Livestock and the Environment

Addressing the Consequences of Livestock Sector's Growth

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Content

- Sector's emissions
- Trends in the sector: effects on emissions
- Technical mitigation options
- Policies and strategies
- Conclusions

A food-chain perspective of GHG emissions

IPCC attribution

- Emissions from **feed** production
  - chemical fertilizer fabrication ← Industry and energy
  - chemical fertilizer application ← Agriculture
  - on-farm fossil fuel use ← Energy
  - livestock-related deforestation ← Forestry
  - C release from ag. soils ← Agriculture
- Emissions from **livestock rearing**
  - Methane from enteric fermentation ← Agriculture / livestock
  - Methane and Nitrous Oxide from manure ← Agriculture / livestock
- **Post harvest** emissions
  - slaughtering and processing ← Industry and energy
  - international transportation ← Transport and energy

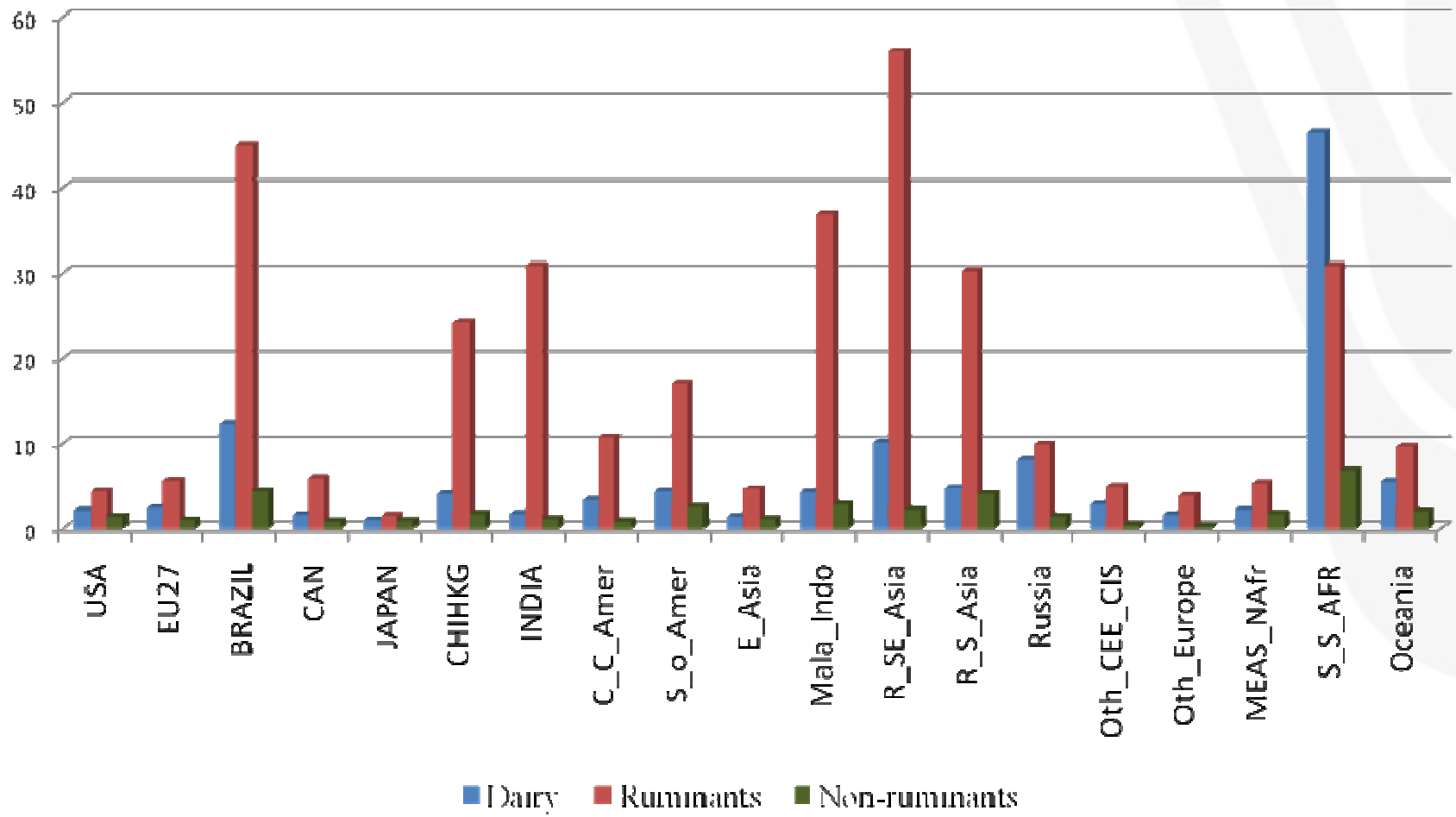
Relative contributions along the food chain

About 7.1 billion tonnes CO2 equivalent
or
18% of total anthropogenic GHG emissions
(2/3 from extensive systems and 1/3 from intensive systems)

…but variable across the world (eg. 60% of Brazil's emissions)

- Land use and Land Use Change : **36%**
- Feed Production: **7%**
- Animals: **25%**
- Manure Management: **31%**
- Processing and Transport: **1%**

Emission intensity of output ($kgCO_2eq/\$$)



Source: GTAP 2001 non-CO_2 emissions database

Trends in the livestock sector

Growth
Intensification
Dichotomy
Geographical concentration
Dependence on trade

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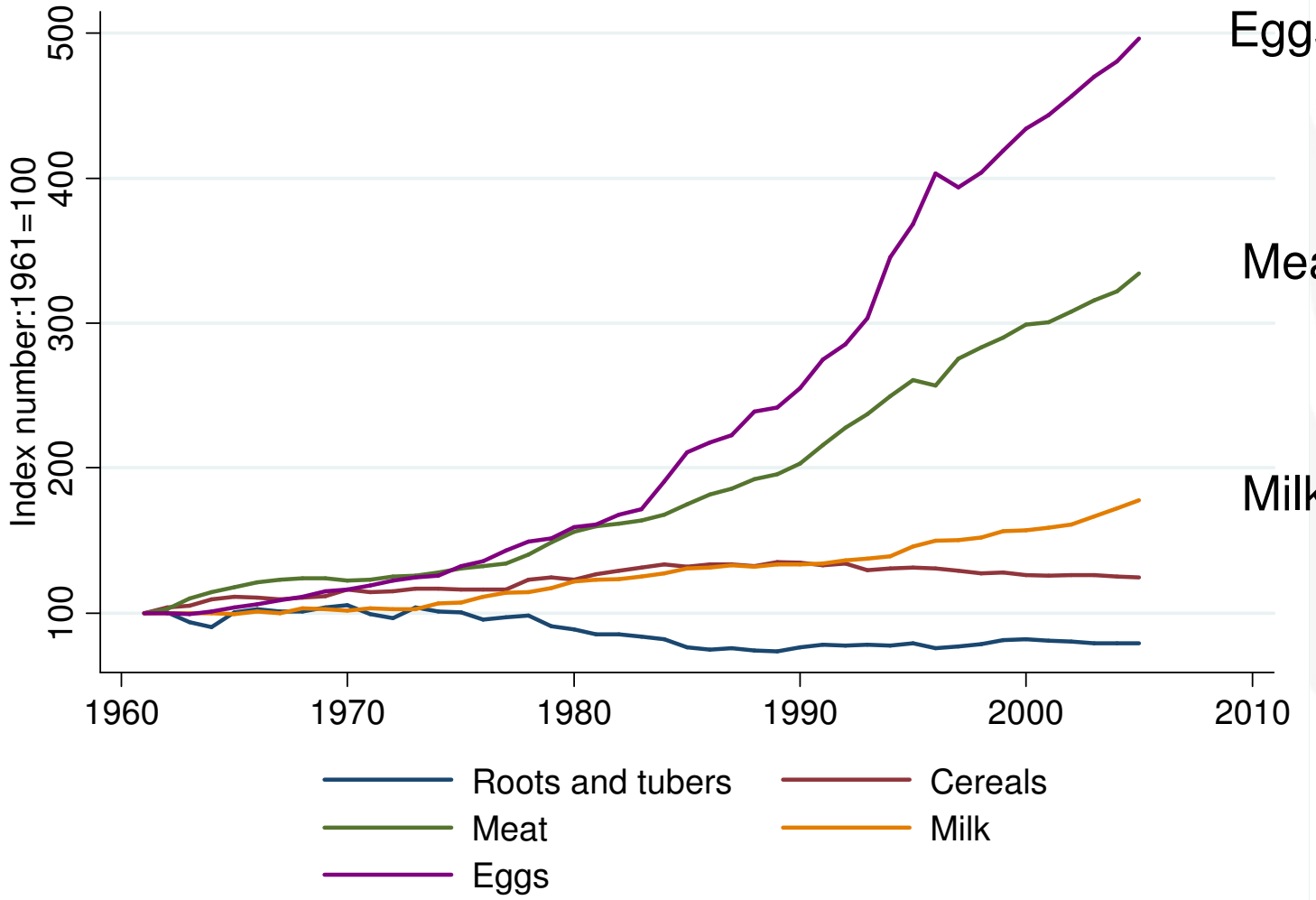
Consumption is growing rapidly in developing countries …



Per caput consumption of major food items in developing countries – kg per caput per year (index numbers 1961=100)

Meat consumption trends

	Per caput consumption of meat	
	2000	**2050**
	Kg/person per year	
Latin America and the Caribbean	58	77
North America and Europe	83	89
East-South Asia and the Pacific	28	51
Sub-Saharan Africa	11	22
Central-West Asia and North Africa	20	33

Source: Rosegrant and Thornton, 2008.

Trends in the livestock sector

Growth

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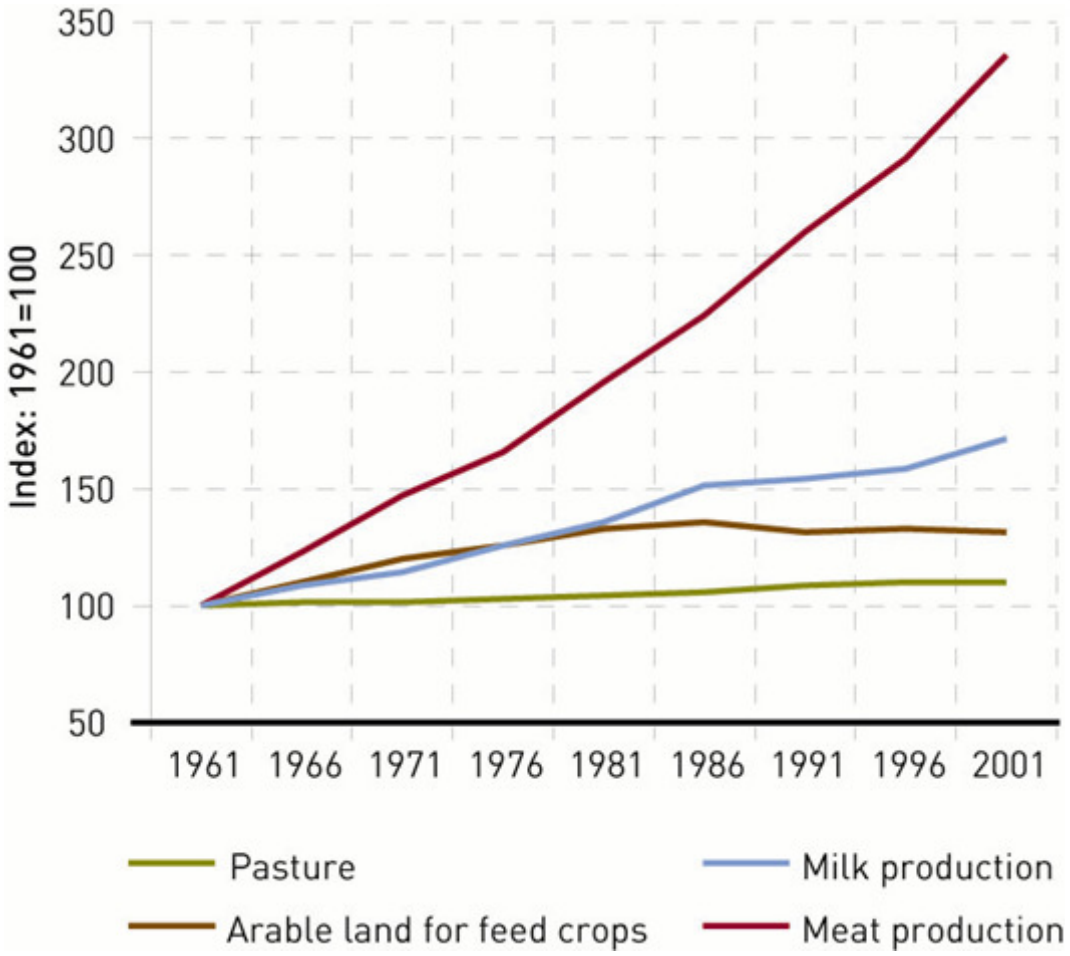
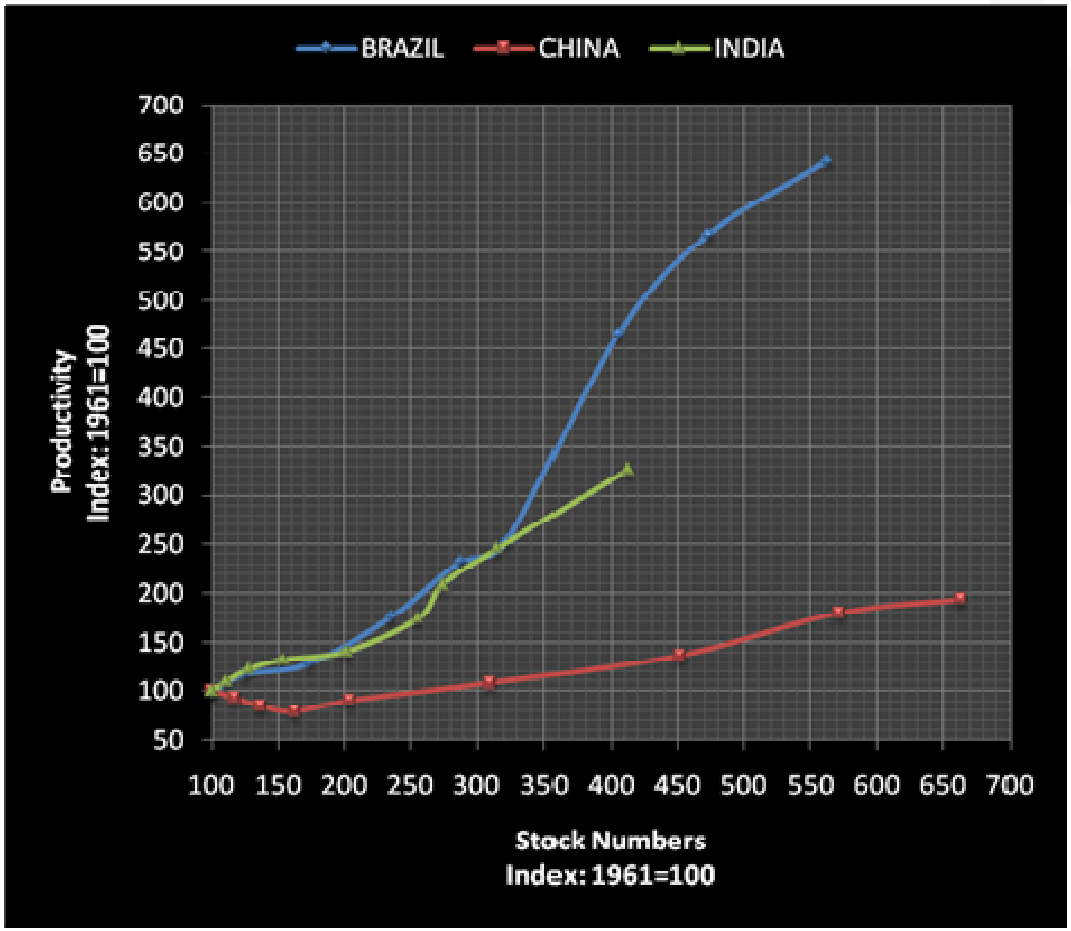
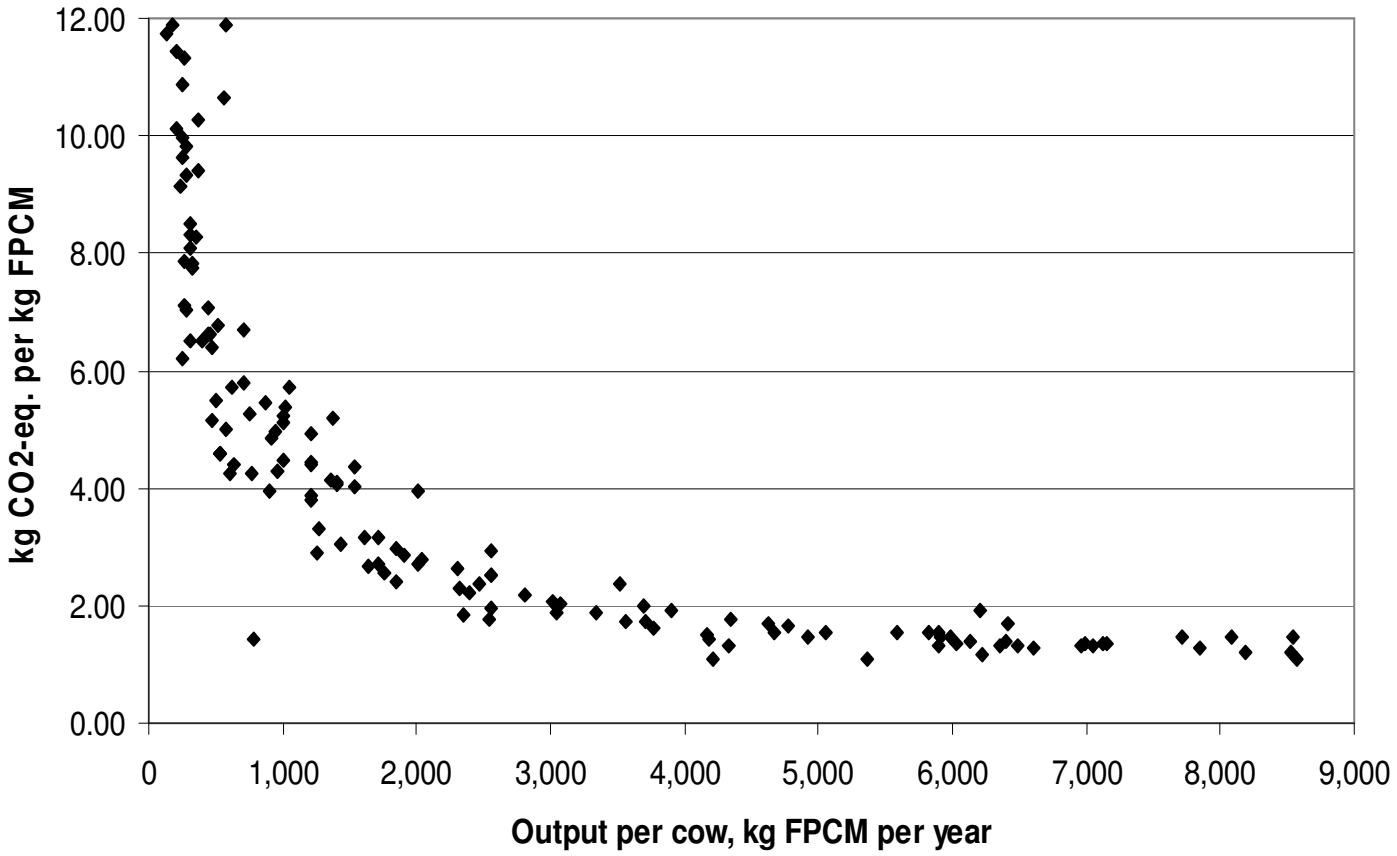
Trends in land-use area for livestock production and total production of meat and milk



Production intensification and expansion : monogastrics in the « big three » India, China and Brazil



Relationship between total greenhouse gas emissions and output per cow



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Growing dichotomy between:

- large-scale commercial production
  - sophisticated technology, confined animals
  - over 70 percent and 60 percent of poultry and pig production, respectively
  - rapidly growing, pulled by demand in urban areas

- livestock kept by a large number of smallholders and pastoralists
  - contributes to the livelihoods of ca. 70 percent of rural poor
  - relies on locally available resources, low productivity but resilience
  - issues of access to markets

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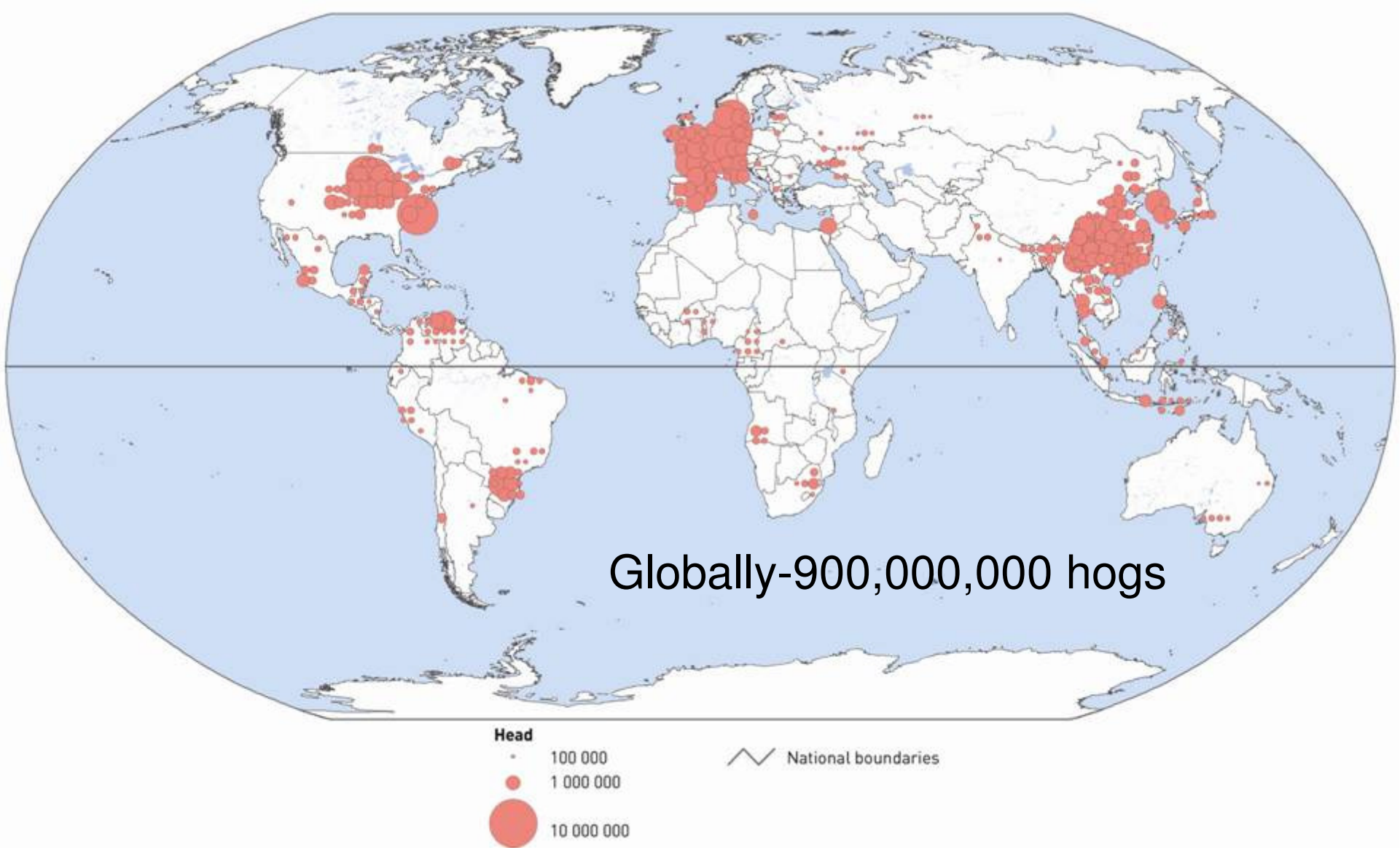
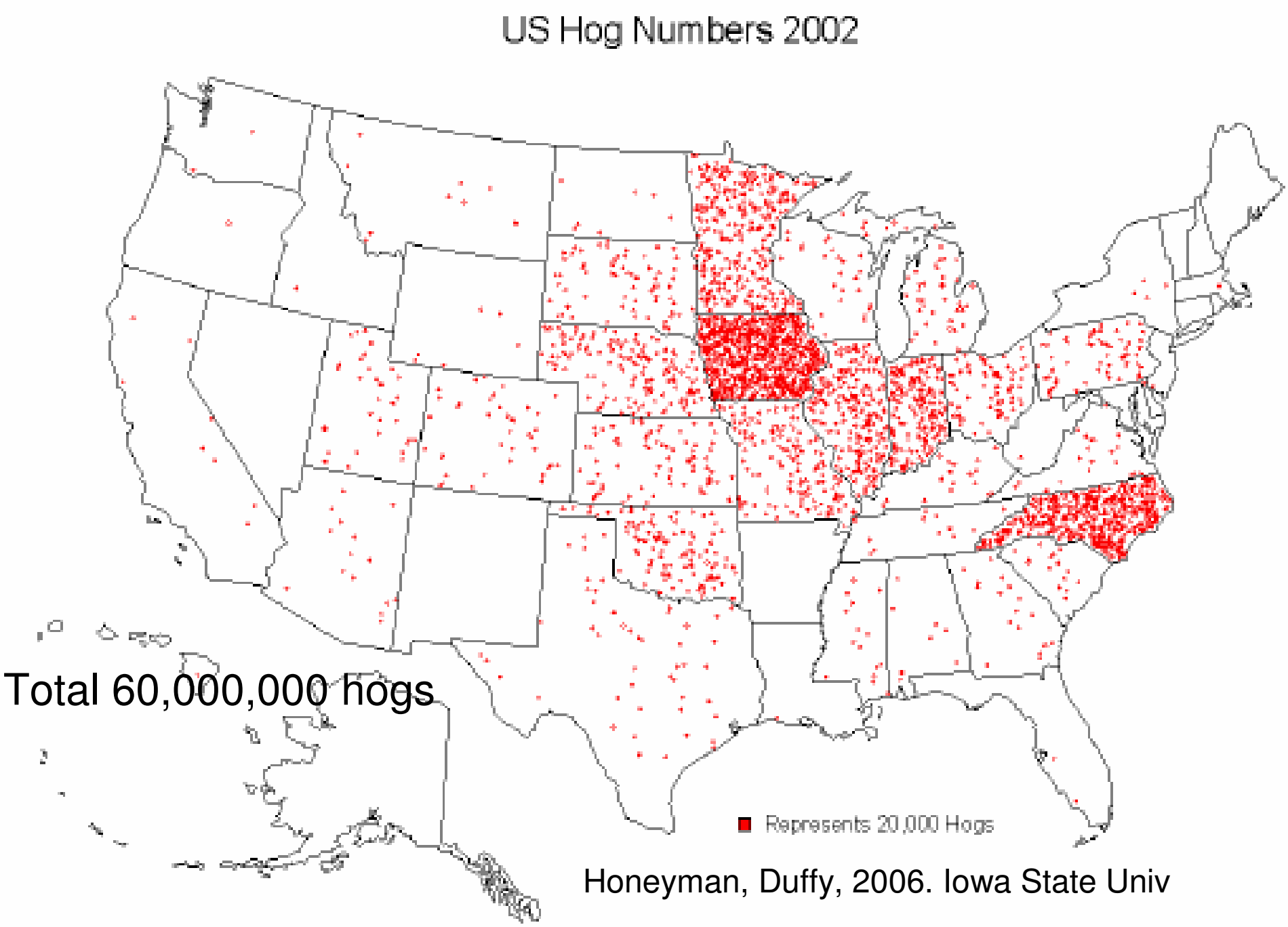


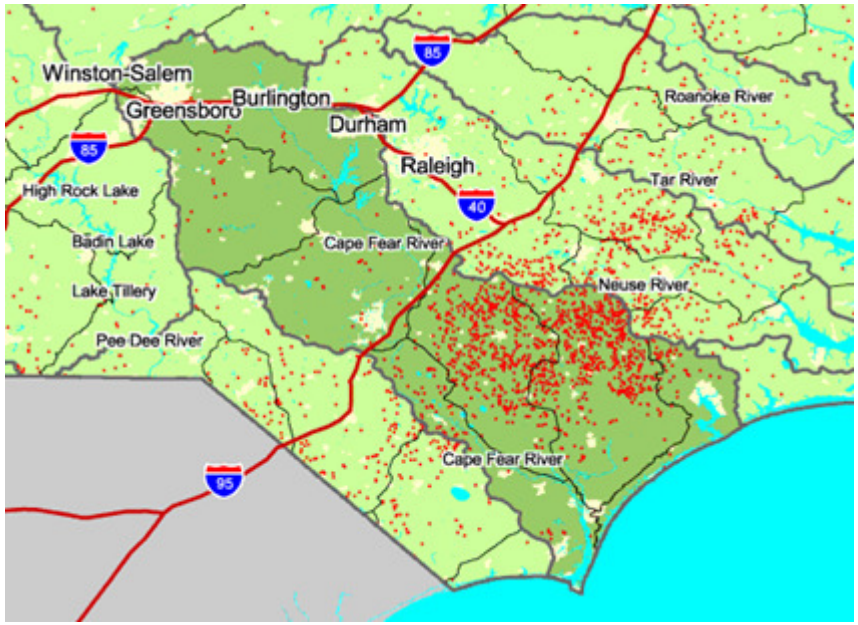
Estimated distribution of industrialized produced pig populations. Livestock's Long Shadow, 2006



Total 60,000,000 hogs

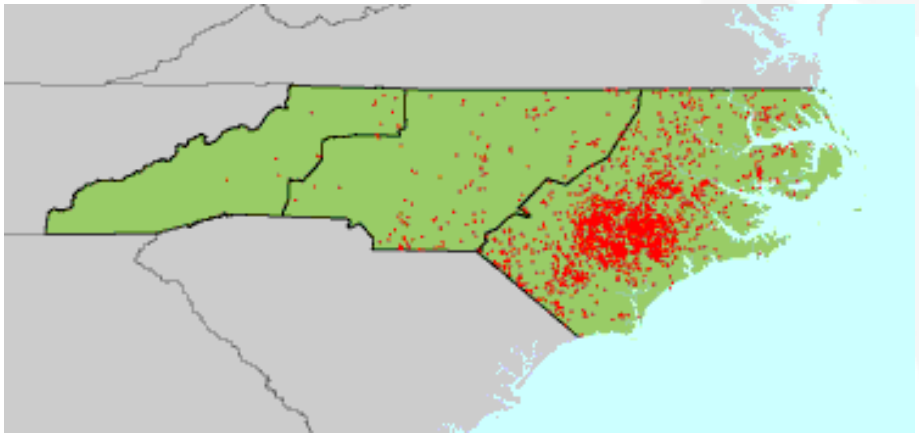
Honeyman, Duffy, 2006. Iowa State Univ

Hogs in North Carolina



US National Agricultural Statistics Service 2005

http://www.scorecard.org/env-releases/aw/nc-riverbasin.tcl?image_id=030300&huc6=030300



Environmental Defense

Trends in the livestock sector

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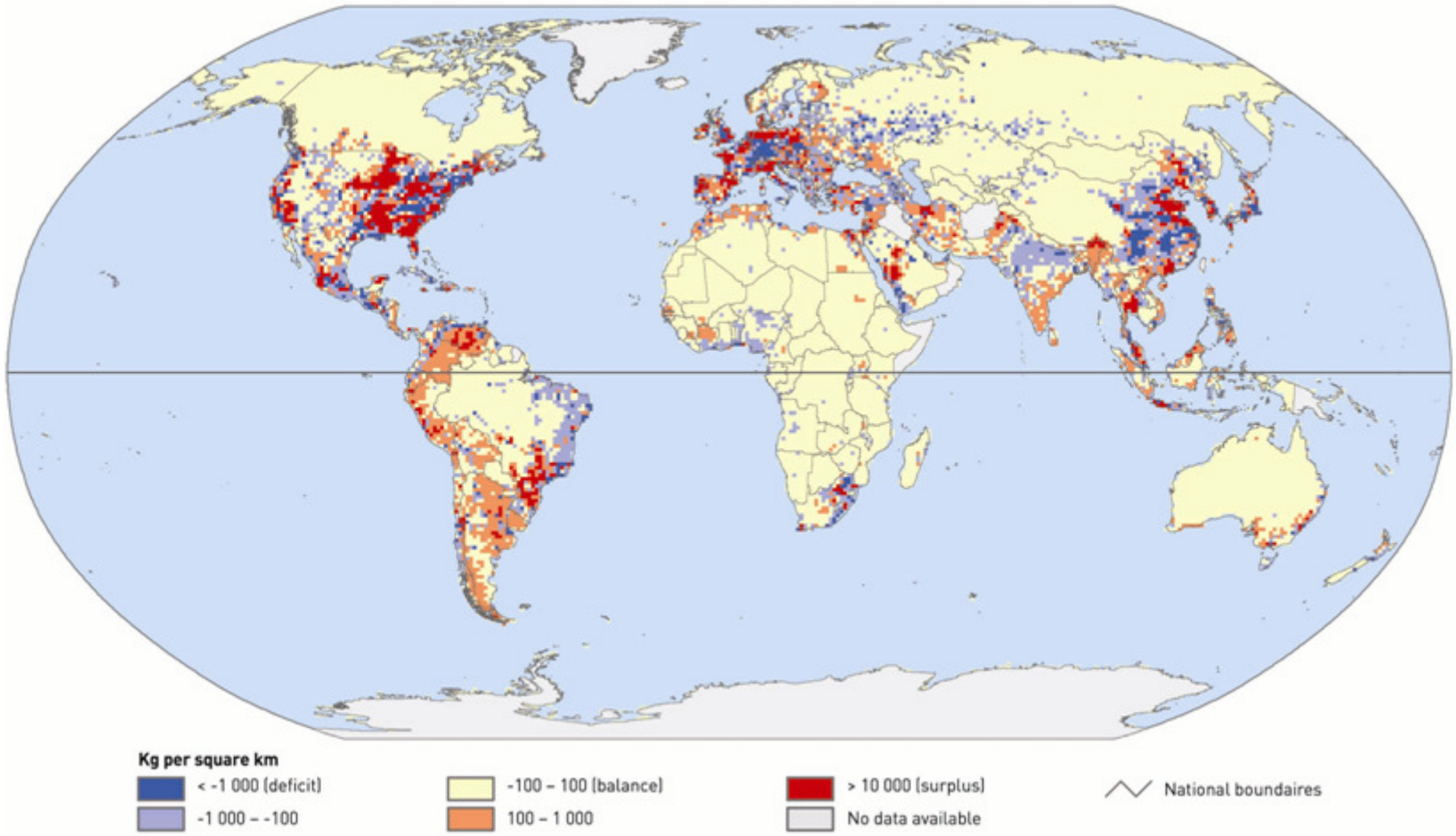
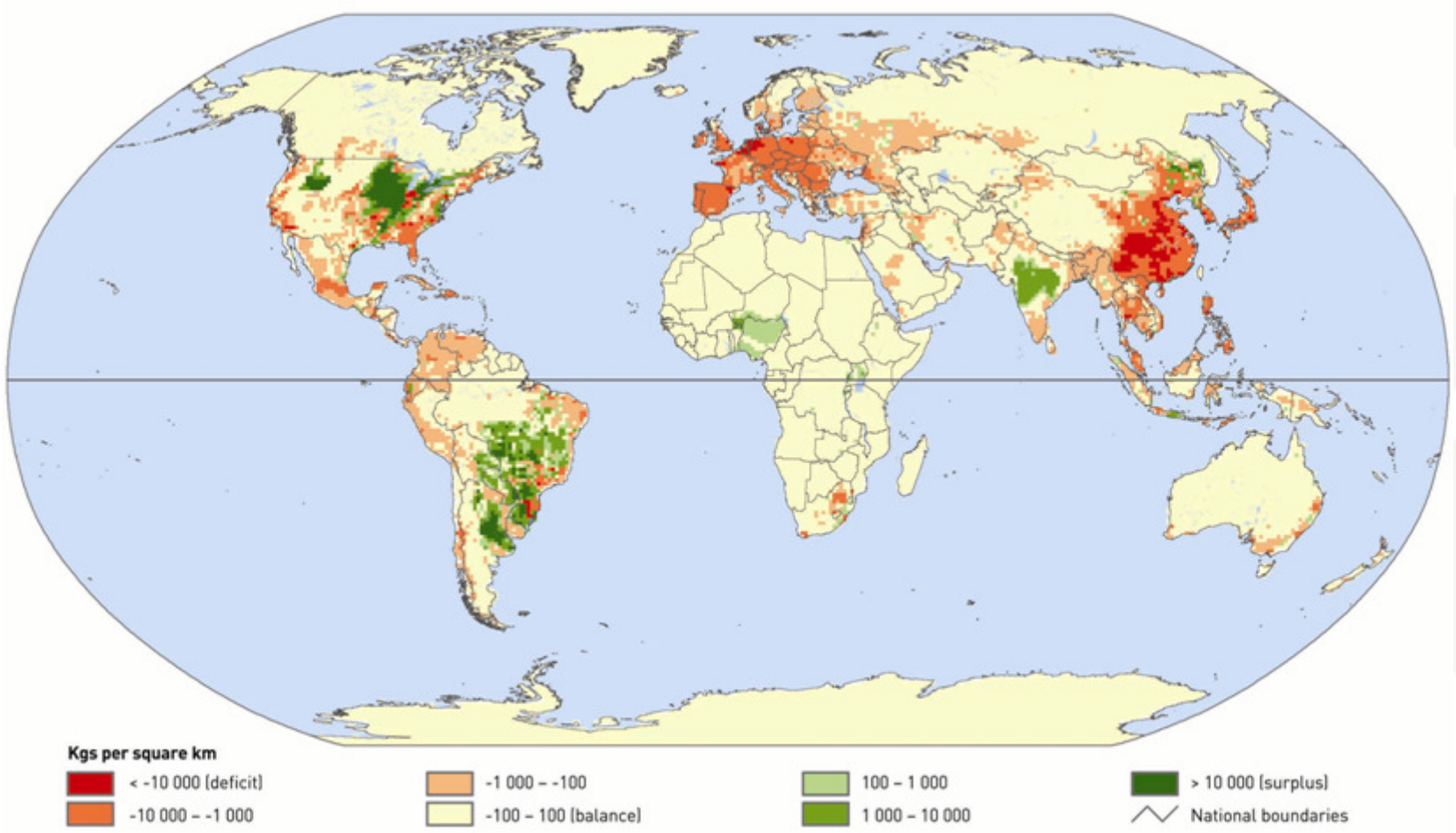
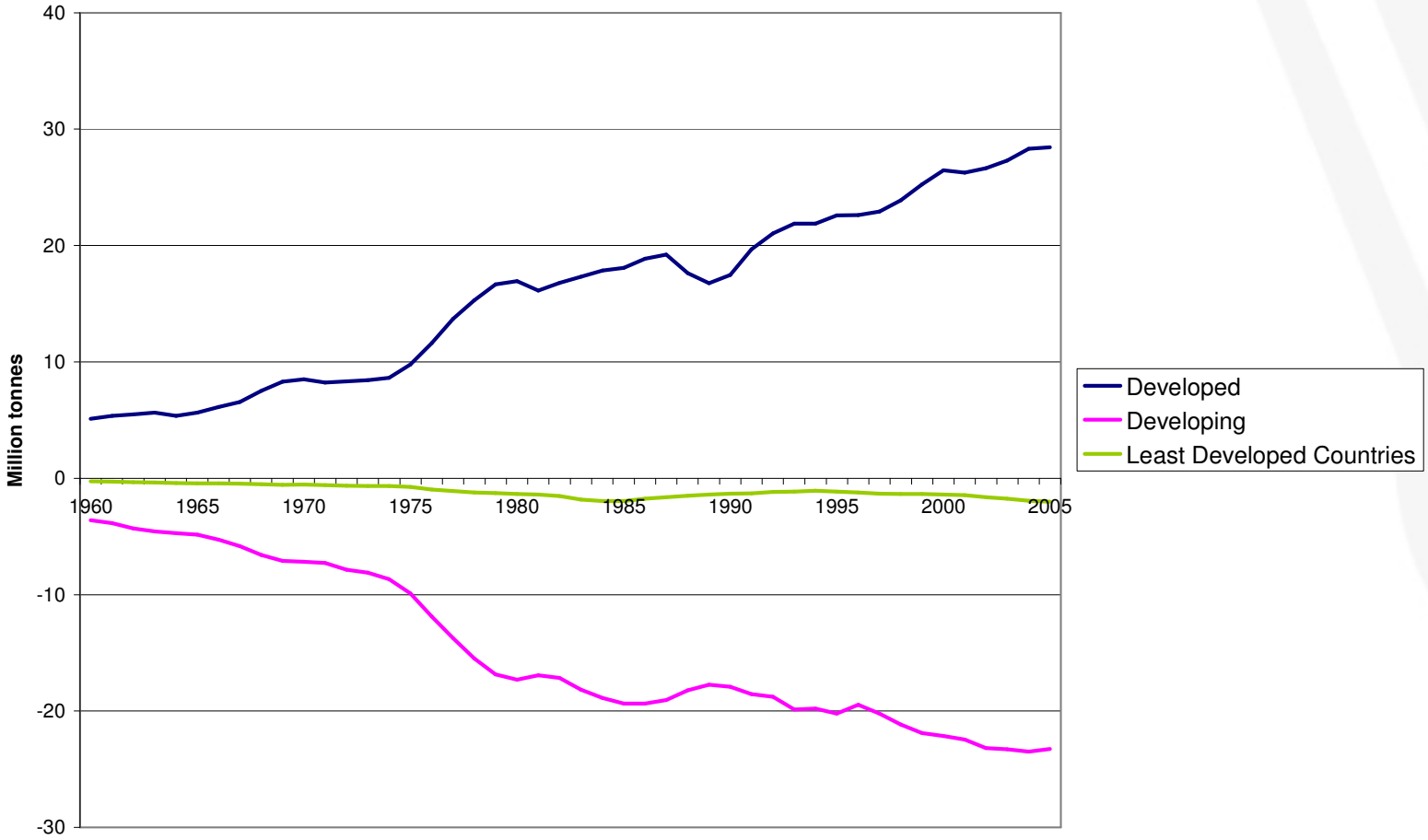
Estimated poultry meat surplus/deficit



Estimated soymeal surplus/deficit



Net milk exports



Structural change

Summary of environmental implications

Environmental consequences of structural changes in the livestock sector

Structural Change	Environmental implications
Improved productivity, feed conversion efficiency through the adoption of new technologies	**+** (efficiency of natural resource use) - (agricultural biodiversity, health risks)
Larger production units	**-** (natural resource and waste management)
Geographical concentration	**- -** (waste management)
Rangeland abandonment	-/+ Biodiversity, C sequestration
Dependence on transport - delocalization	**+** (resource use efficiency) - Nutrient management (P), GHG emissions, leakage

Mitigation options and strategies

The dual challenge

- Livestock: a growing sector, especially in developing countries
  - driven by income, demography and changing preferences,
  - among highest growth rate in agriculture commodity
  - over 80% of production growth in non OECD countries

(OECD-FAO, 2009)

- Climate change
  - the worst-case ipcc scenario trajectories are being realized
  - societies are highly vulnerable, with strong differential effects on people within and between countries and regions.
  - risk of crossing tipping points
  - there is no excuse for inaction

(Climate Change: Global Risks, Challenges & Decisions – 2009, Copenhagen)

↳ Dual challenge of food security and climate change mitigation

Mitigation Options (1)

Efficiency gains:

- reduce emissions per unit of animal product by cutting on "unproductive" emissions (breeding, animal health, feeding, energy use efficiency).
- waste recycling (food processing, food waste, *meat and bone meals?*)

Manure management: (i) reduce emissions during storage and application (ii) recover energy from organic matter (balanced feeding, storage facilities, anaerobic digestion, waste application)

Control of enteric fermentation: reduce methane emission from the rumen (feed digestibility, feed additives, rumen manipulation)

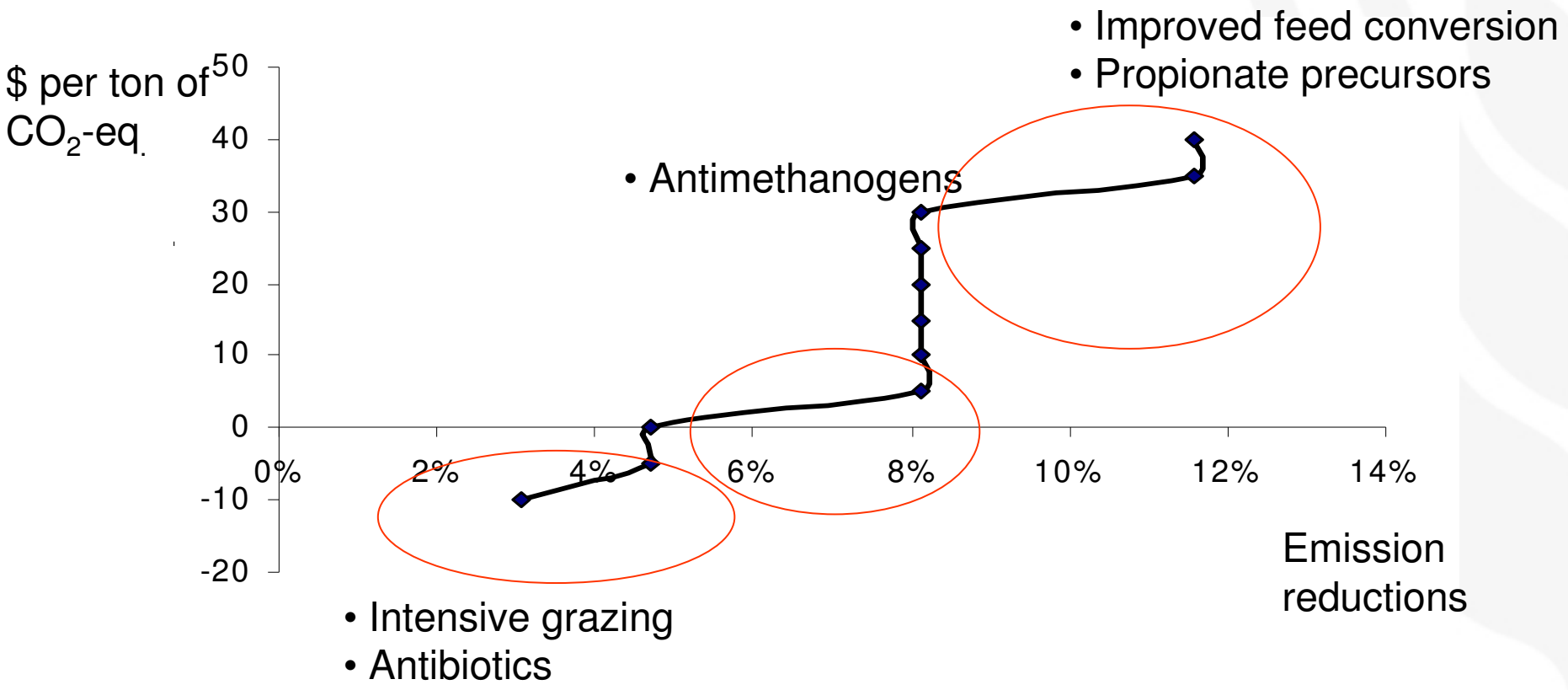
Mitigation Options (2)

Land management : (i) limit emissions related to land conversions (deforestation and grassland plowing) and (ii) sequester carbon in grassland's soil and vegetation

- large technical potential for C sequestration, can generate C credits
- Synergies: cc adaptation, food security, biodiversity
- Limitations
  - costs and institutional barriers
  - soil saturation
  - permanence

Change in production structure : shift to dairy and monogastrics, *aquaculture*.

USEPA MAC curve Brazil - Ruminant



adapted from USEPA, 2010

Policy context

- Agriculture is part of the **mitigation commitments** made by Annex 1 countries.
- Agriculture generally seen as **offset supplier** in national policies.
- **Uncertainties** about the place/role of agriculture in **post-Kyoto** agreements.
- Depending on **emission intensities**, mitigation incentives could redistribute global livestock production
- Mitigation measures in **other sectors** (forestry) will affect livestock
- **Absolute reduction** (kg CO2eq.) versus **emissions intensity reduction** (kg CO2eq. per kg product) reduction

Policy strategies

1. Enhance efficiency of production systems

- technology uptake and innovation
- minimization of waste

- **Technology transfer -** access to information, capital, markets
- **Payment for environmental services (public or private)** - Clean Development Mechanism
- **Good practices**: voluntary (Coorporate Social Response), regulated or condition to access subsidy schemes

2. Directly address GHG emissions

- technologies enhancement. Same, one step further
- change in production structure

- **taxes**
- **Cap and trade policies (emission permits)**

Key messages

- Large, growing, dynamic sector
- Public goods at risk
  - Climate
  - *Natural resources and the environment*
  - *Livelihoods and food security*
  - *Animal diseases and human health*
- Under BAU, livestock sector's growth will cause emission growth
  - Substantial reduction can be achieved through efficiency gains, with significant co-benefits in terms of food security, other environmental impacts and profitability
  - Further mitigation will require to introduce specific emissions constraints
- Needs better policies, institutions and regulations
- Conflicts and trade-offs (e.g. broader environmental issues, poverty reduction, food security)