Sustainable Livestock Systems: what might the future hold?

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Food for Future Symposium, WUR
22 June 2018
Animal agriculture and the environment

- 14.5% anthropogenic greenhouse gas emissions
- 70% of total freshwater use is for agriculture, of which 31% is for livestock
- 30% global terrestrial biomes – livestock raising
- 33% all croplands – livestock feed
Figure 1. Estimates of the % growth in demand for animal source foods in different World regions, comparing 2005 and 2030. Estimates were developed using the IMPACT model, courtesy Dolapo Enahoro, ILRI.
Meeting demand in developing economies

- Importing livestock products
- Importing livestock industrial production know-how
- Transforming smallholder livestock systems
Smallholders still dominate livestock production in many countries

<table>
<thead>
<tr>
<th>Region (definition of ‘smallholder’)</th>
<th>% production by smallholder livestock farms</th>
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<tbody>
<tr>
<td></td>
<td>Beef</td>
</tr>
<tr>
<td>East Africa (≤ 6 milking animals)</td>
<td></td>
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<tr>
<td>Bangladesh (&lt; 3ha land)</td>
<td>65</td>
</tr>
<tr>
<td>India (&lt; 2ha land)</td>
<td>75</td>
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<tr>
<td>Vietnam (small scale)</td>
<td></td>
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<tr>
<td>Philippines (backyard)</td>
<td>50</td>
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</tbody>
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Various sources: BMGF, FAO and ILRI
Mixed crop livestock systems in SSA

Type of system

Crop diversity
Livestock are critical assets

• Prevalent across SSA agricultural systems
• Make a large contribution to food security
  – 41-86% of staple grains
  – 90% milk
  – 80% meat
• Well integrated systems increase productivity of crops and livestock
Livestock are kept for multiple reasons

- As assets
- As savings accounts
- To complement crop production
- For cultural status
- Because livestock production is the most sensible livelihood option
As much as half of the agricultural GHG emissions come from animals

GHG per kg of animal protein produced varies hugely: Big opportunities to mitigate

Herrero et al. 2013
Production of the greenhouse gas methane falls as animal productivity rises.
Ruminant CH$_4$ emissions during livestock production in OECD countries versus SSA

- OECD states: Strong and linear relationship between intake and digestibility & enteric methane production
- SSA: Livestock often at sub-maintenance: no data relevant ranges unexplored

Lack of knowledge on ruminant CH$_4$ emissions in SSA → wrong GHG inventories
Adoption of Improved Forages

• Barriers
  – Low availability of land (B) – paddocks?
  – Diversified cropping strategies (M, I?)
  – Low accessibility of improved planting material (M)

• Potential incentives?
  – Field trials to improve farmer awareness
  – Investments to stimulate fodder seed
  – Financial evaluation of specialization vs diversification
Livestock Production, a Much Smaller Challenge to Global Food Security Than Often Reported (IMAGE)

6.0 BILLION TONES DRY MATTER

- **Grass & leaves**: 46%
- **Grains**: 13%
- **Crop residues**: 19%
- **Fodder crops**: 8%
- **Oil seed cakes**: 5%
- **By-products**: 5%
- **Other non-edible**: 3%
- **Other edible**: 1%

**Fodder crops**: grain and legume silage, fodder beets
**Crop residues**: straws and stover, sugar cane tops, banana stems
**By-products**: brans, corn gluten meal and feed, molasses, beetroot pulp and spent breweries, distilleries, biofuel grains
**Other non-edible**: second grade cereals, swill, fish meal, synthetic amino acids, lime
**Other edible**: cassava pellets, beans and soy beans, rapeseed and soy oil
Rangelands are a vast carbon sink

Rangelands, covering up to 40% of the Earth’s surface, comprise a vast carbon sink.

With moderate livestock grazing and good management, Africa’s rangelands alone could sequester 8.6 million tonnes of carbon each year.
Rangelands benefit from livestock
But people are required for good management
How can management improve rangeland productivity?

• Recognize the need to manage across boundaries and at large scale
• Engage communities to get proper buy-in
• Nest governance arrangements across levels
  • Local communities need county or district support
  • Cross county agreements need national support
  • Cross-border agreements need regional support
• Demonstrate the benefits of investing in rangelands
Climate change impacts: Mixed Crop Livestock Systems

Thornton and Herrero, NCC 2015
Regional integration

Proactive governance

Reactive governance

Fragmented status quo
East Africa intervention impacts

Ericksen et al in prep
West Africa intervention impacts

WA: Household with 5 heads of cattle (in blue); 2 of those replaced by 20 chicken (in red)

Ericksen et al in prep
Tradeoffs among multiple outcomes from sustainable intensification

Hammond et al 2017, Ag Systems
Take-home messages

• Livestock production varies greatly across contexts
• Livestock contribute immensely to livelihoods and nutrition
• Livestock can benefit the environment
• All good management requires carefully designed incentives
• Tradeoffs are inevitable
better lives through livestock

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