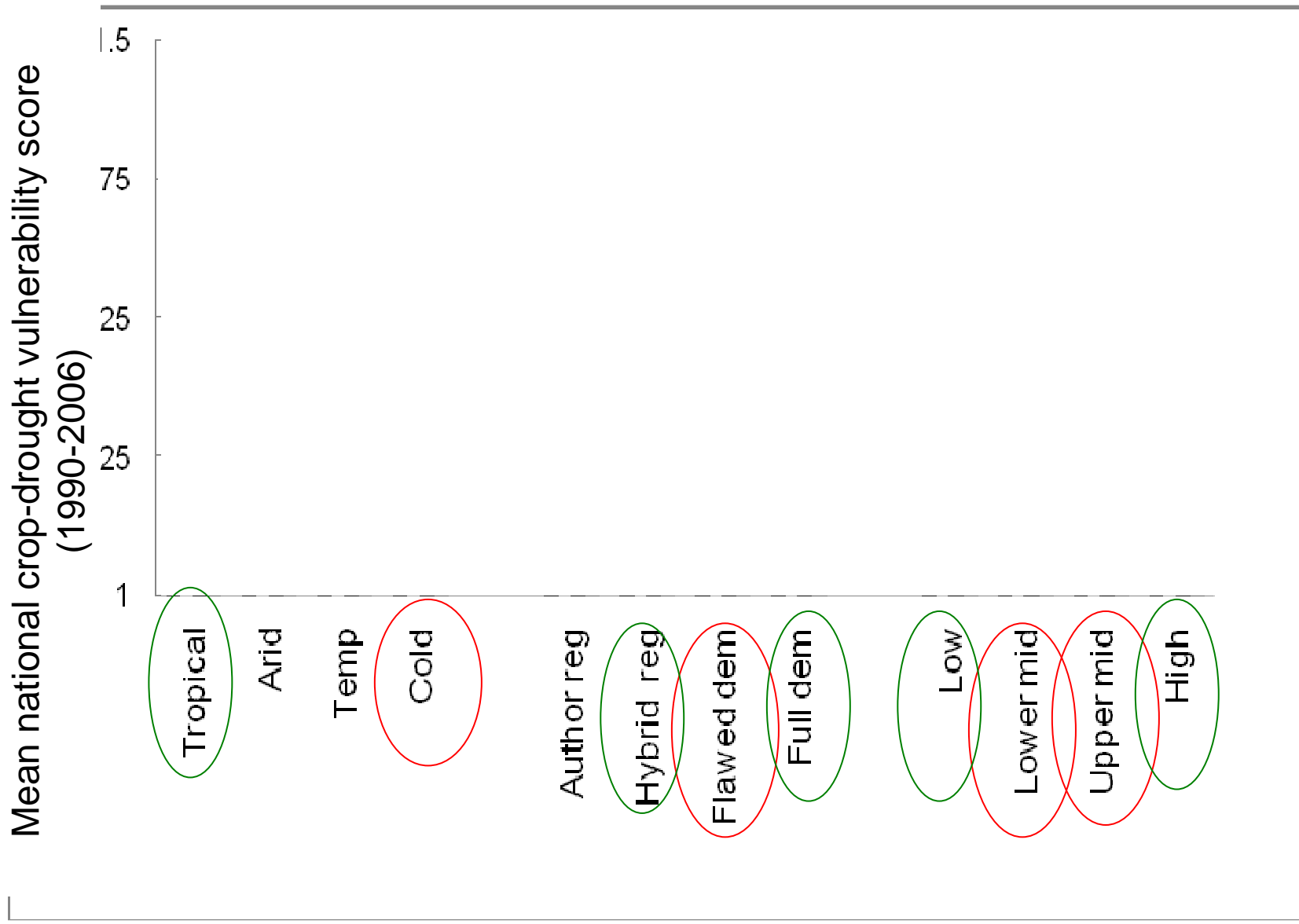
Capital

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Simelton, E., Fraser, E.D.G., Termansen, M., Forster, P., and Dougill, A. (2009).  
“Typologies of crop-drought vulnerability.” *Environmental Science and Policy*,  
Available on-line.





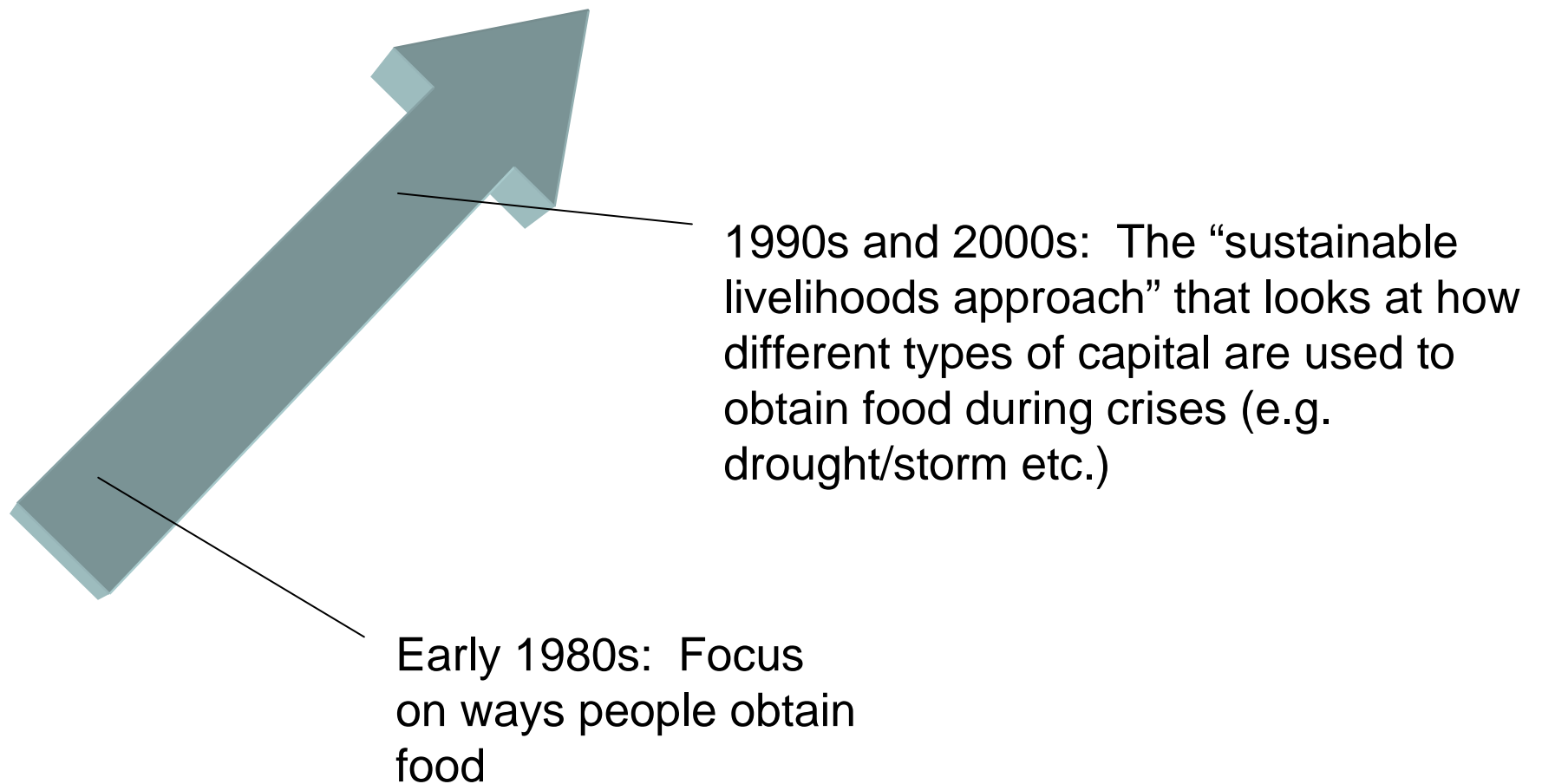


# Criticisms

- While sophisticated methodologically, and lending itself to policy recommendations, this approach struggles due to (1) limits to what we know. (2) data quality, scale, and period.

Approach 2: more qualitative,  
more economic.

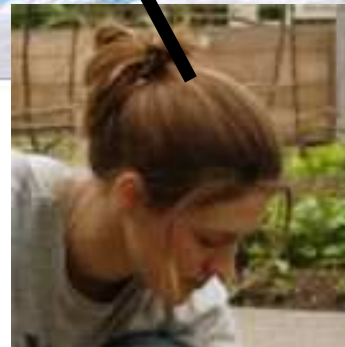
# Understand food security qualitatively and from the “bottom up”





Phy

e 2003



# Pastoral Botswana



# Private Ranch (Left) versus Communal Grazing Land (Right)





# Bush Encroached System



# Method: system dynamics modelling

**1. Establish problem and boundaries of system.**

**2. Interview experts or stakeholders to establish a narrative that explains the system.**

**4. Stop here, and reflect if you can make recommendations.**

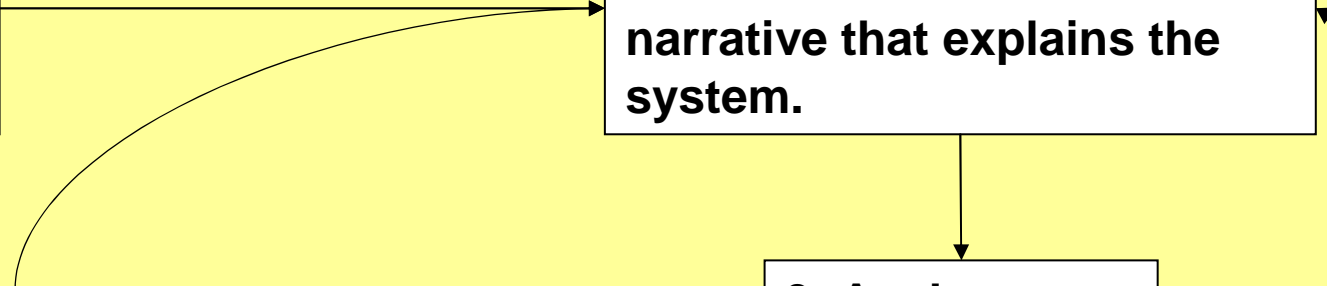
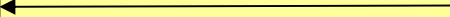
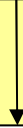
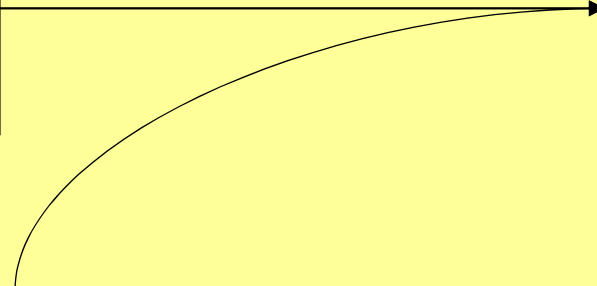
**3. Analyse narrative using a flow chart or "mind map".**

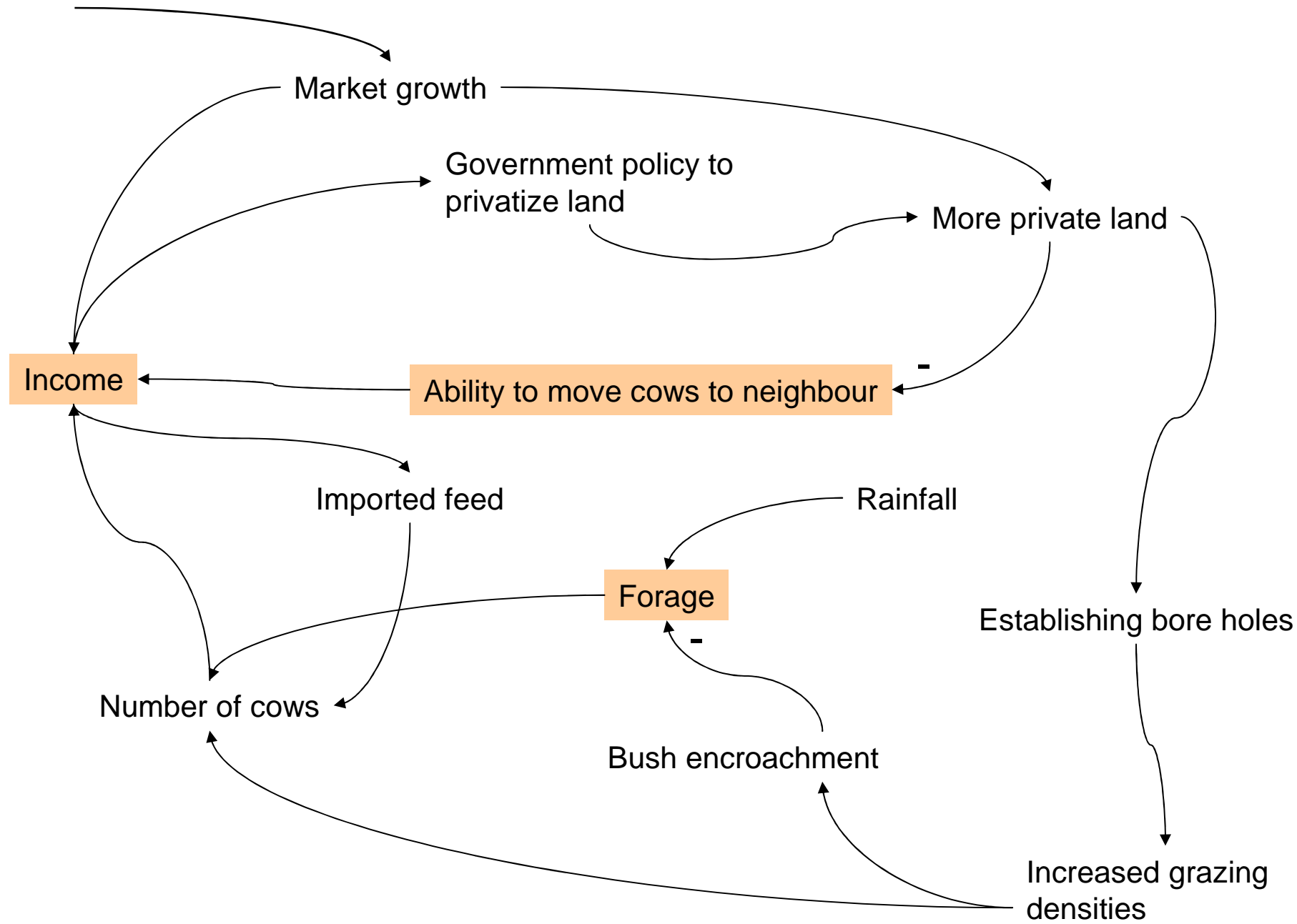
**Conventional social sciences**

**5. Explore each relationship within the system, and decide whether relationships are linear or non-linear, their slope, etc**

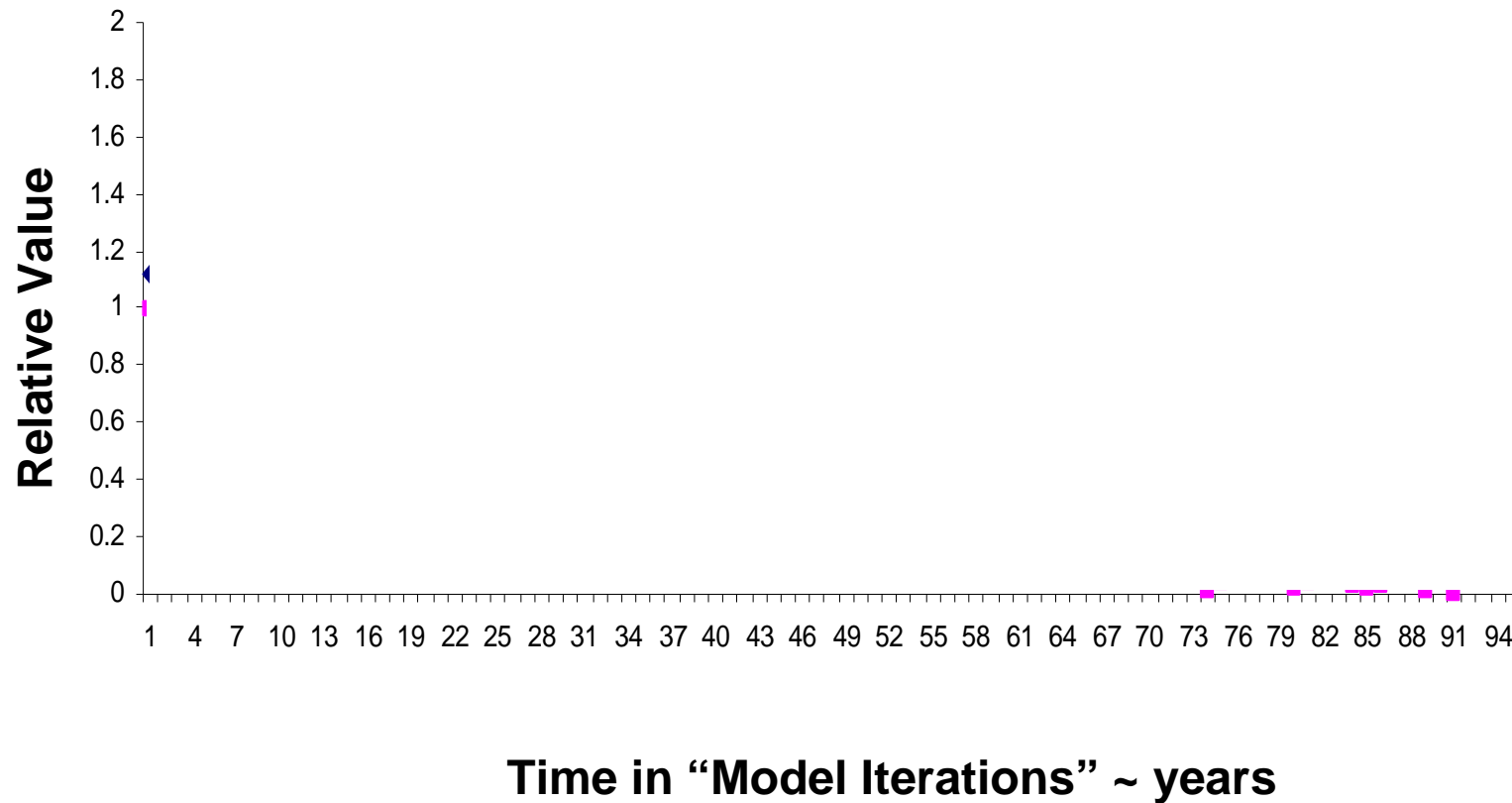
**Controversial modelling**

**6. Use computers to run different simulations of the model to explore scenarios.**

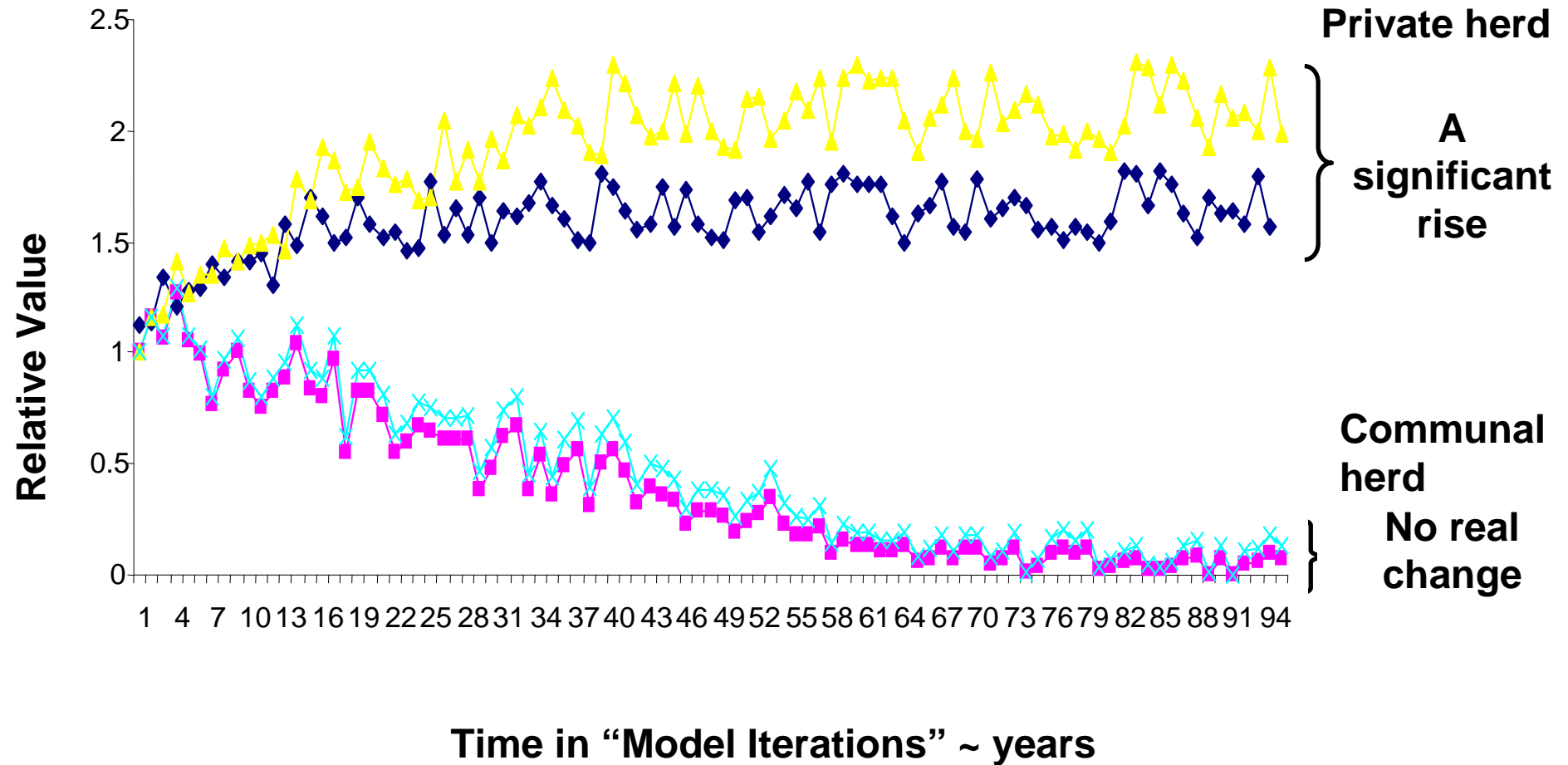




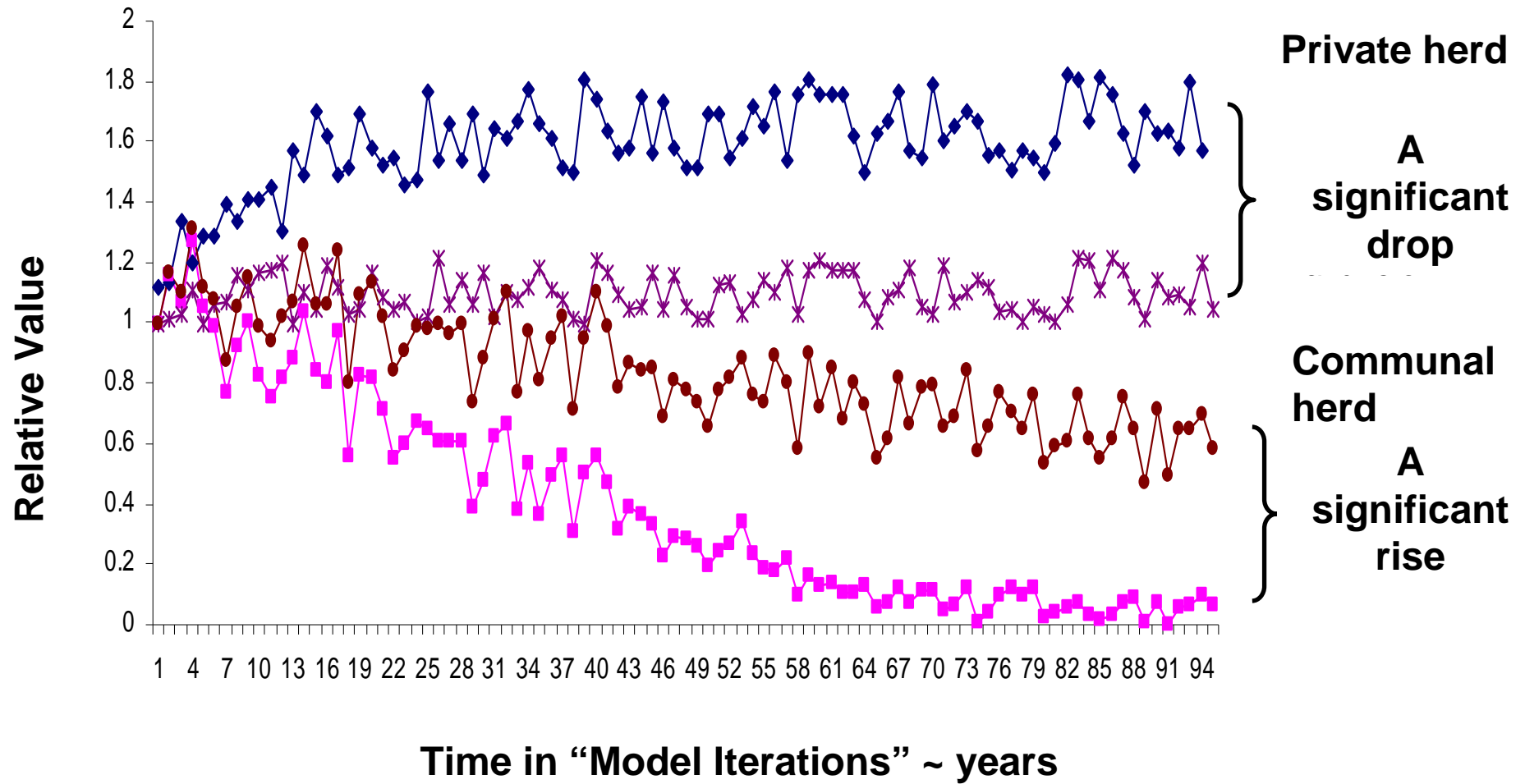
# Using models to explore implications of stakeholder recommendations ... (a) A baseline showing effect of climate change



# The effect of “Agricultural Best Management” scenario to help reduce impact of climate change



# Pro-poor land reform scenario



# One implication (of *this* model)

- Enacting pro-poor land reform is more effective at helping communal farmers maintain incomes in light of climate change than promoting agricultural best management.
- Outputs of the model should be used to stimulate discussion rather than direct policy.
- All our case studies will be published as part of a special issue in *Ecology and Society* that will be out in late 2010.



# Criticism of this approach

- Still very small scale and difficult to generalize.
- Models may look accurate but really they aren't.
- Difficult to validate or test models.

# A Final Approach: Historic Analysis

- Fall of the Maya Civilization (circa 800)
- Collapse of Medieval Civilization (circa 1300)
- Fall of Rome (Circa 300)
- And famines in both “global” versus a local food systems – in the 19<sup>th</sup> century.



<http://uts.cc.utexas.edu/~marl/images/Tikal.JPG>



**DALE MACKENZIE BROWN**

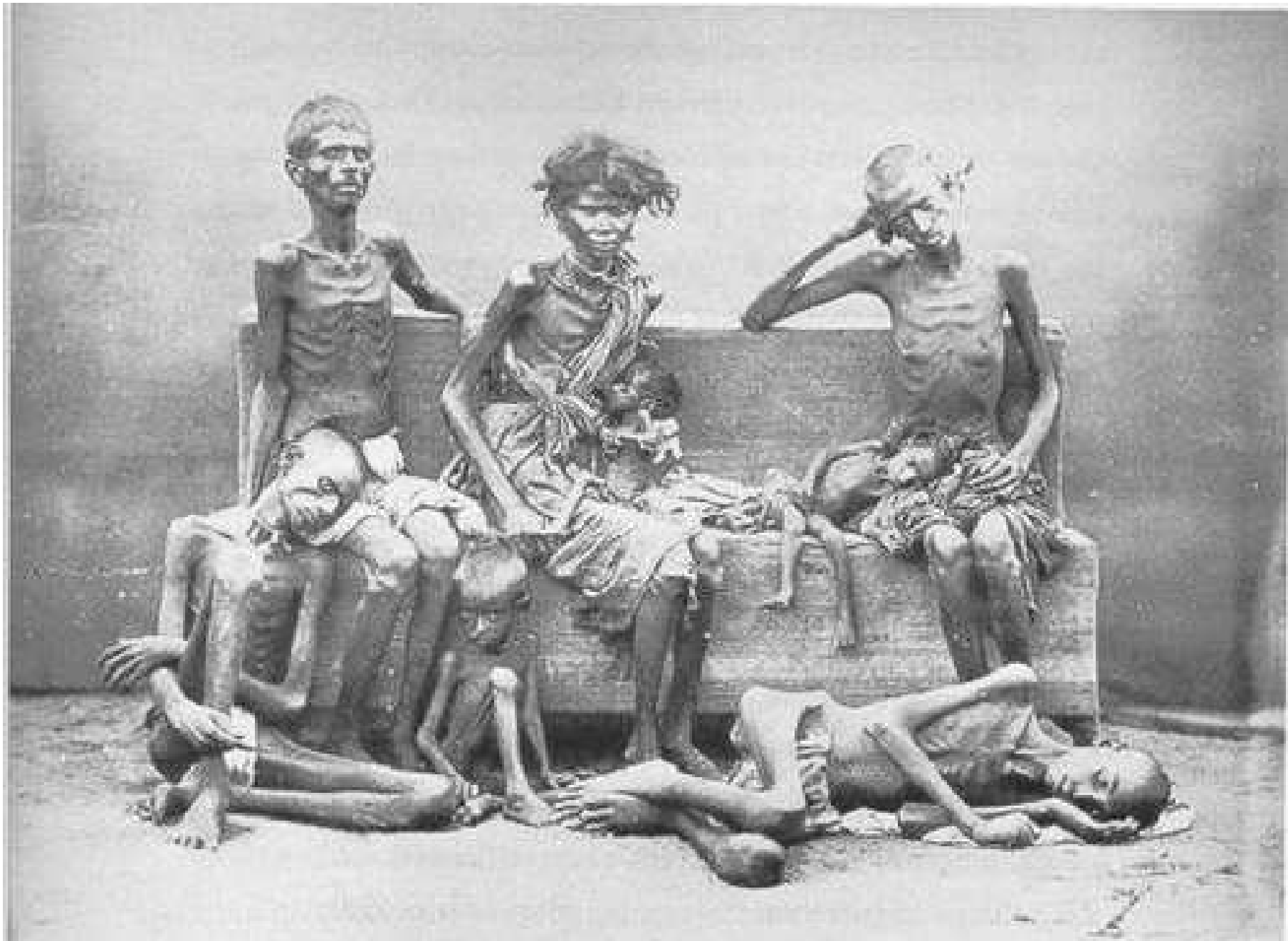
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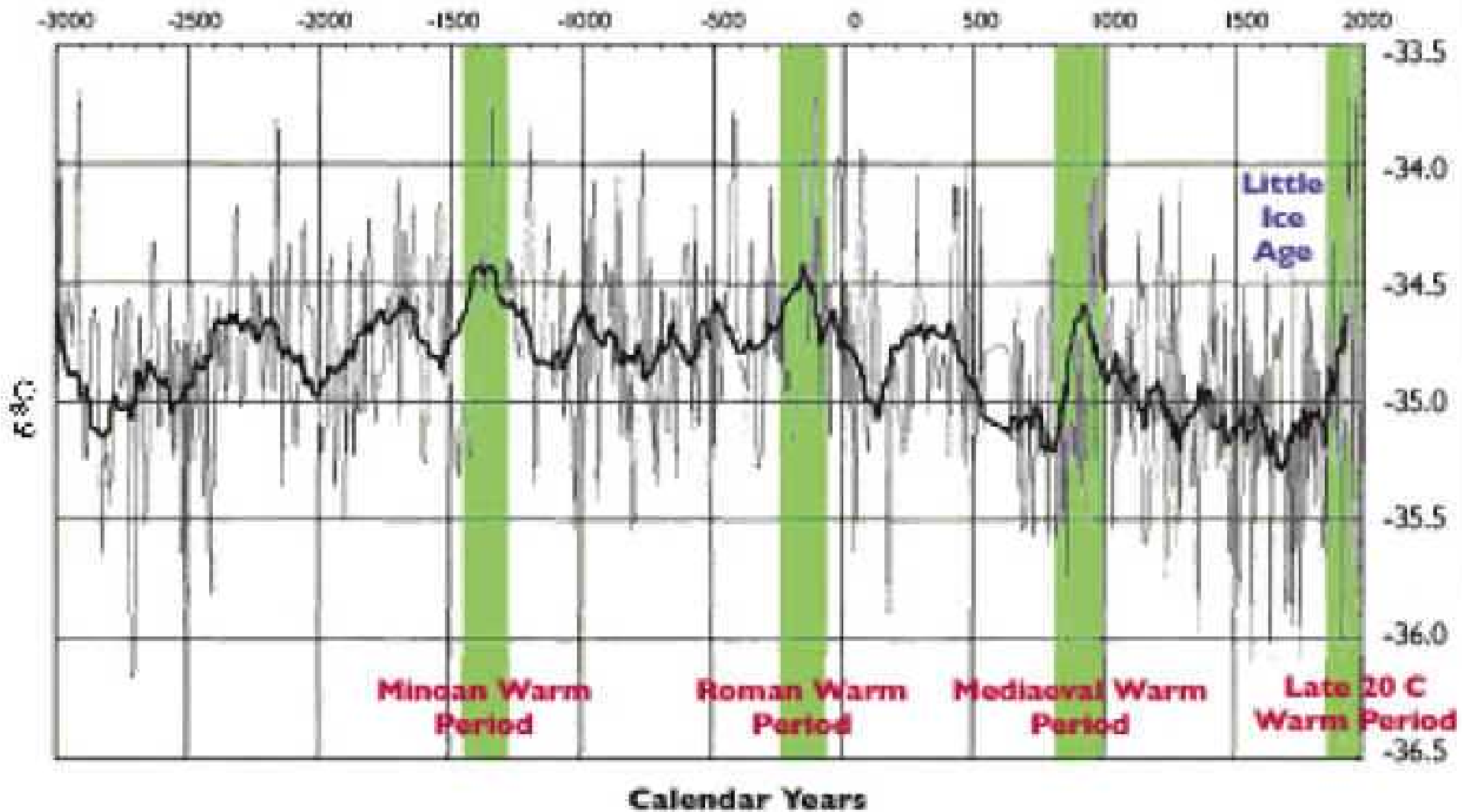


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# The “good weather” trap.



Source: Grootes, P. M. (et al), 'Comparison of oxygen isotope records from the GISP2 and GRIP Greenland ice cores', *Nature*, 366, 1993, pp. 552-4.



# The “farmer specialization” trap



**Allegory of Good Government by Ambrogio Lorenzetti, Sienna, (c.1290 – c.1348)**



[http://it.stlawu.edu/~ptalag37/images/new/ireland/images/Untitled-22\\_jpg.jpg](http://it.stlawu.edu/~ptalag37/images/new/ireland/images/Untitled-22_jpg.jpg)



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# The poor and marginalized trap



Photo from cover of: Davis, M. (2001) *Late Victorian Holocausts: El Niño famines and the making of the third world*, London, Verso.

“[Any policy to] mitigate the effects of famine ...serve but to enhance the evils resulting from overpopulation”

- Sir Evelyn Baring (then England’s finance minister referring to the 1876-79 famine in India)





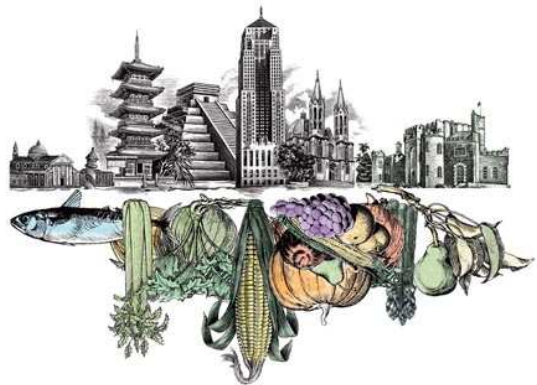
<http://www.rootsweb.com/~irlker/images/glenevict.jpg>





Of course, we've made these same  
three mistakes today...

# EMPIRES OF FOOD



FEAST, FAMINE,  
AND THE RISE AND FALL  
OF CIVILIZATIONS

EVAN D.G. FRASER AND ANDREW RIMAS

*Authors of Beef: the Untold Story of How Milk, Meat and Muscle Shaped the World*

EVAN D.G.  
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RIMAS

# Empires of Food

Feast, Famine and the Rise  
and Fall of Civilizations



“Beddington said a major technological push is needed to develop renewable energy supplies, boost crop yields and better utilize existing water supplies.”



Food and water shortages as a result of climate change and growing populations are likely to trigger mass migration and unrest. Photograph: AFP/Getty

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To me this is too much technocentrism.

- We need multi-integrated, and trans disciplinary research to approach this problem from a holistic perspective.

Sustainability Research Institute  
School of Earth and Environment



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**For more information, copies of papers, etc.:**

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