

Chinese grasslands: problems, dilemmas and directions

David Kemp, Colin Brown, Han Guodong,
David Michalk, Nan Zhibiao, Wu Jianping,
Xu Zhu and ... many colleagues



Australian Government
Australian Centre for
International Agricultural Research



Australian Government
Department of Agriculture,
Fisheries and Forestry

North-western China grasslands

- eastern end of the vast Eurasian grasslands
 - ↳ several thousand plant species
- 300m ha supporting 40+m people
 - ↳ been grazed with livestock for millennia
 - ↳ 40% of the poor people in China < \$2 / head / day

China's grasslands

acknowledged problems on 90% of grasslands

↳ poverty

↳ over-grazing

→ too many people + animals and reduced grazing land

→ policies had been focused on increasing animal number than on increasing animal product

↳ dust storms

↳ siltation of rivers

↳ loss of biodiversity

↳ high methane production

Livestock

early stages of:

user ➔ keeper ➔ producer ➔ breeder[#]

- survival rather than production
 - ↳ typically either stressed or recovering from stress
 - ↳ heavy losses in harsh winters
- shifting from a focus on animal numbers to animal production, driven by developing markets
 - ↳ both farmers and local officials have focused on animal number

[#] Luke (1989); Neidhardt *et al.* (1996)

*“when we were young we had
trouble seeing the cattle, now
we can see the mice”*

elderly herders in Inner Mongolia
discussing changes they have seen

Beijing is unimpressed with dust
storms

National policies

- promoting ecologically sustainable use of grasslands, and
- the improvement of income and well-being of herders, many of whom are from ethnic minority groups

policies are incorporated into the
National Grassland Laws

Methane

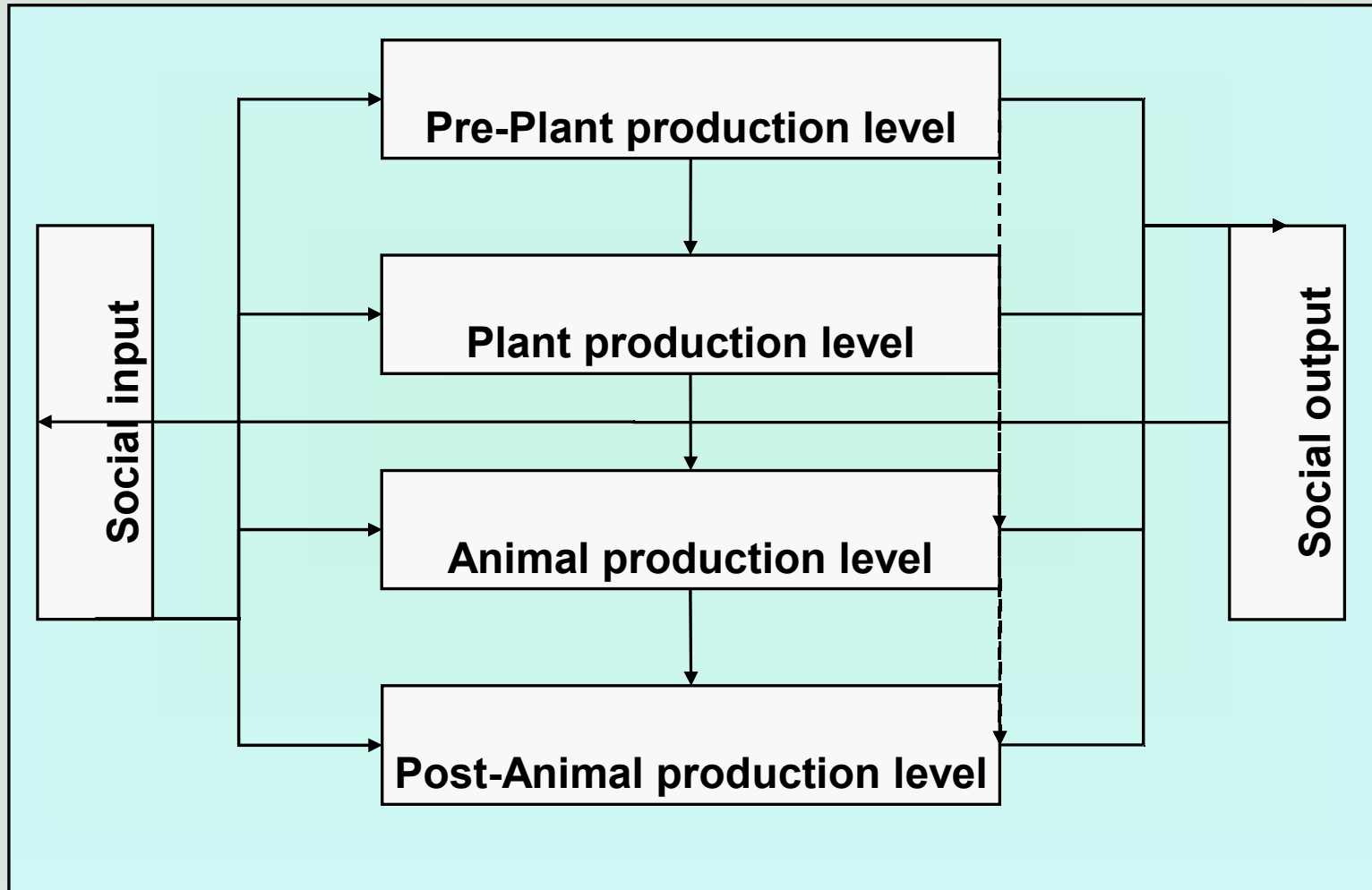
China has policies to reduce the amount of greenhouse gases

- ➔ non-dairy cattle produce around 60% of the enteric methane emissions and 18% of China's national methane emissions
- ➔ what can be done to reduce greenhouse gases?

Focusing the problem

- the core issues are:
 - ↳ poverty alleviation
 - ↳ grassland rehabilitation
- the situation is:
 - ↳ too many animals on a declining resource
 - ↳ BUT farmers the world over see more animals as the way to greater incomes

Grassland production system



Solutions

not initially obvious as reducing animal numbers and improving incomes could come from:

- ↳ market developments
- ↳ improved management of livestock
- ↳ growing more forage
- ↳ better financial arrangements
- ↳ policy changes
- ↳ technological advances

plus training herders to become producers

Questions

- can stocking rates be reduced by producing more animal products that get higher prices
 - ➔ can animals be pen-fed over autumn to spring to protect livestock from the cold and to manage the energy balance better?
 - ➔ what can be done about common grazing?
 - ➔ does reducing grazing from mid autumn through spring increase grassland productivity?
 - ➔ can spring supplementary feeding reduce grazing pressures?
 - ➔ what are the options for increasing yield of digestible nutrients sustainably from grassland?

Questions (2)

- could regulatory changes *e.g.* ‘forbidding grazing’ achieve the goals set
 - ➔ what are the costs and are there better strategies?
 - ➔ what national and regional policy initiatives are likely to have a positive impact and which may not?
- can livestock breeding cycles be reorganised to better align with forage availability?
- will more efficient livestock production systems produce the greatest reductions in methane?

Answering the questions

- not easy
- in many instances little work had been done
- the component information had not been collated and interpreted

Chinese participants

Gansu

- ➔ Gansu Agricultural University
- ➔ Gansu Grassland Ecological Research Institute

Inner Mongolia

- ➔ Grassland Research Institute (CAAS)
- ➔ Inner Mongolia Agricultural University

Beijing

- ➔ Institute of Environment and Sustainable Development in Agriculture (CAAS)
- ➔ Research Centre for Rural Economy (MoA)

Other participants

Australia

- ↳ Charles Sturt University
- ↳ New South Wales Department of Primary Industries
- ↳ University of Queensland

discussions with many others:

- ↳ World Bank Pastoral Development Project
- ↳ Derek Baker (NZ / Denmark)
- ↳ Canadian International Development Agency
- ↳ US Department of Agriculture
- ↳ plus ...

Project strategy

- not immediately obvious if leaping into experiments would provide the answers required
 - ↳ Chinese grassland research provides a lot of data
- analysis of the livestock farming system was seen as the better way forward
 - ↳ systems analysis has been limited in China

Project strategy (Part A)

survey farms in selected villages to define a **'typical'** farm

↳ farms where livestock was a useful source of income

↳ close to average – but adjusted for anomalies

→ if only one farm had yaks that distorts averages

Project strategy (Part A – 1)

develop a series of models to analyse

1. current livestock production system (feed balance analyser)
2. options for farm improvement (linear program)
3. sustainability of better options over long term (dynamic model)

the core of each model is the bio-physical relationships – economic analyses then depend upon those relationships

Study villages

- Gansu

- ↳ Sunan – alpine grassland is 30% of China's grassland

- ↳ Huanxian – loess soils are a major livestock / cropping system of central China

- Inner Mongolia

- has 50% of NW grasslands – desert, meadow and typical steppe

- ↳ Siziwang – desert steppe

- ↳ Taipusi – meadow steppe

What are the study villages like?

- Climate
 - ➔ summer rainfall (total of 150-450mm); 3-4 month growing seasons; dry cold winters ($< -20^{\circ}\text{C}$)
- Soils
 - ➔ wind-blown and other sediments, moderate fertility
- Grassland
 - ➔ representative of major grassland ecosystems
- Livestock system
 - ➔ sheep, goats, cattle and yaks
 - ➔ producing meat, milk and fibre

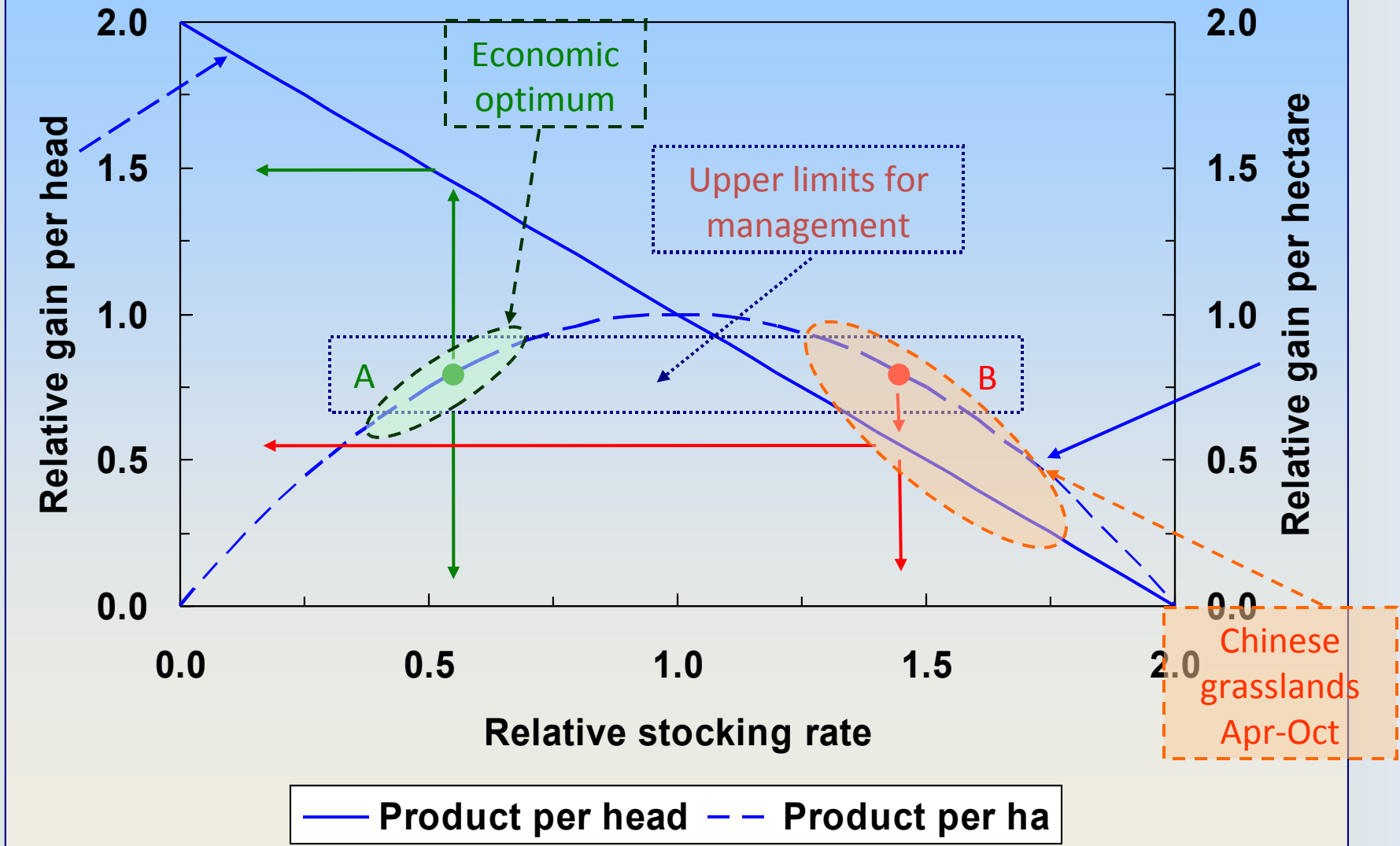
Project strategy (Part B)

- analysis of national grassland policies and how they are implemented down through the six or so layers of Government in China

Understanding animal production

with too many animals grazing a finite resource can we envisage a strategy for reducing animal numbers that can lead to improved incomes and the opportunity to rehabilitate grasslands?

Animal production relationships



Simulating production

energy has been used as the unit of currency to simulate feed supply, animal demand and to drive the biophysical parts of models

- ↳ more useful than dry matter
- ↳ sufficient understanding and data exists
- ↳ was judged the main constraint, moreso than protein, minerals *etc.*, though those components need to be considered when interpreting output

Future trends

- feeding the expanding world population that demands better quality products is a challenge
- demand for red meat is likely to expand faster than for cereals
 - ↳ but consumers will want larger quantities of more tender meat i.e. more product per animal
- this aligns with the strategy being developed in this project
 - ↳ fewer animals and more product

A farming systems approach?

- today we review the approach taken, tools developed and results to date
- a group of grassland scientists have become more focused on animals and economics
- farm improvement is only starting and as farm changes are implemented much research will be needed to resolve the better options
- farming systems is an undeveloped discipline in China – a skills shortage in China

Workshop session's outline

1. Livestock systems and developing solutions
2. Case studies of current conditions
3. Policy environment
4. Solutions for farmers
5. Panel discussion

We aim to provide a core set of information to
facilitate discussion

Your task

the program is tight, but we hope to provide sufficient time for you to ask questions and to help develop our collective understanding of this very large problem

Acknowledgements

Australian Centre for International Agricultural Research (ACIAR)

Australian Greenhouse Office (AGO)

Australian Department of Agriculture, Fisheries and Forestry (DAFF)

many colleagues who through on-going discussions have contributed to the solutions proposed



© 2008



Australian Government
Australian Centre for
International Agricultural Research ©



Australian Government
Department of Agriculture,
Fisheries and Forestry