



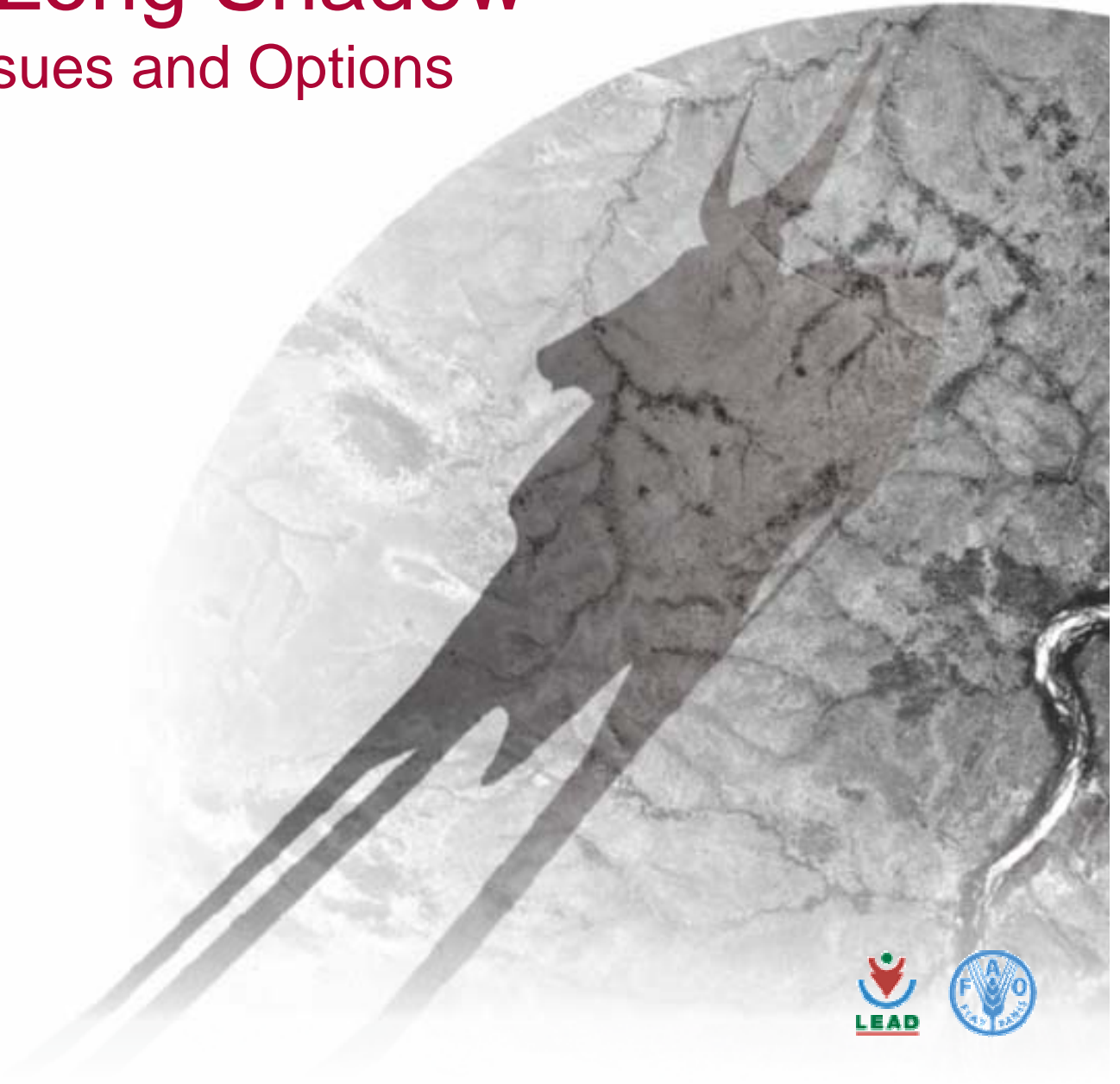
Livestock's role in global climate change

Pierre Gerber and Henning Steinfeld
Presented by Irene Hoffmann,
Hammamet, Tunisia 17 May 2008

Livestock's Long Shadow

Environmental Issues and Options

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Cees de Haan





Content

- Livestock and climate change: overall picture
- Mitigation and Adaptation: main opportunities
- Policy options
- Role for FAO
- Concluding remarks



A snapshot of the world livestock sector



Drivers of the Livestock Sector

- **Demand Drivers**

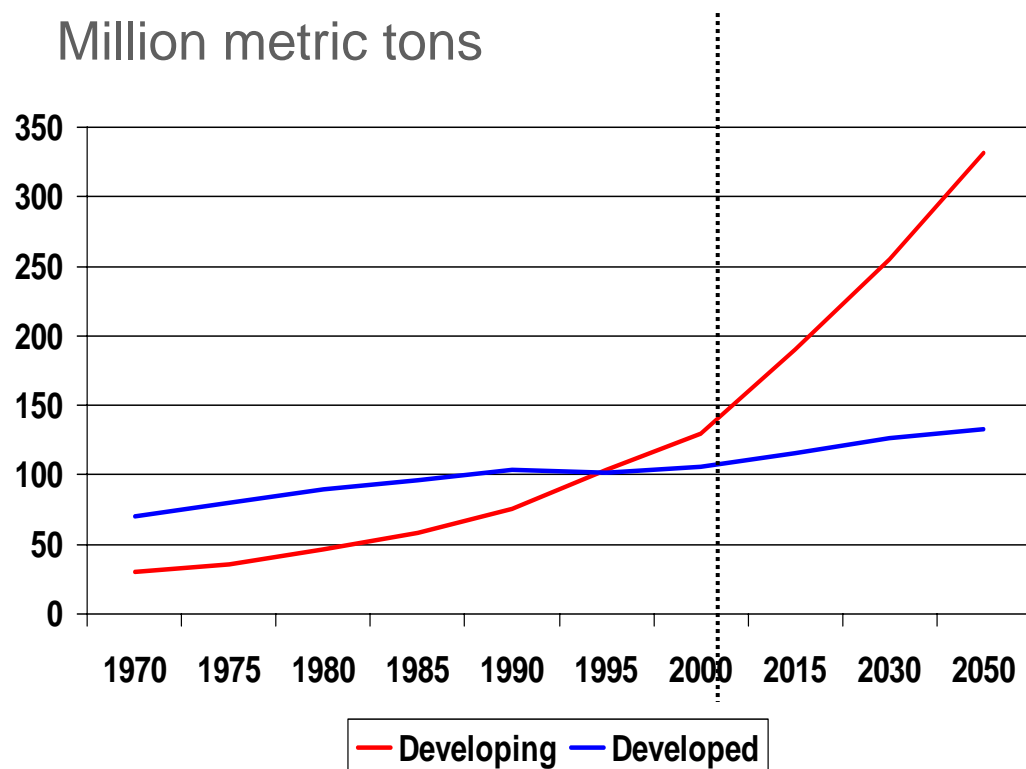
- **population** growth: + 50 % by 2050 globally; slowing down in East Asia, still strong elsewhere in developing countries
- **income** growth: strong in E and S Asia, NENA and SS Africa picking up
- **urbanization**: more than 80 % of world population growth occurs in cities of developing countries

- **Supply Drivers**

- cheap **grain**: decreasing prices over the past four decades, recent upsurge
- **technological** change: genetics, feeding, transport
- cheap **energy**: declining prices, recent surge
- **policy** environment: incentive frameworks, market and credit regulation, sanitary standards, labour and environmental policies



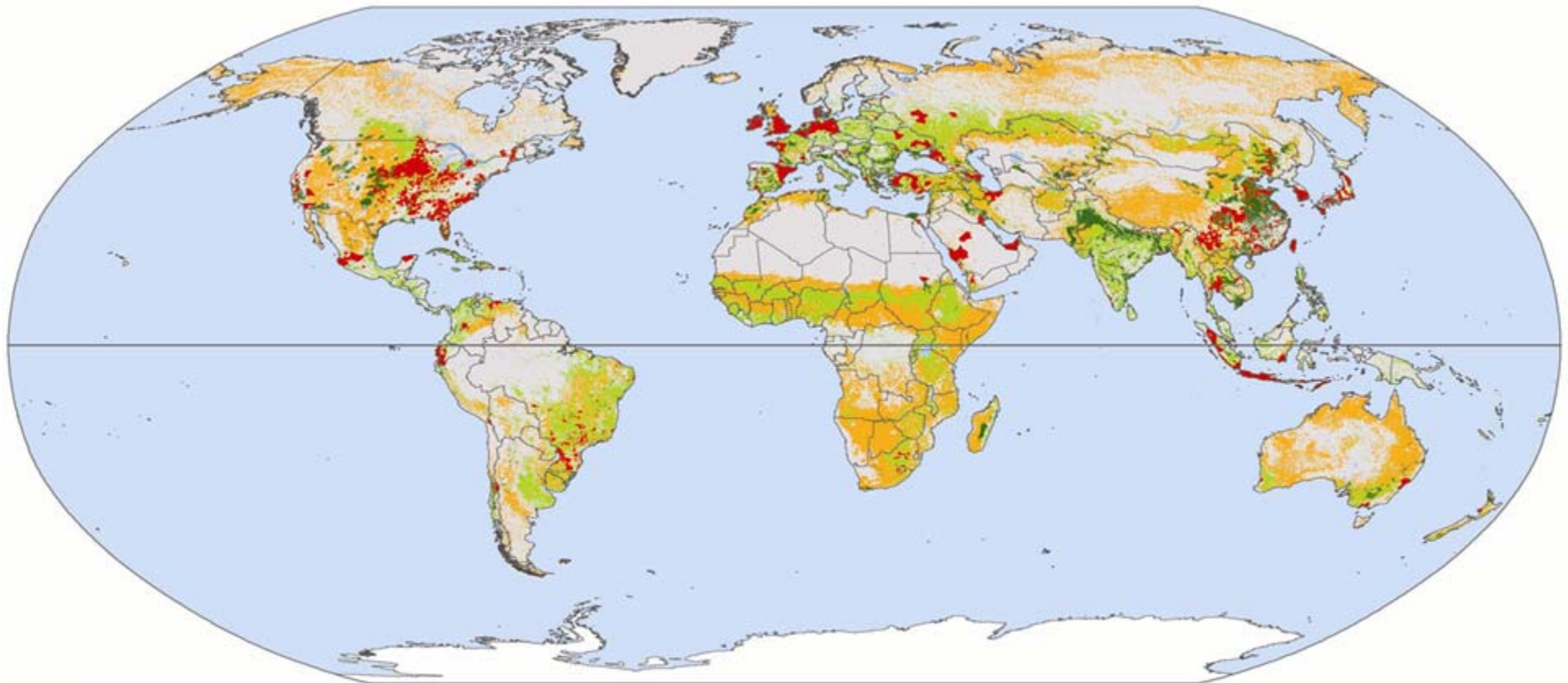
Broad trends: soaring output and underlying structural changes





- Growing **intensities**
- Increasing **scales**
- Vertical **integration**/longer food chains
- Geographic shifts / **geographic concentration**





Estimated distribution of livestock production systems



Livestock production systems

 Mixed, irrigated
 Mixed, rainfed

 Grazing
 Other type

 Areas dominated by landless production
 Boreal and arctic climates

 National boundaries

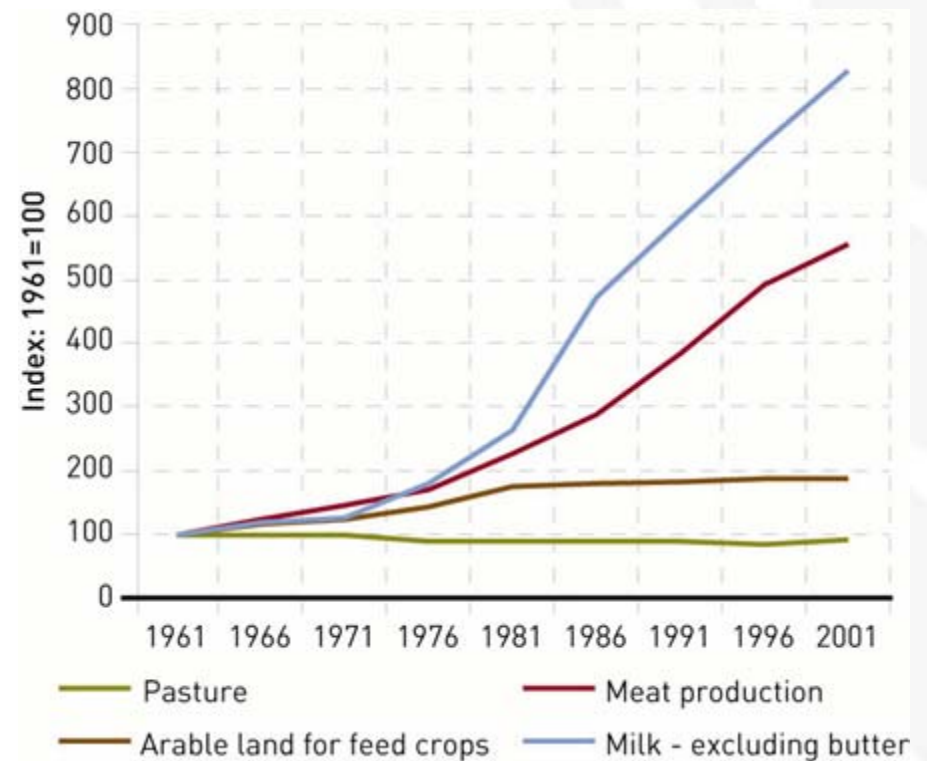
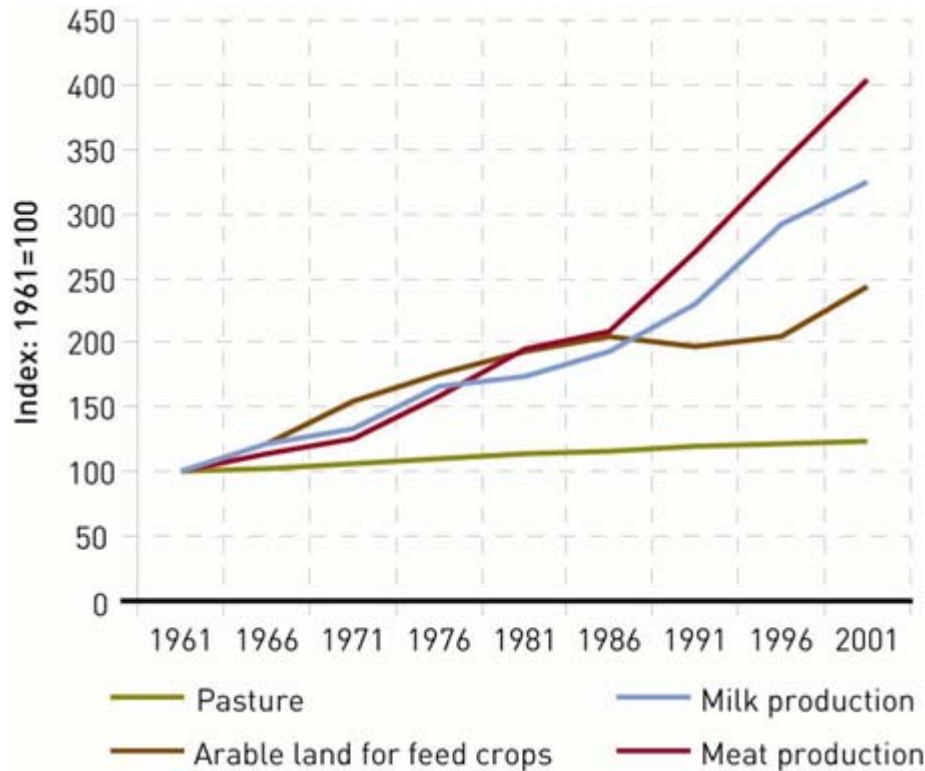


Livestock and Land Use

- Extent of **pasture** land
 - **3.4 billion hectares** (about 26% of emerged lands)
 - low intensity in developing countries but growing in Latin America
 - marginal land frontier exhausted
 - 20% of rangelands are **degraded** (higher in the dry lands)
- Extent of **feed-crops**
 - **470 million hectares** (about 33% of arable land)
 - cereals: production growth mainly based on intensification / regional distribution of crops
 - soybean: production growth based on expansion



Trends in land-use area for livestock production and production of meat and milk in South America and East and Southeast Asia





Implications for Green House Gas Emissions



A food-chain perspective of GHG emissions

- Emissions from **feed** production
 - chemical fertilizer fabrication and application
 - on-farm fossil fuel use
 - livestock-related land use changes
 - C release from soils
 - ✓ [Savannah burning]
- Emissions from **livestock rearing**
 - Methane from enteric fermentation
 - Methane from animal manure
 - ✓ [respiration by livestock]
- **Post harvest** emissions
 - slaughtering and processing
 - international transportation
 - ✓ [national transportation]



Relative contributions along the food chain (1)

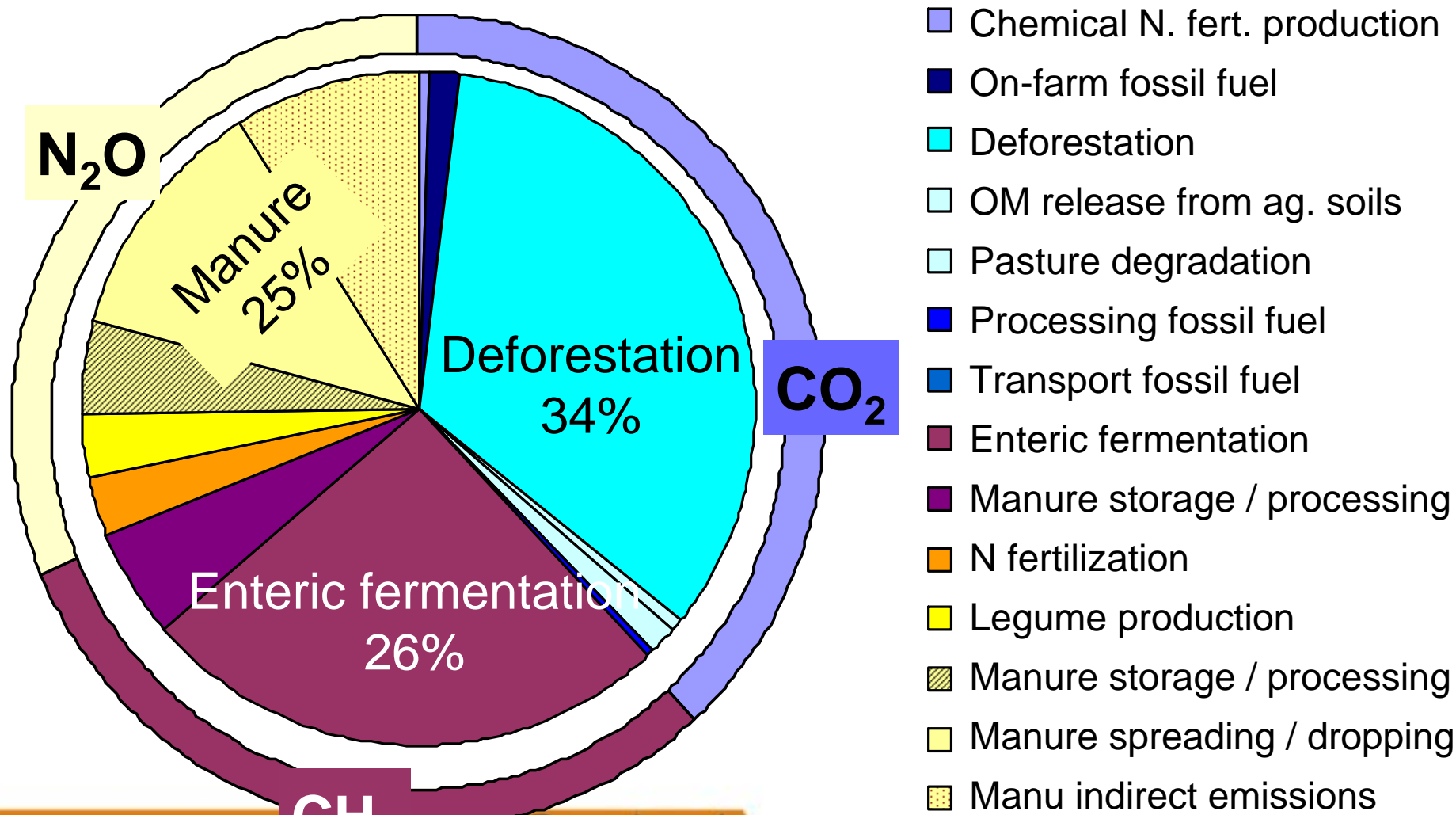
About 7.1 billion tonnes CO₂ equivalent
or
18% of total anthropogenic GHG emissions
(2/3 from extensive systems and 1/3 from intensive systems)

...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%**



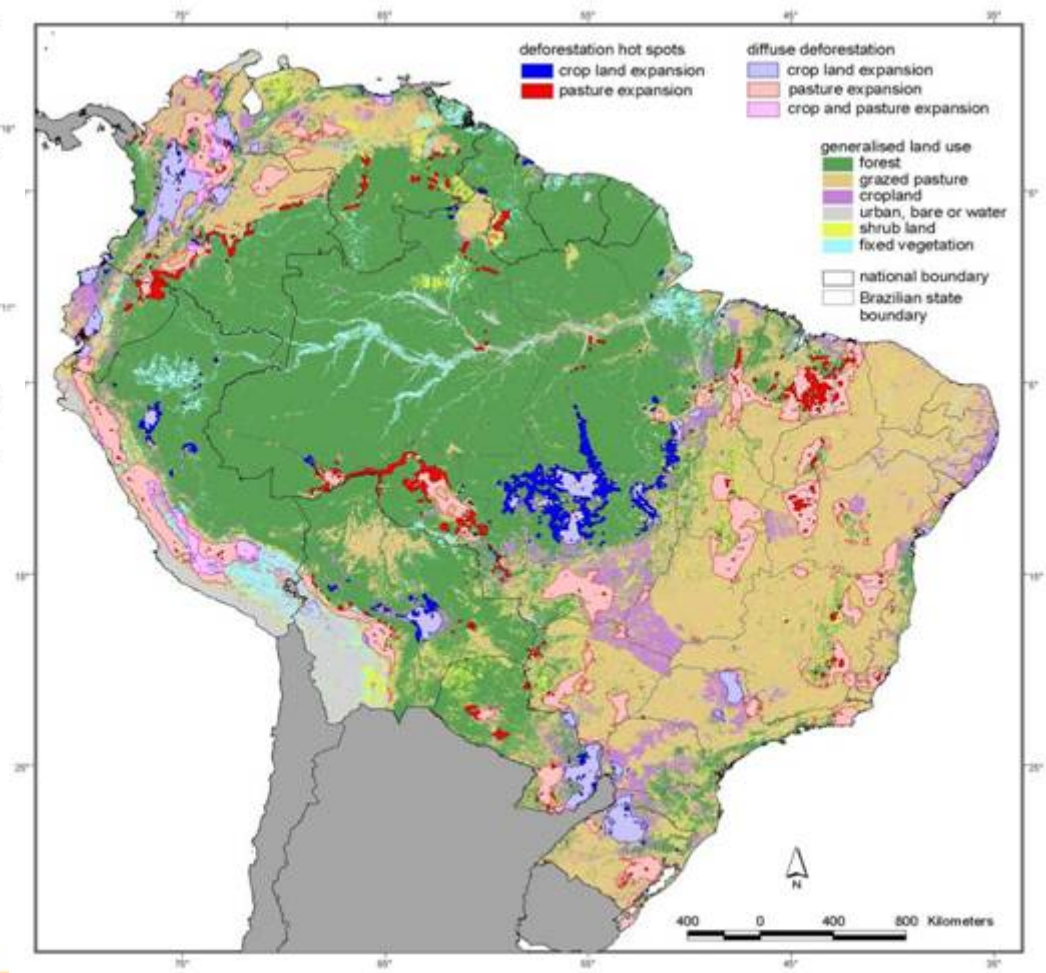
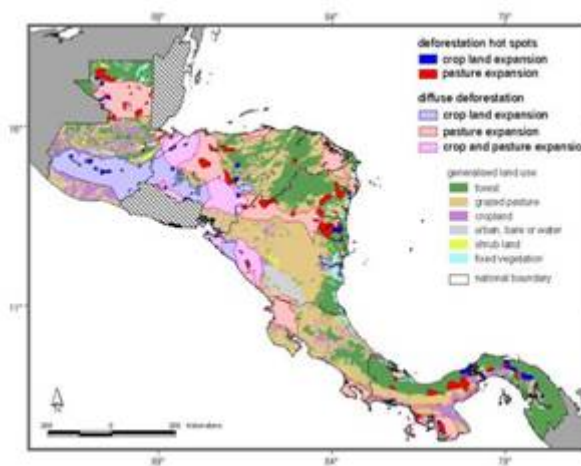
Relative contributions along the food chain (2)



Bonneau, 2008



Livestock related land use change: Deforestation in the Neotropics



~2.4 million ha/year
Forest → Pasture

~0.5 million ha/year
Forest → Feed crops



~2.4 billion tons CO₂



Impacts of Climate Change on the livestock sector

	Grazing systems	Non-grazing systems
Direct impacts	<ul style="list-style-type: none"> – extreme weather events – drought and floods – disease epidemics – productivity losses (physiological stress) due to temperature increase – water availability 	<ul style="list-style-type: none"> – extreme weather events – disease epidemics – productivity losses (physiological stress) due to temperature increase – water availability
Indirect impacts	<p>Agro-ecological changes:</p> <ul style="list-style-type: none"> – fodder quality and quantity – host-pathogen interactions 	<p>Resource price:</p> <ul style="list-style-type: none"> – feed (production ; biofuels) – energy



Policy agenda – what is at stake?

- **Challenges** at several levels
 - Food security
 - Public health
 - Security / stability
 - Biodiversity
- Post Kyoto agreements: Moving towards **Carbon-constrained** economies?
 - emission reduction targets
 - cap and trade policies : new market
 - C neutral livestock production?



Mitigation and adaptation



Mitigation Options (1)

- Control **Land Use change**
 - intensification of animal production (genetics, animal husbandry) and of pasture management (rotation, fertilization, improved pastures species, fodder and protein banks)
 - combined with other measure avoiding deforestation (land use, subsidies, etc.)
- Conserve/restore **C and N in cultivated soils**
 - increase tree cover and live fences
 - pasture rotation and improved pasture species
- silvo-pastoral systems, conservation agriculture



Mitigation Options (2)

- **Enteric fermentation**
 - productivity gains
 - feed formulation
- **Feeding** management
 - balanced feeding, reducing methane emissions and lowering the N content
- **Manure** management
 - anaerobic digestion (methane production)
 - waste application (dosing and injection)





Adaptation

- Pasture management (species, tree cover)
- Disease surveillance and control
- Improved resource use efficiency (water, land, feed)
- Insurance
 - More of the same, under tougher constraints: improve systems' resilience



Policy instruments - mitigation

- **Payment for environmental services** - Clean Development Mechanism
 - emissions from animal waste management
 - avoided deforestation?
 - carbon sequestration in rangelands??
- Subsidies to **intensification** and land tenure / forest conservation policies
- **Good practices:** voluntary, regulated or condition to access subsidy schemes
 - manure storage and land application
 - soil conservation



Payment for Environmental Services: promising instrument for extensive systems

- **water:** local demand, markets often exist
- **carbon:** global demand - CDM
- **biodiversity:** global demand; markets are not in place except for tourism
- agricultural **landscapes:** local demand; few markets in place, mostly via tourism





Policy instruments - adaptation

- Support to **technology transfer**, especially where resources and communication are limited
- **Payment for environmental services**
- Development of **insurance schemes** (weather, diseases)



Policy context

- Other **environmental** issues
 - biodiversity
 - water resources
- The **social and health** dimensions of livestock
 - 40% of agricultural GDP, 1.5 % of global GDP
 - estimated 1.3 billion people in rural households depend on livestock, entirely or partially
 - cultural dimension of livestock
 - Provide protein and micro-nutrients to many of the 830 million food insecure people
 - Contribute to health problems of the affluent (obesity, cancers, cardio-vascular diseases)
- High **food prices** on mid-term perspective (demography, economic growth, bio-fuels, climate change)



Role for FAO

- **Methodology** and **analytical** framework development
 - Life Cycle Analysis
 - quantification (certification) of C above and below ground in rangelands
 - spatial targeting
 - cost-effectiveness of policy measures
- **Technology transfer**
 - adaptation of technologies
 - expert networks
- **Policy making**
 - national level: national strategies and action plans
 - international level: livestock in post Kyoto agreements
- Approaching **donors**



Concluding remarks (1)

- **High food and feed prices** on mid-term perspective
- Animal production is however projected to (almost) **double by 2050**
- **Environmental impacts will follow** a similar trend under “business as usual” scenario
- **Pressure on resources** shall increase and **resilience** of systems will be challenged



Concluding remarks (2)

- **Technology options are generally available** to mitigate environmental impacts. For climate:
 - Intensification
 - Waste management
 - Carbon conservation/sequestration above and below ground
- Development and implementation of **policy measures** are required, especially in hotspots of environmental impact



Examples

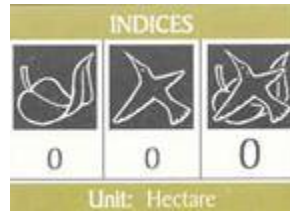


Integrated silvopastoral approaches to ecosystem management project

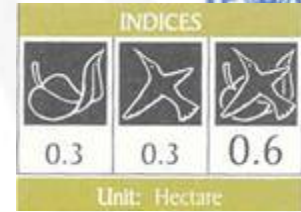
Project design

- Countries: **Costa Rica, Nicaragua** and **Colombia**
- Pilot areas where cattle production is dominant and degraded pasture major problem
- Project allocate funds for PES
- Project provide technical assistance and training to farmers and technicians- group
- Funded by GEF (USD 5 millions)

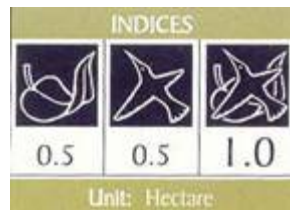
Degraded Pasture



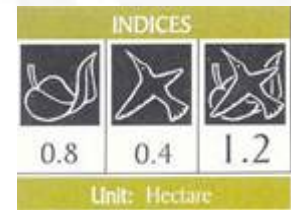
Natural Pasture with Recently Planted Trees



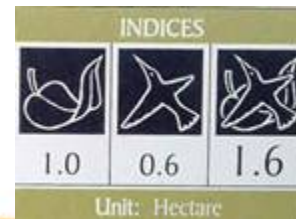
Natural Pasture with High Tree Density



Monoculture Timber Plantation



Intensive Silvopastoral System



Mature Forest





Land Uses	Base line	2006	Change (ha)	Change (%)
Deg. Past.	558,7	153,3	-405,4	-72,6
Nat. Past.	253,6	3,7	-249,9	-98,5
Imp. Past.	62,6	16,2	-46,4	-74,1
Nat. Past. +Trees	910,6	438,3	-472,3	-51,9
Imp. Past. +Trees	246,5	1384,4	1138,1	461,7
Forest	927,4	954,6	27,2	2,9





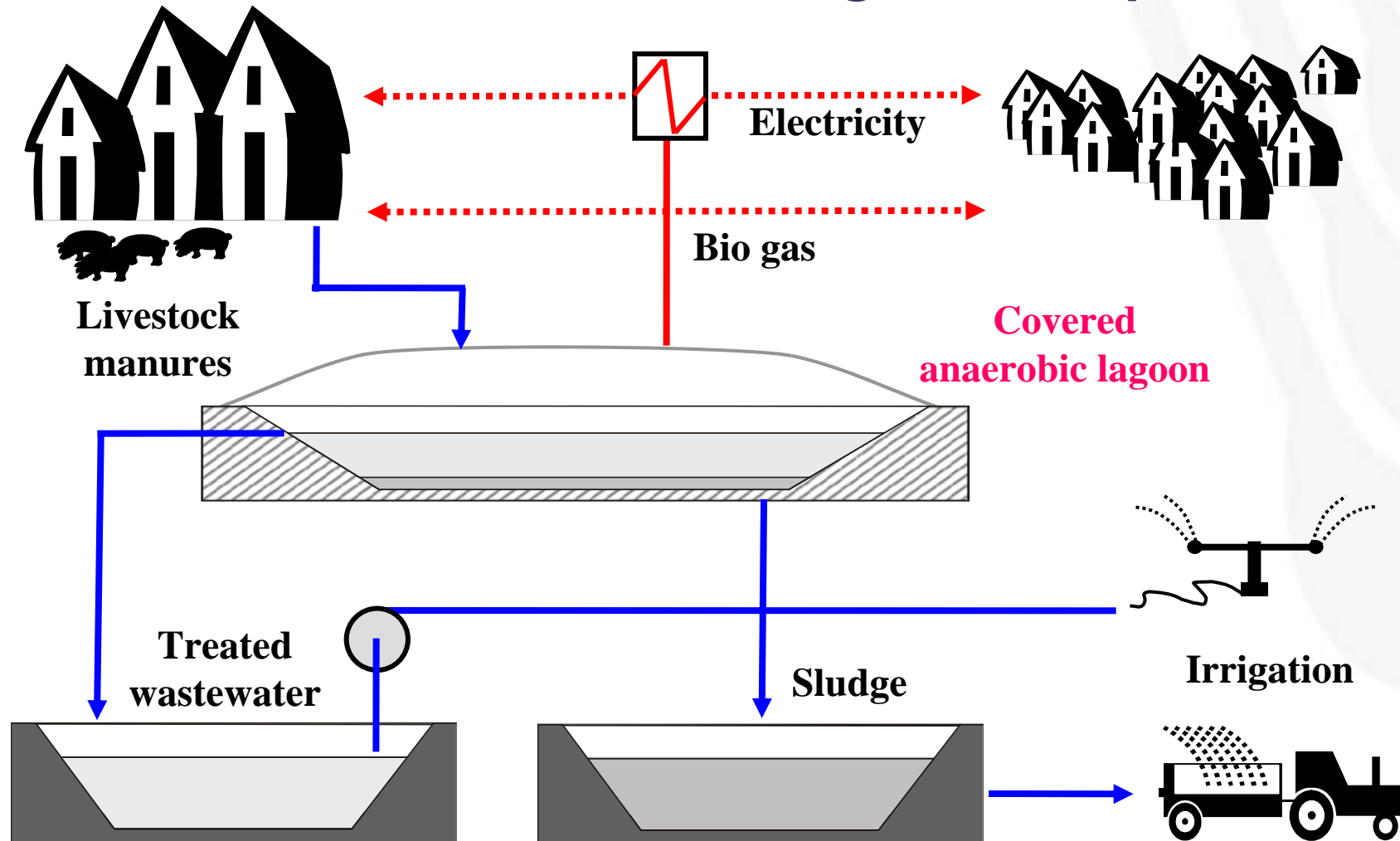
Livestock Waste Management in East Asia Project

Project design

- Countries: **China, Thailand** and **Vietnam**
- Global environment objective is to reduce livestock induced, land-based pollution and environmental degradation of the South China Sea and Gulf of Thailand
- Funded by GEF (USD 7 million out of USD24 million)



Demonstration of manure mgt techniques





Spatial distribution of production units

