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An overview of the key issues and how they interact, describing the high-level ethical, social and political challenges.

Climate Xchange seminar, Edinburgh, June 2013

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LIBYA
BAHRAIN
YEMEN
IRAN
ALGERIA
TUNISIA
EGYPT

at

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- Milk chocolate (66%) (sugar, cocoa butter, cocoa mass, dried skimmed milk, whey powder, butterfat, vegetable fat, lactose, emulsifier (soya lecithin), flavouring), wheat flour, sugar, vegetable fat, cocoa mass, yeast, raising agent (sodium bicarbonate), salt, calcium sulphate, flavouring

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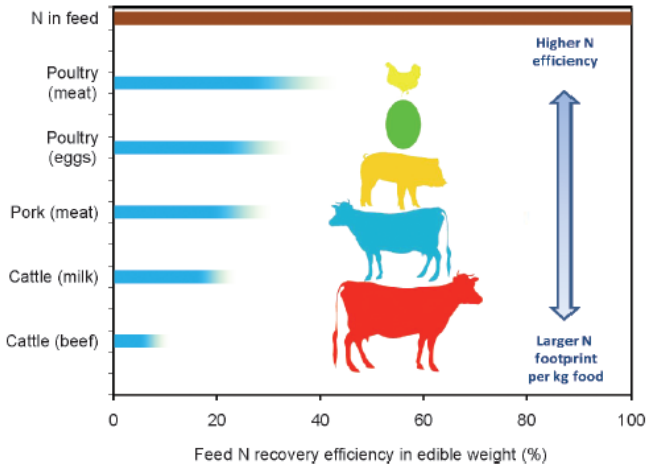
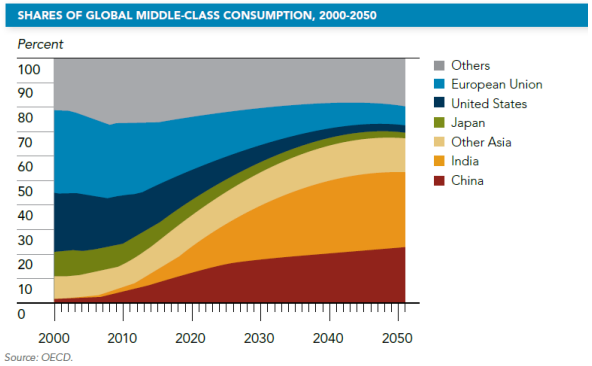
DEMAND FOR FOOD IS GROWING FAST

Growth in global food demand

Animal protein expensive in resources to produce (ENA)





2000: 60% middle class “western” vs 20% “eastern”
2050: 12% vs 78%

- 35% more mouths by 2050
  - Mainly in Asia, Africa and S. Am
- Richer people eat more:
  - ~5bn people in middle class by 2030 (cf 1.8bn now), with associated higher consumption (meat, dairy and total volumes)
  - Mainly in Asia
- 70% urbanised
  - Understanding of food systems

- All add up to projected increased global food demand (FAO estimate 60% more)

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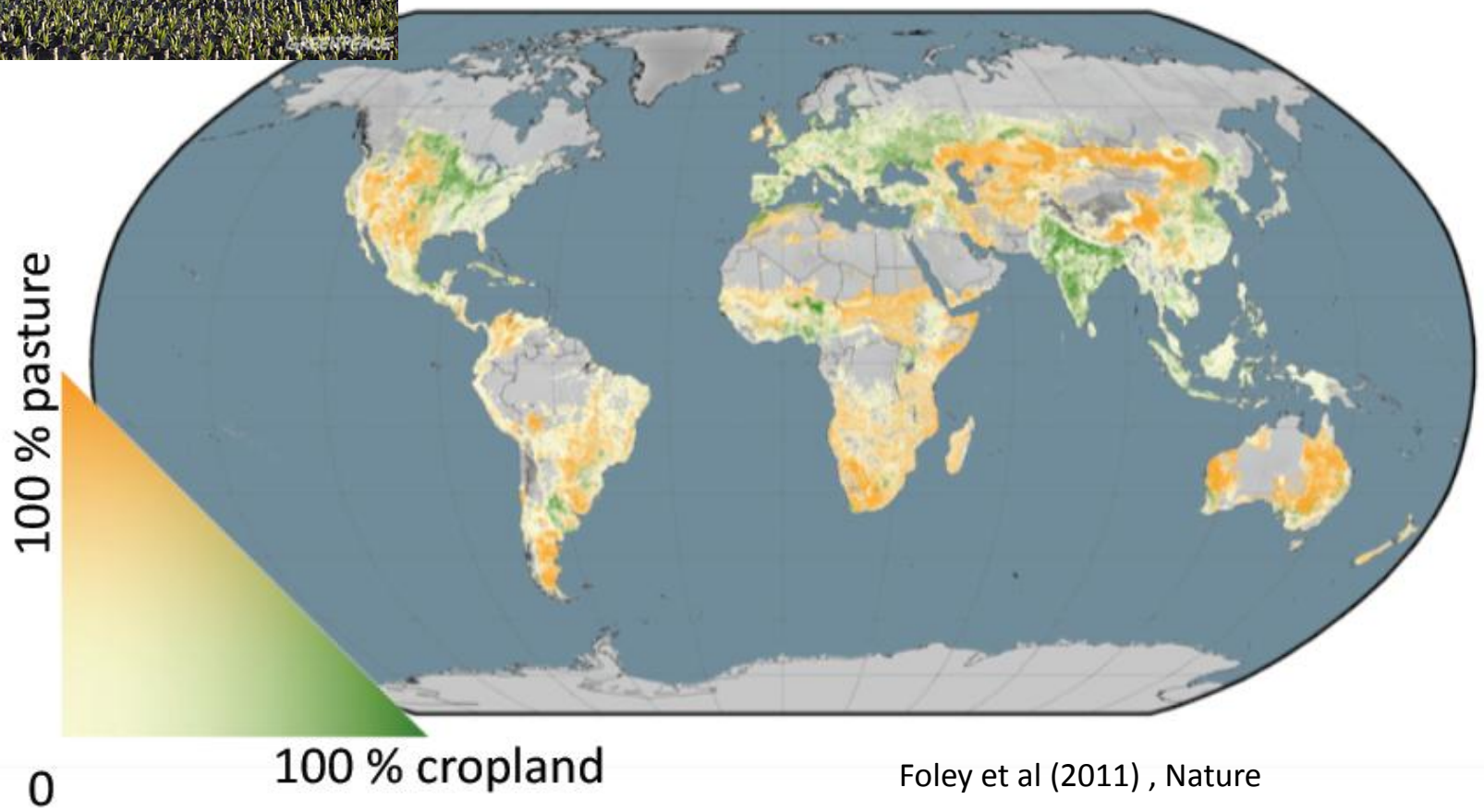
CONSTRAINTS ON SUPPLY GROWTH

Globally, there's no more land



Foley et al (2011) , Nature

Figure S1. Extent of Global Agricultural Lands. This map illustrates the global extent of croplands (green) and pastures (brown), as estimated from satellite- and census-based data by Ramankutty *et al.*[1]. According to U.N. FAO statistics, croplands currently extend over 1.53 billion hectares (~12% of the Earth's land surface, not counting Greenland and Antarctica), while

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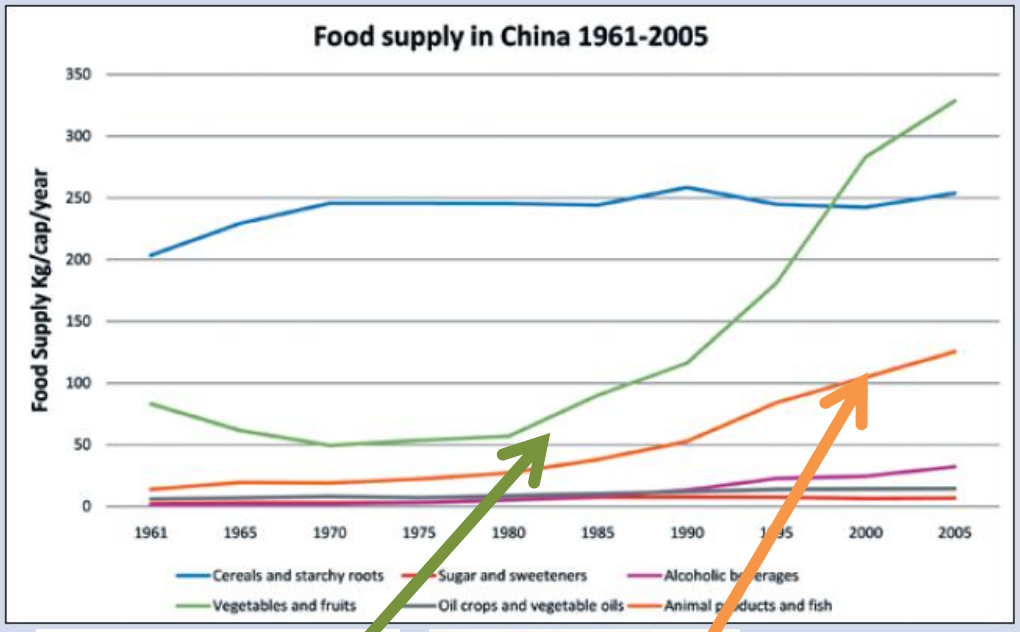
Other constraints on production growth

- Resource and regulatory squeezes:
  - Nitrogen
  - Fuel
  - Phosphate
  - pesticides

Cost–benefit analysis highlights that the environmental costs of all N losses in Europe (estimated at €70–€320 billion per year at current rates) outweighs the direct economic benefits of N in agriculture. (European Nitrogen Assessment 2010)

Increasing competition for water

By 2050 over half the world's population will not have enough water to meet demands



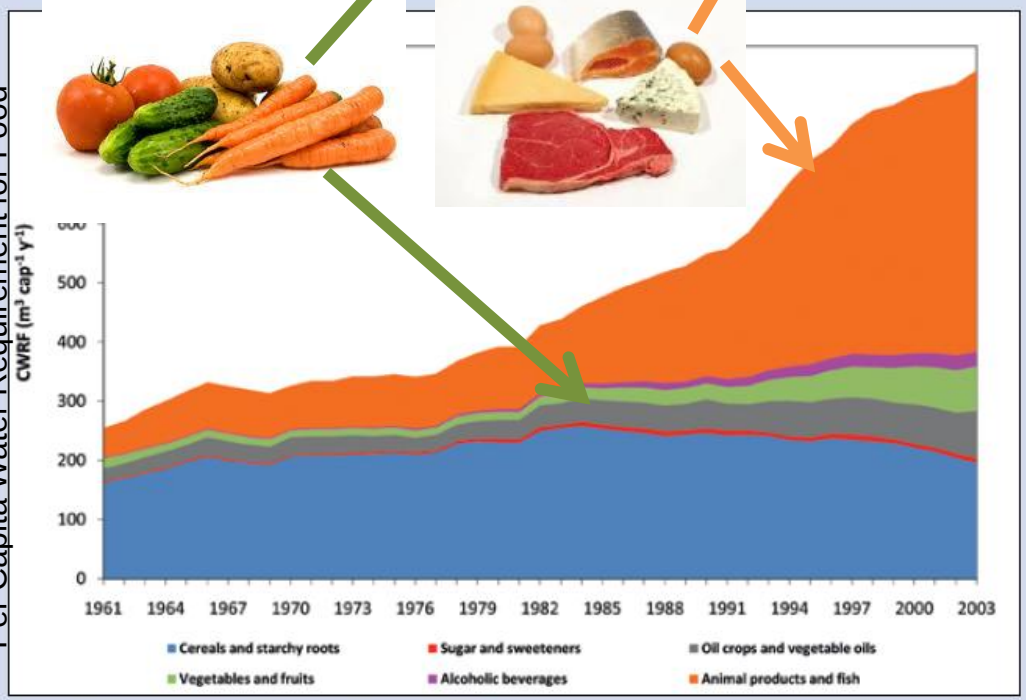


Figure 2. Food supply in China and the associated per capita water requirement 1961-2005 (Lundqvist 2010, updated from Liu, J. *et al.*, 2008)

How to Cite: Jägerskog, A., Jønch Clausen, T. (eds.) 2012. Feeding a Thirsty World – Challenges and Opportunities for a Water and Food Secure Future. Report Nr. 31. SIWI, Stockholm.

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CLIMATE CHANGE:

CHANGING VARIABILITY: THE WEATHER

Increasing extremes

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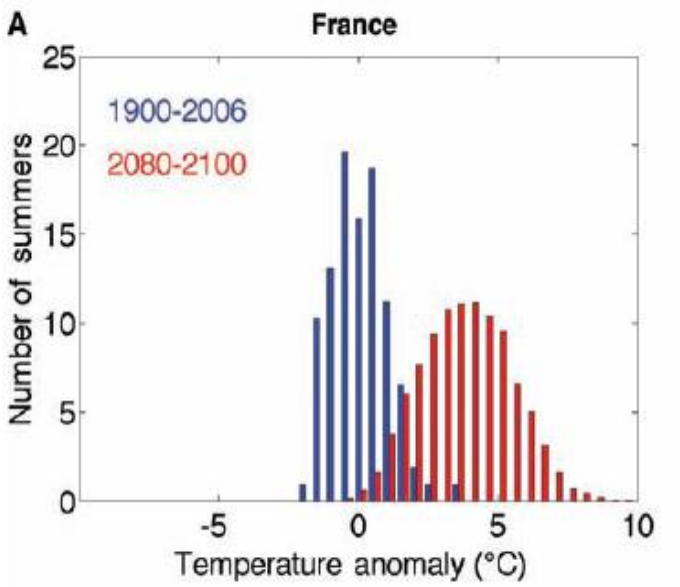
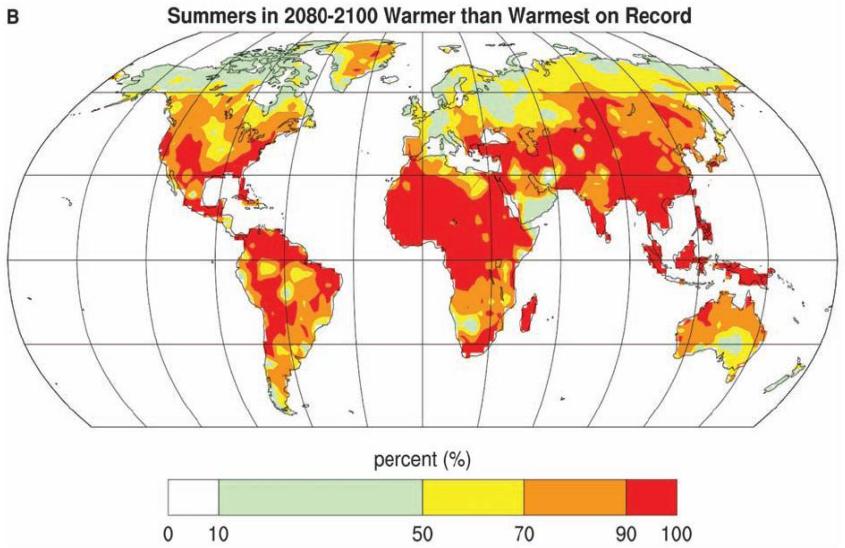
"…in France and northern Italy, where over 70,000 people perished from heat-related causes….. Italy experienced a record drop in maize yields of 36% from a year earlier, whereas in France maize and fodder production fell by 30%, fruit harvests declined by 25%, and wheat harvests (which had nearly reached maturity by the time the heat set in) declined by 21%"





Battisti 2009 Science

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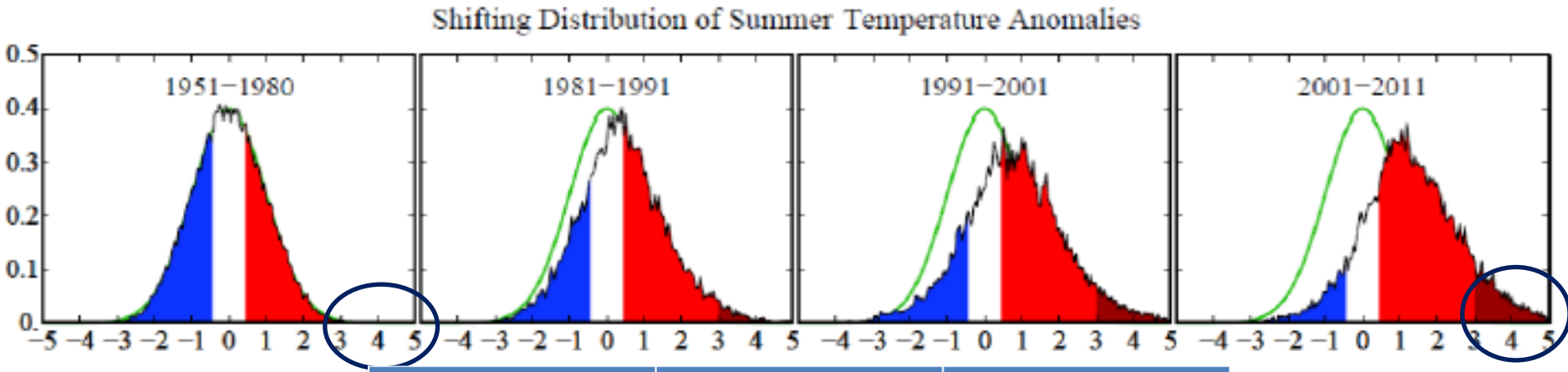
Changing weather

Historically, what was a 1 in 700 year event is now a 1 in 7-10 year event



score	Probability	Odds/Return time
>0.7	33%	1 in 3
>2	2.3%	1 in 44
>3	0.14%	1 in 741
>3.3	0.1%	1 in 1000
>4	0.003	1 in 31574

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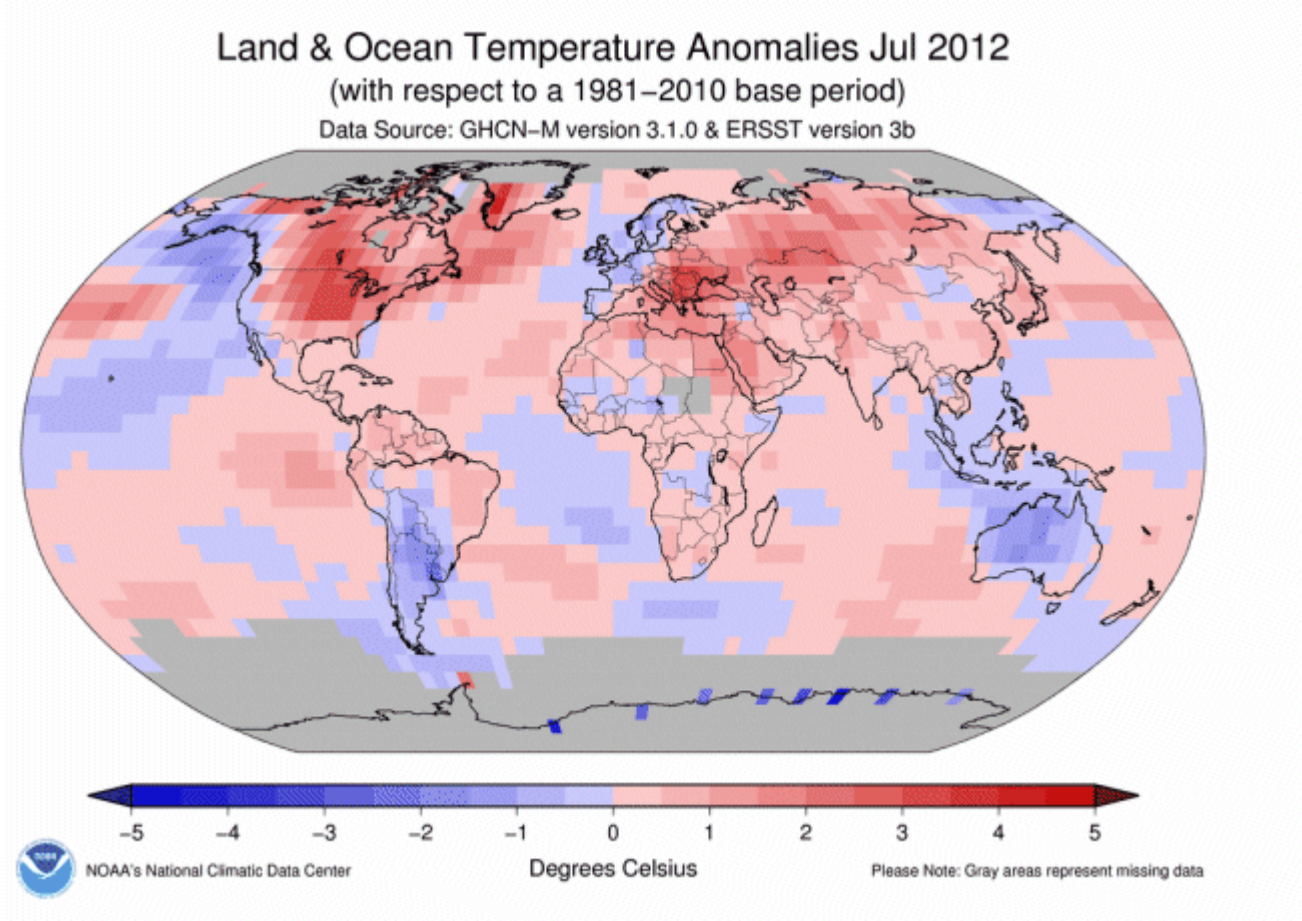
The same weather phenomenon can be very large scale



Need to increase resilience throughout the food chain

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DEFINING SUSTAINABLE AGRICULTURE

“Sustainable Agriculture” needs…

- Management of farming’s impacts within plots/fields
- management of land to maintain other services

Sustainable agricultural landscapes require landscape planning: many services depend on the amount, quality and configuration of non-cropped habitat

Sustainability typically has a production cost...and so does climate resilience

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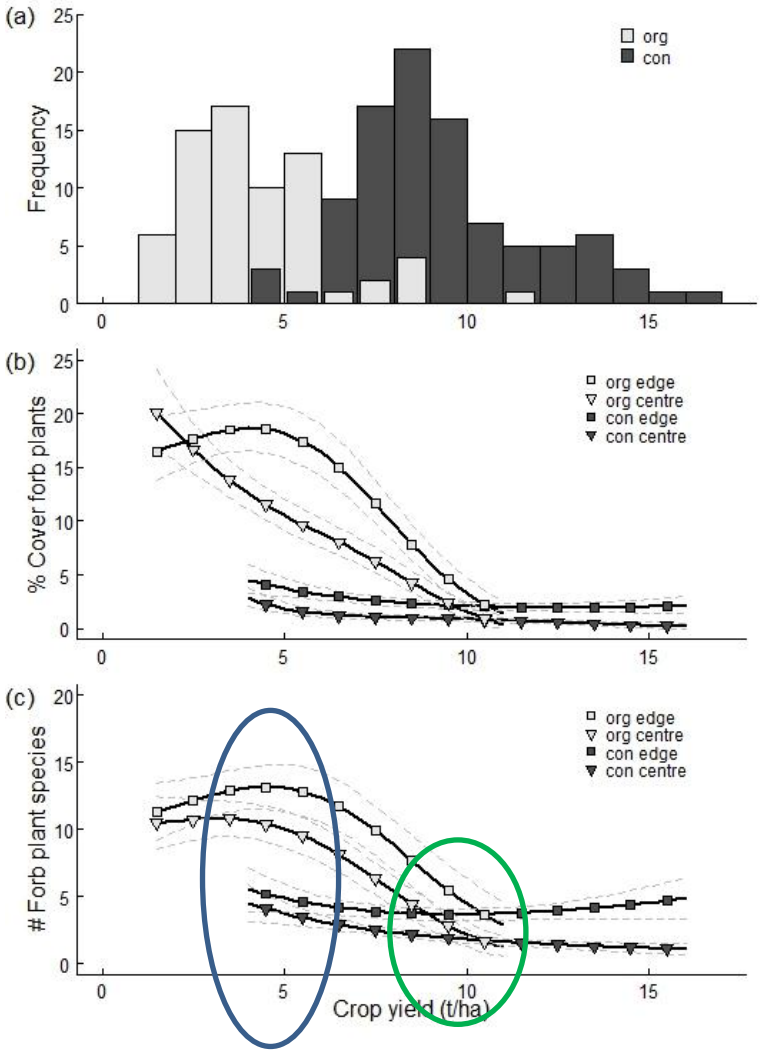
Low-yielding organic farming has biodiversity benefits but High-yielding organic agriculture can impact on ecology in similar ways to conventional farming



Gabriel et al 2013 J appl ecology

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SUSTAINABILITY NEEDS A SPATIAL STRATEGY

Different places respond differently to the same intervention for a whole variety of reasons

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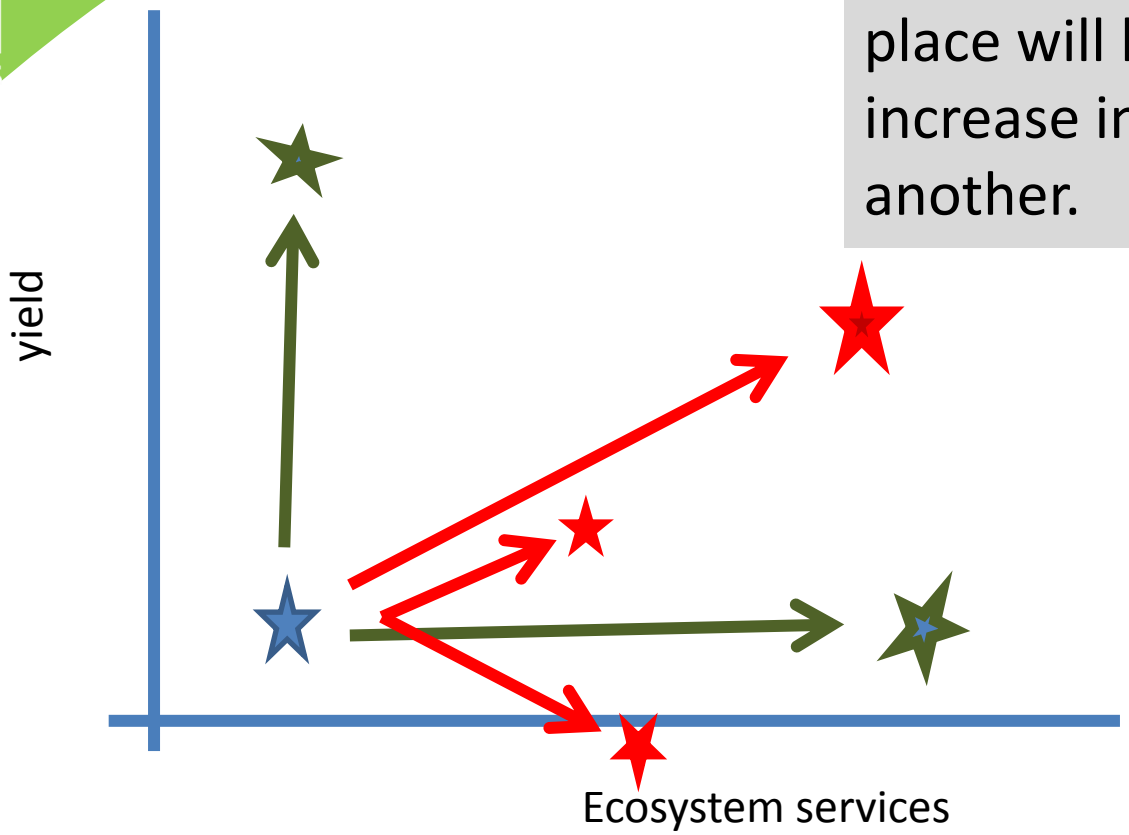
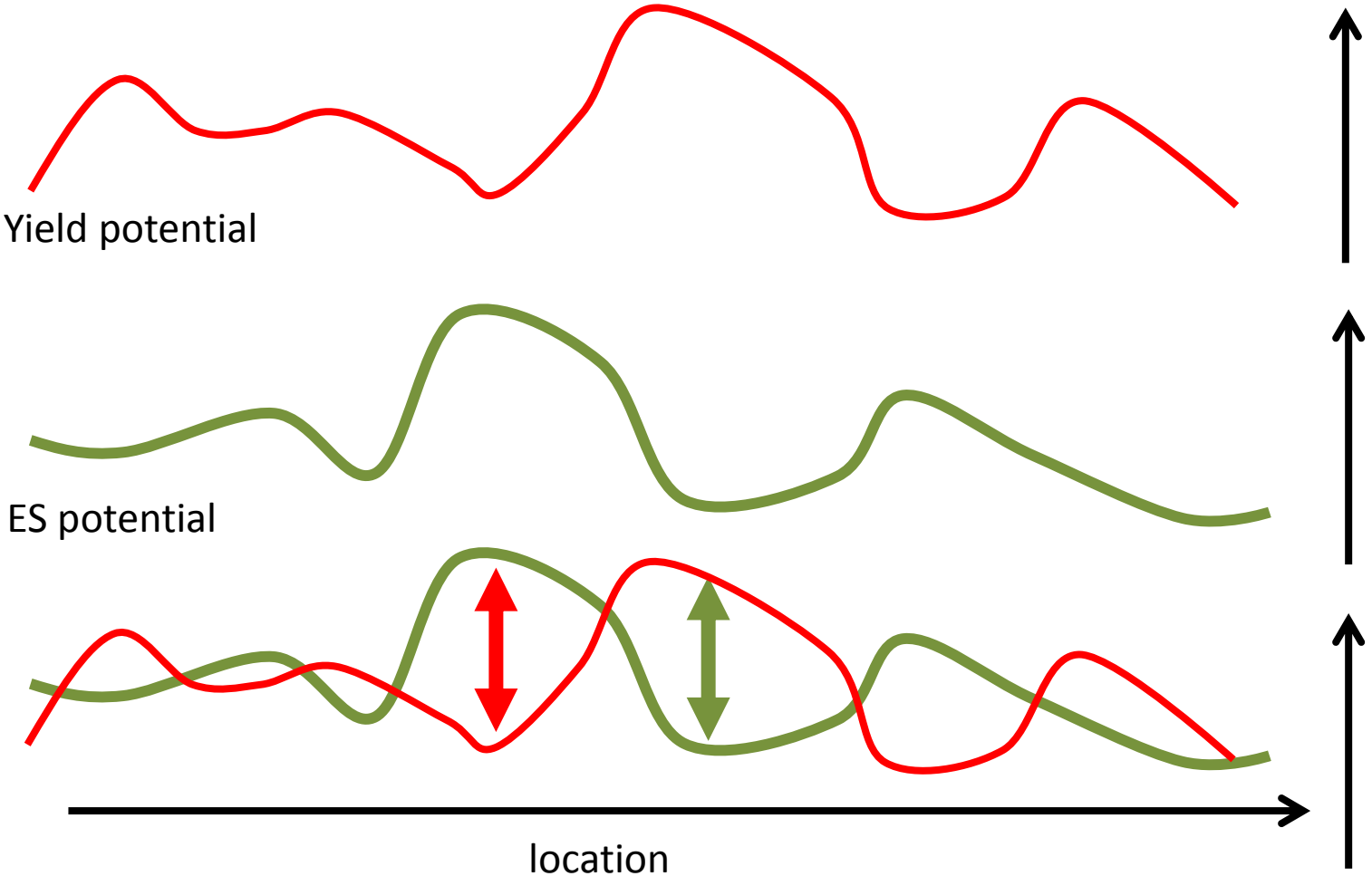
Systems thinking

A zero sum game? If there is a trade-off between yield and services and demand is inelastic then a reduction in yield in one place will lead to an increase in yields in another.



Spatial analysis



Scale independent: landscape, region, country, globe

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DOES DEMAND REQUIRE SUPPLY?

Or if sustainable intensification doesn't allow supply growth what do we do?

IT'S NOT JUST ABOUT PRODUCTION

Global food losses/waste is estimated to be 1.3 billion tonnes per annum (pa), equating to approximately one third of edible food intended for human consumption

The total food production of sub-Saharan Africa = developed world food waste (230mt)

Unequal access to resources

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If all of humanity lived like an average resident of Indonesia, only two-thirds of the planet's biocapacity would be used; if everyone lived like an average Argentinean, humanity would demand more than half an additional planet; and if everyone lived like an average resident of the USA, a total of four Earths would be required to regenerate humanity's annual demand on nature.

WWF ecological footprint index
From Living Planet Report 2012

Germany: The Melander family – 4 mouths $500.07 per week

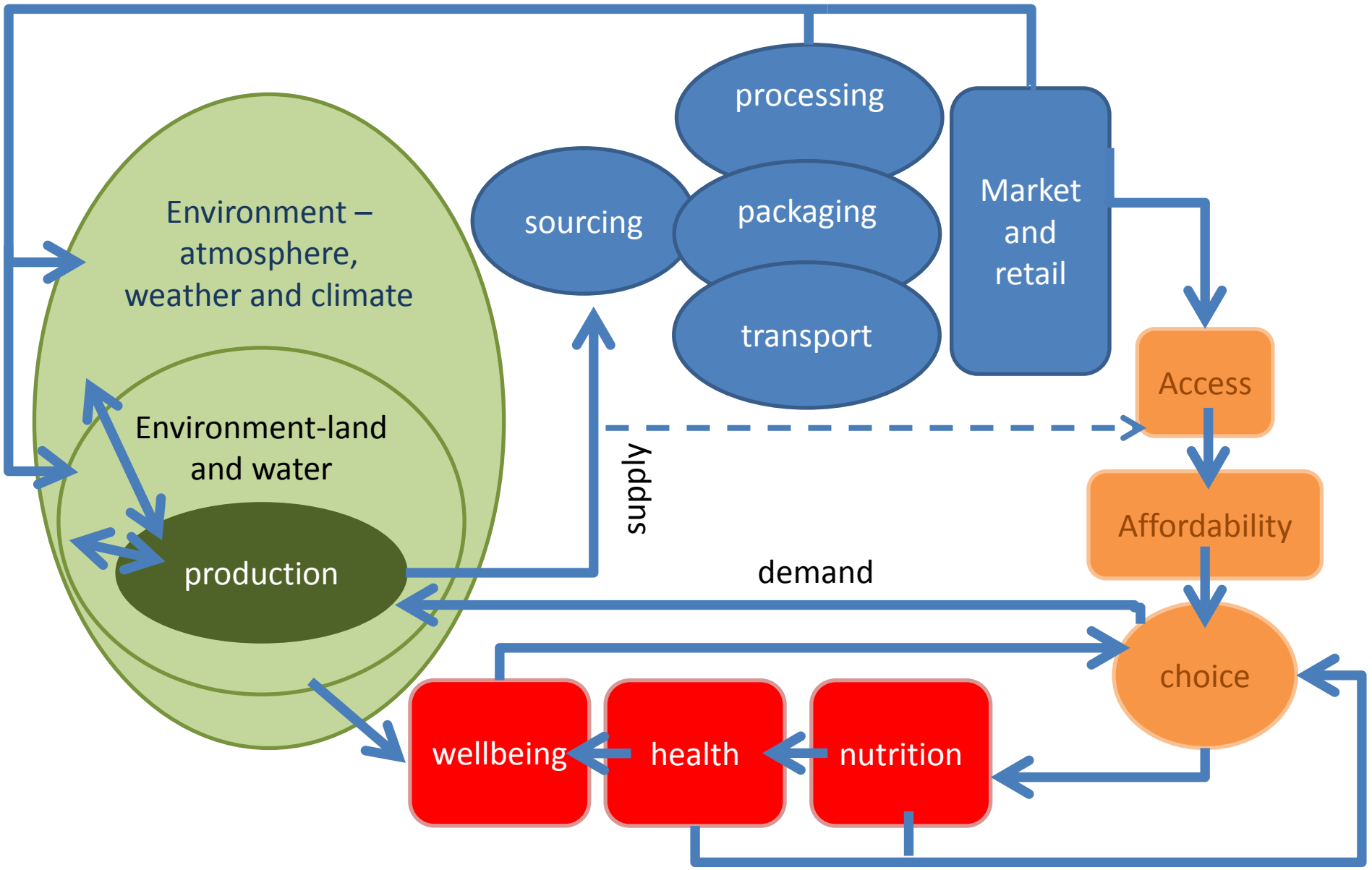
2005

Chad: The Aboubakar family - 6 mouths $1.23 per week

Can we change our attitude to food?

Meeting demand will be increasingly costly – on health and environmental terms – and may not be possible to do it sustainably in the face of climate change

- We want abundant, cheap, safe, nutritious, high-welfare, local and sustainable food – but we can't have it all



Complex system: who has the power?

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Thank you!

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