Proximate causes and underlying driving forces on land-use change among small-scale farmers – illustrations from biomass expanding areas in the Loess Plateau, China

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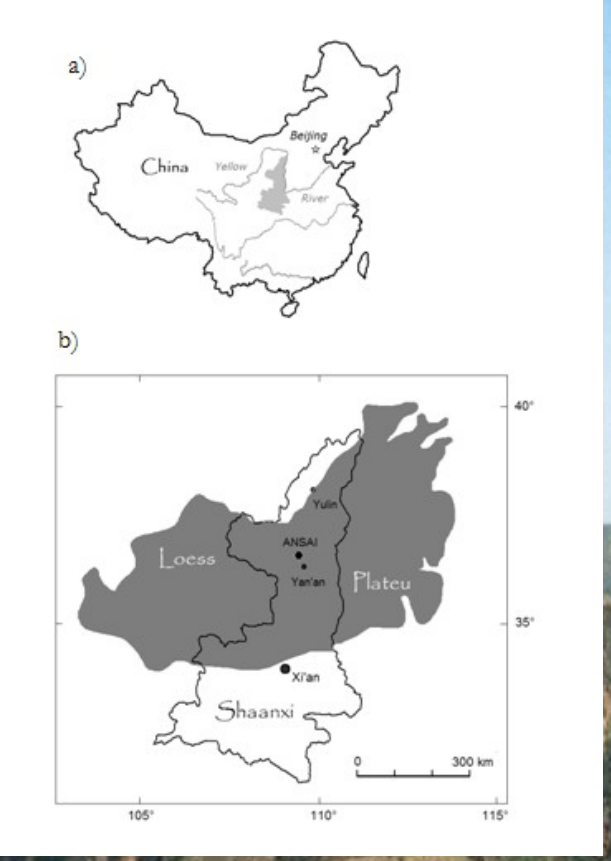
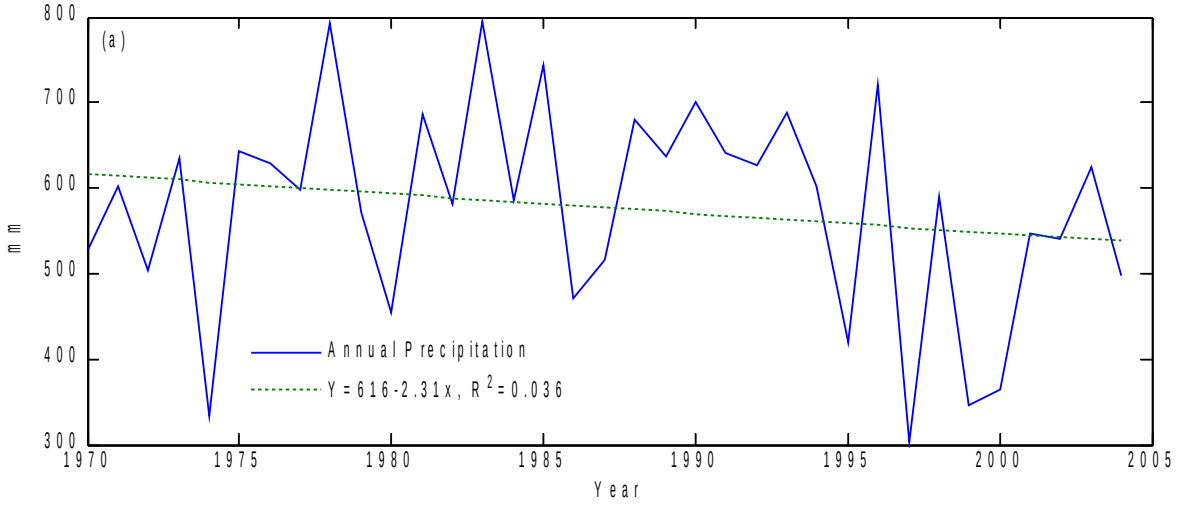
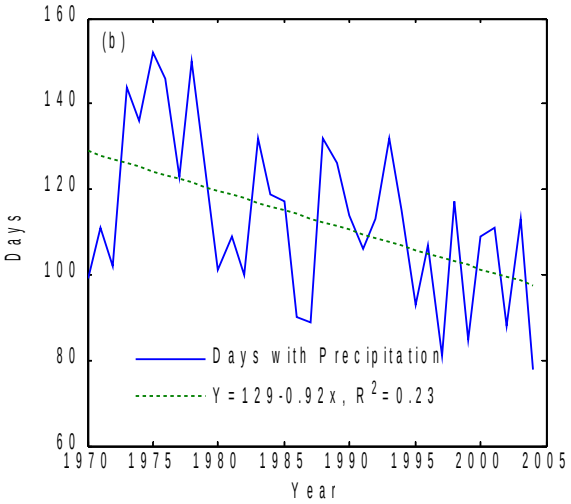
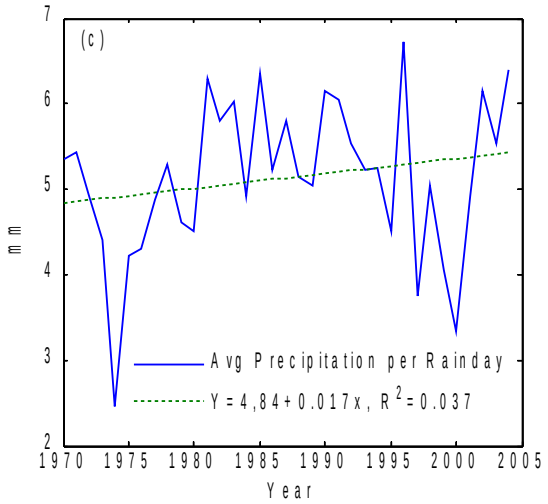


- Small scale farmers
- 400-500 mm P/yr (irrigation limit)
- Loess Plateu
- Household Responsibility System (1982). From farming in communs to household leases.







T increase 0.9°C in Ansai for the period 1955–2004

The Cropland Conversion Programme (massive land reform 2000)

CSPR

Impact of land reform

Example from our 23 households

	Total Land	Hill Land	Flatland		Cultivated Land	Terraced land
1982	32.3	29.2	3.1		31.6	-
2005	29.1	27.8	1.3		3.2	1.4
Change	-9.9 %	-4.8 %	-57.6 %		-89.9 %	

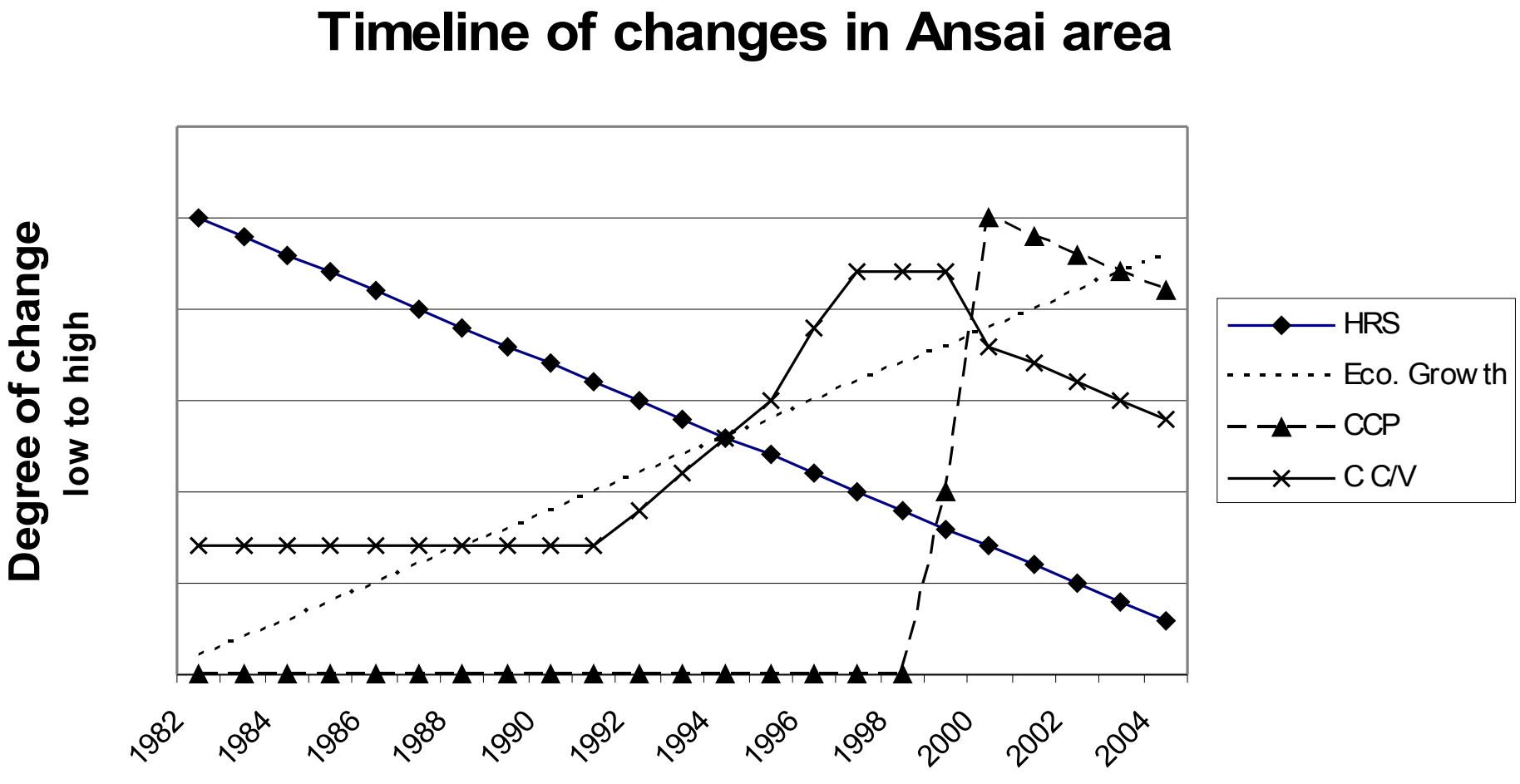
Theory: Proximate causes and underlying driving forces for land-use change

- e.g. Geist and Lambin (2002, 2004) and Keys and McConnell (2005)
- meta-studies
- avoid generalisations and single explanatory causes based on data from national statistics
- different levels of drivers and their inter-linkages

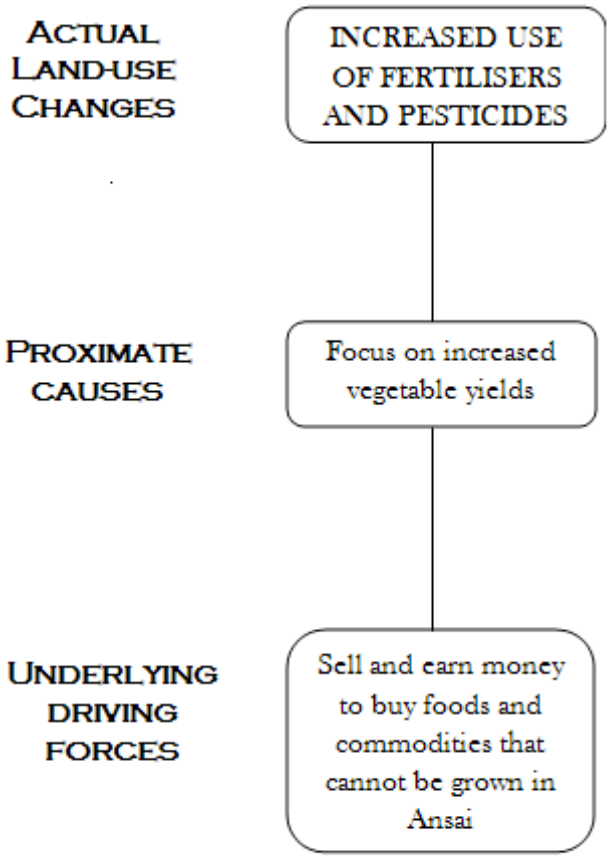
_____ additions_____

- qualitative household interviews (23 farmers)
- changes over time and trends (1982 – 2005)

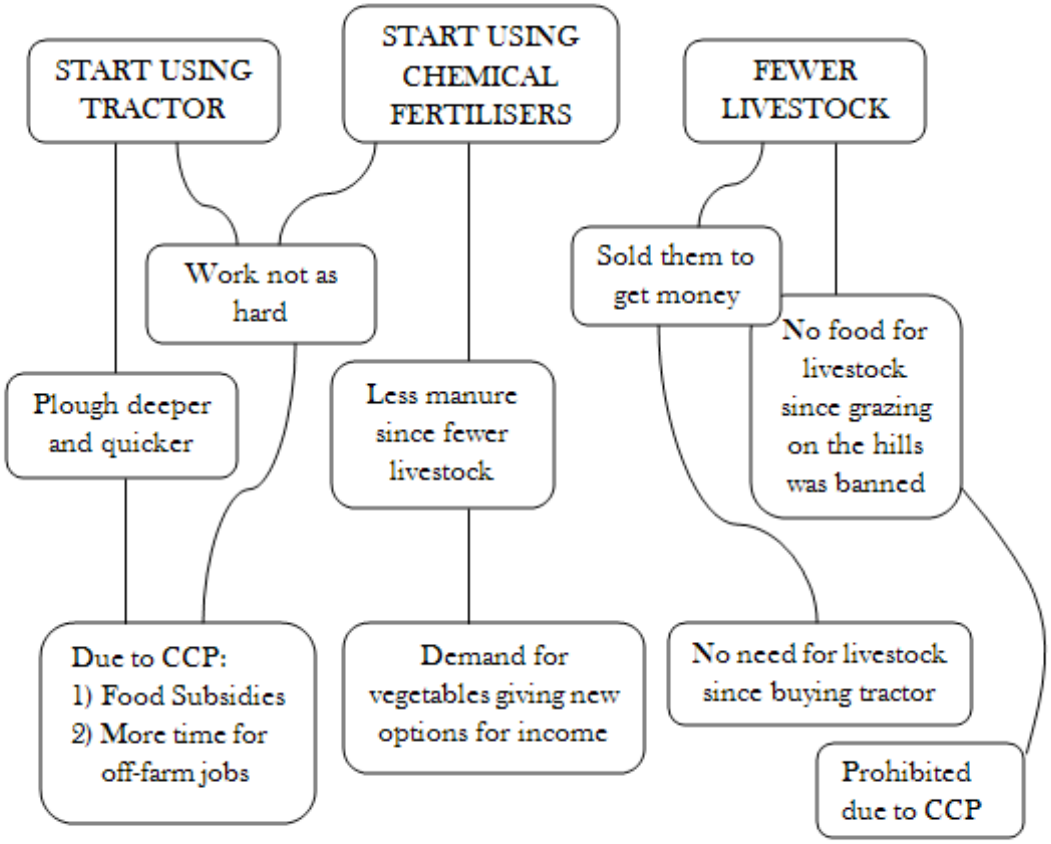
Conceptual timeline



Example 1
Single linkages



Example 2
Multiple linkages



UNDERLYING DRIVING FORCES

Economic
- Compensation provided, mainly in the form of food from the CCP, less need to grow own crops
- Demand for vegetables in the growing city nearby – Ansai
- Need money to by food, fertiliser and plastic film – more expenses today than previously
- Activities generating income have increased in number due to expanding city, highway construction, oil drilling – temporary jobs
- No need for livestock when less land to cultivate – vegetable growing, tractor use
- Planting fruit trees on valley bottom resulted in higher compensation when the highway was constructed
- Compensation: from CCP, mainly food, runs for 8 years (start 2000), money for highway disbursed for 12 years (start varies)

Policy
- National environmental plans

Climate
- Due to warmer winters, greenhouse used all year around
- Unreliable and decreasing rainfall

Cultural
- Food consumption pattern has changed to rice and wheat products
- Power structure in village

Conclutions from the study

- Natural hardships (erosion and water limitation), small-scale farmers perceive themselves less vulnerable today –
  - decreased dependence on natural factors such as rainfall and farm subsistence.
- Most dominating driver perceived by farmers is economic and is described as
  - earning money, and preferably more money.
- The modified model describes
  - the array of actual causes
  - the proximate causes, as the tools that the farmers use
  - the underlying driving forces are the engines of change. This level, however, **is not practical for the farmers**, hence all levels need to be assessed in policy-making situations.
- Short-term solutions for the farmers, in terms of land use, appear in the results.
  - To generate more sustainable land use, **long-term economic benefits** for farmers should be sought in policy implementations.

Implications for indirect land use and increased biomass production

- Ongoing research: assess the carbon sequestered through the land reform
- Potential climate feed-back process from increased biomass (increased vegetation →more transpiration (latent heat) → cooling effect)
- Even with complex and non-linear changes of land use, **economic incentives** spanning over a **rational time-frame** tend to dominate as force of change

Thank You!

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