



Livestock sector trends and greenhouse gas emissions

global perspectives

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Livestock's long shadow

Environmental issues and options

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The long shadow: a start

- The LLS report greatly contributed to raise awareness:
 - media & policy debate
 - private sector
 - academia
 - FAO/UN - The Independent external evaluation
 - ...also often misused
- “Livestock’s Long Shadow”: a diagnostic to design intervention: action plan now requested.
- Environment: one of the 5 Program Entities of the Animal Production and Health Division
- Key concepts: resource use efficiency, sustainable intensification



Policy context

- The **social** 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
 - essential in arable production
- The **health** dimensions 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)
- Other **environmental** issues
 - biodiversity
 - water resources



Content

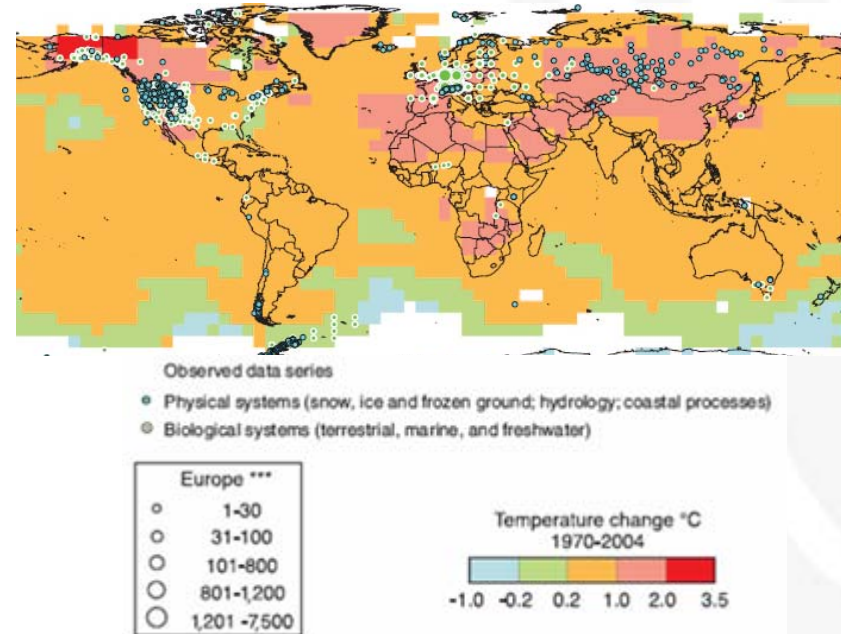
1. Climate change
2. Trends in the livestock sector
3. Green house gas emissions from the livestock sector: a global estimate
4. Mitigation option



Climate change

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

- The **worst-case IPCC scenario** trajectories are being realized
- **Societies are highly vulnerable**
- Climate change is having **strongly differential effects on people** within and between countries and regions.
- Weaker targets for 2020 increase the **risk of crossing tipping points**
- There is **no excuse for inaction**.





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



A snapshot of the world livestock sector



Drivers of structural change

Demand shifters

- Population growth and other demographic factors
- Income growth
- Urbanization

Supply shifters

- Cheap grains (historical trend)
- Cheap energy (fossil fuel)
- Improved technologies (genetics, feeding)

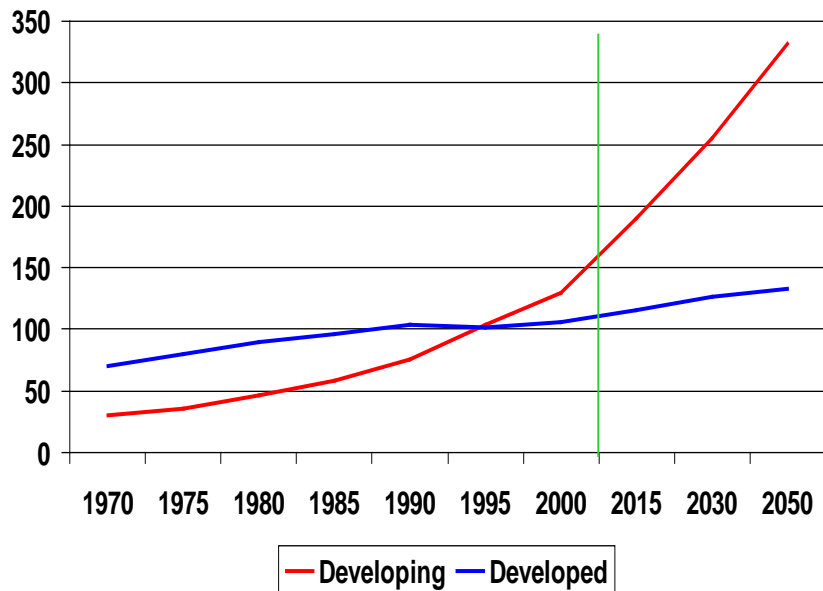
Facilitators

- Market liberalization
- Neglect of externalities
- Transport and communication infrastructure

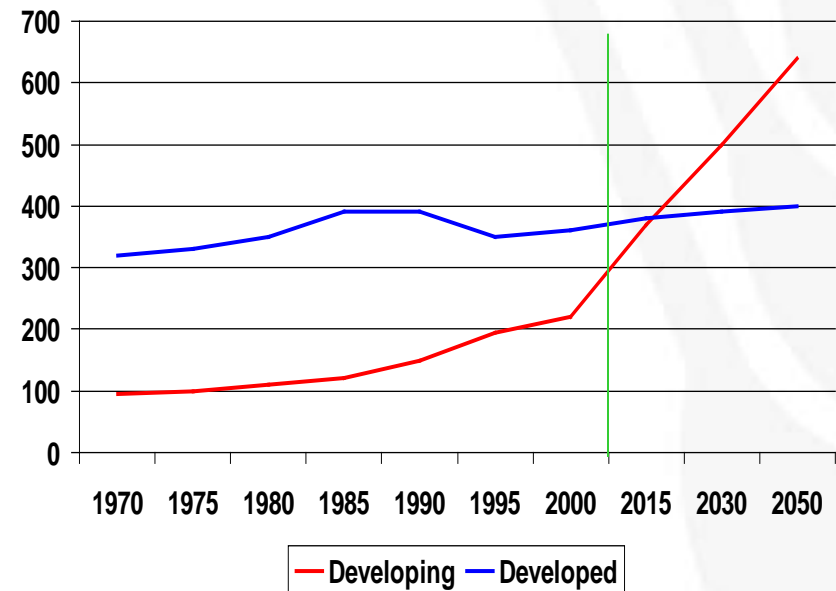


Livestock sector's trends

Past and projected **meat** production (million tonnes)



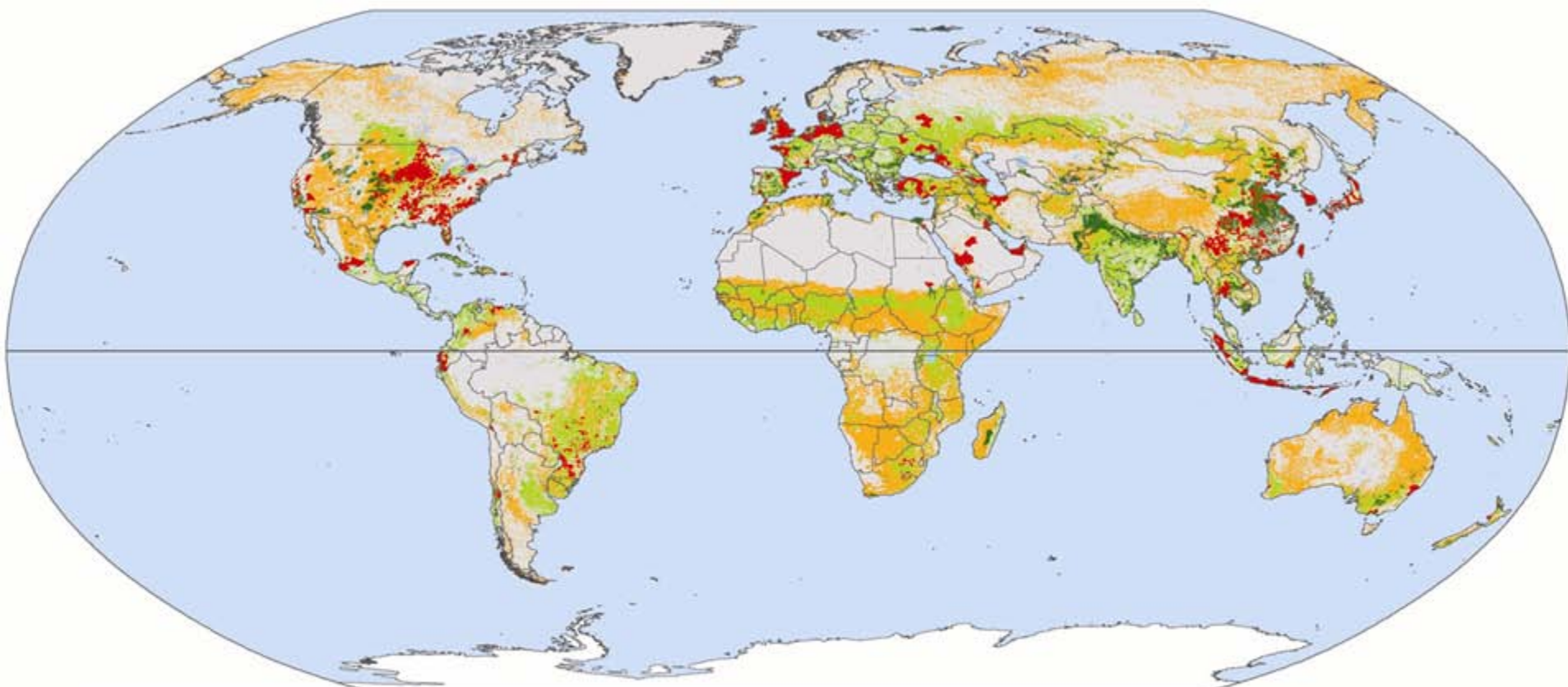
Past and projected **milk** production (million tonnes)



- 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



Extent of land used by livestock

Pastures

- 3.4 billion hectares (about 26% of emerged lands)
- Wide range of production intensity
- Marginal land frontier exhausted

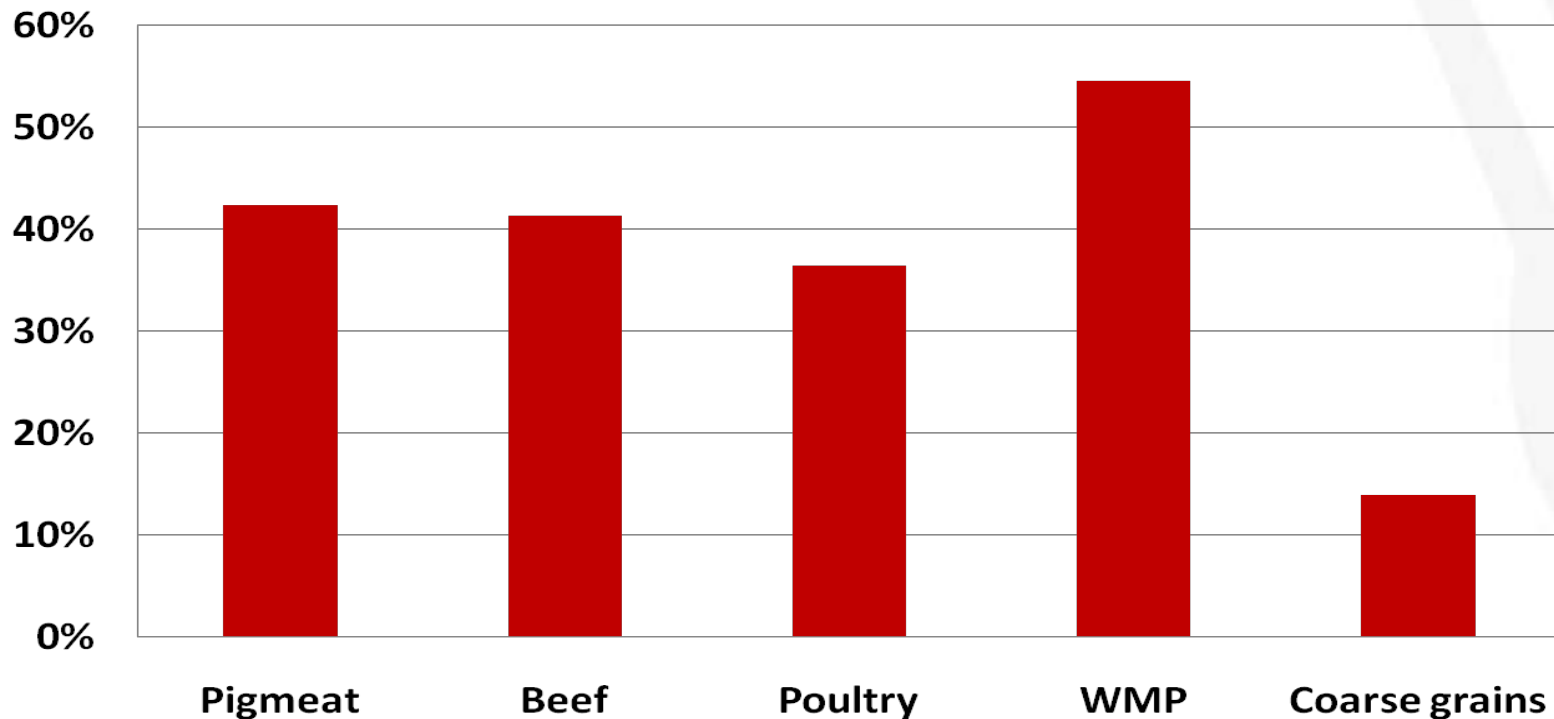
Feed crops

- 470 million hectares (about 33% of arable land)
- Cereals:
 - production growth mainly based on intensification
 - maize, barley and wheat are the three main species
- Soybean:
 - production growth based on expansion
 - eight countries provide 97% of global production



Strong trade expansion for all types of meat

Percent growth in imports
2017 compared to the 2005-07 average

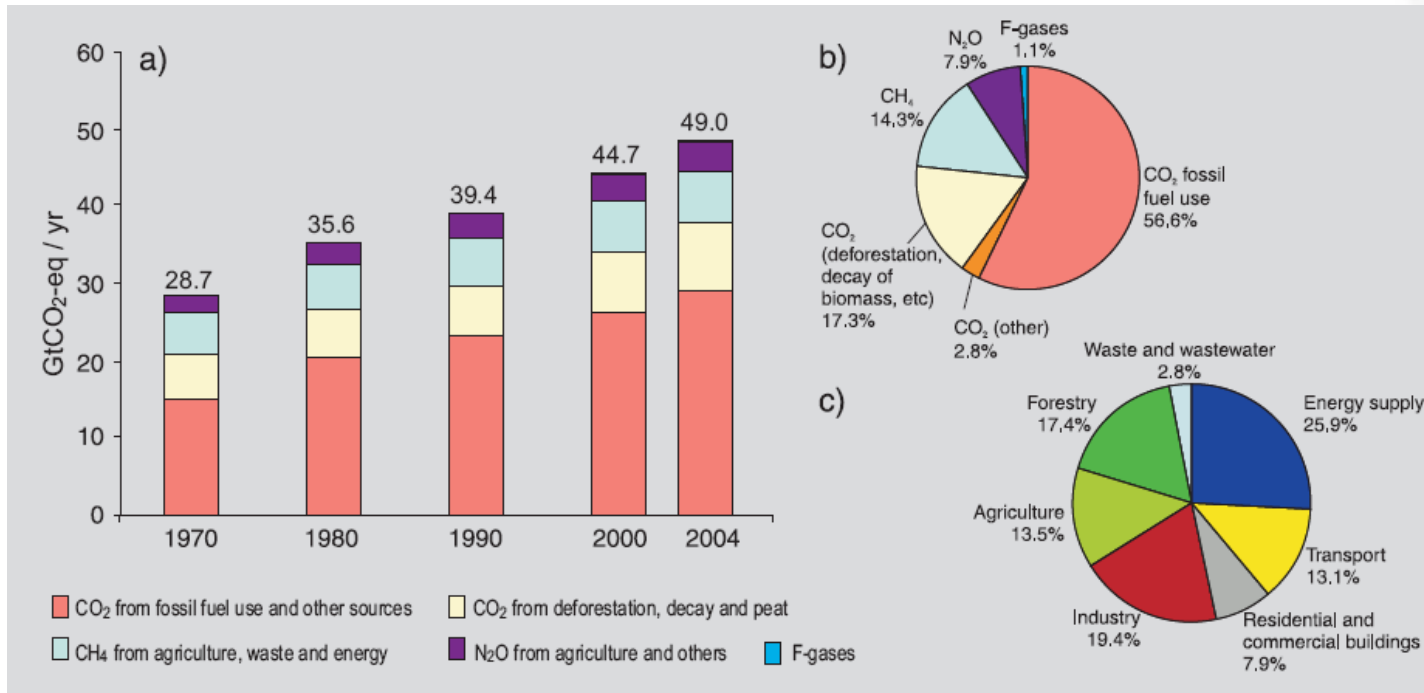




Implications for Green House Gas Emissions



Global anthropogenic emissions IPCC fourth assessment report



AGRICULTURE:

Livestock

Enteric Fermentation (CH₄)

Manure Management (N₂O, CH₄)

Land

Cropland (CO₂, CH₄, N₂O, NO_x, CO, NMVOC, SO₂)

Grassland (CO₂, CH₄, N₂O, NO_x, CO, NMVOC, SO₂)



A food-chain perspective of GHG emissions

- 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%**

1/ Beef

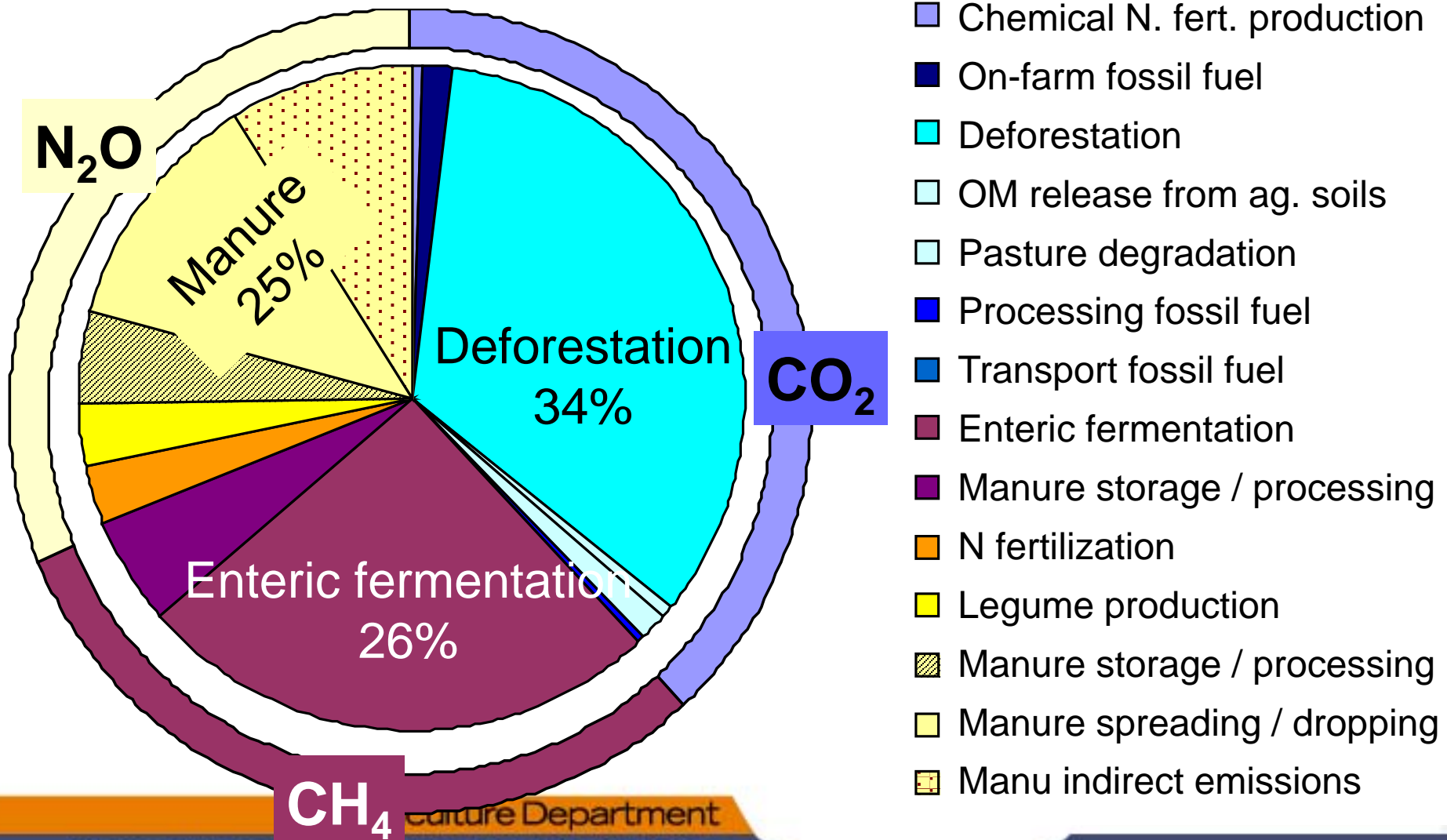
2/ Dairy

3/ Pig

4/ Poultry



Relative contributions by GHG





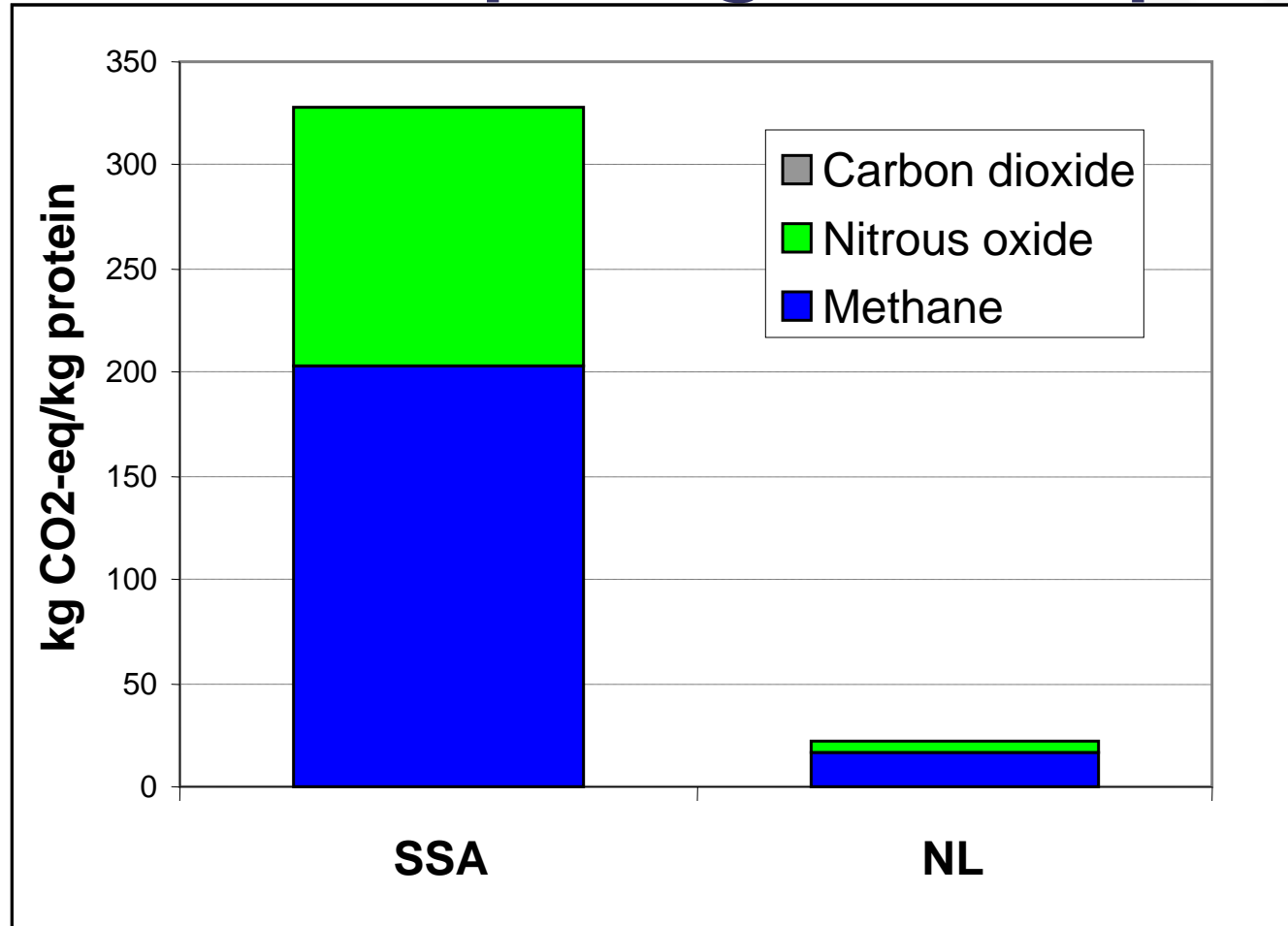
LCA of Livestock Production Systems

Sub Saharan Africa Netherlands

<i>Growth conditions</i>	<i>poor</i>	<i>good</i>
<i>Level external inputs</i>	<i>low</i>	<i>high</i>
Live Weight (kg/cow)	250	650
Age at first calving (year)	4	2
Death rates calves (%)	23	2
Digestibility feed (%)	55	76
Milk/cow (kg/cow.year)	250	8000
Fertilizer N use (kg/ha)	0	200
Concentrate (% of total ration)	0	25



GHG emissions per kg animal protein





But that wasn't the final picture...

- Land use: in SSA 13 times higher
 - concentration of emissions is lower per ha
- Intensive dairying:
 - non renewable resources e.g. fossil fuel
 - leaching
 - ammonia volatilization
 - biodiversity
 - groundwater use



Mitigation options



Technical mitigation options

- Control of **Land use change**
 - sustainable intensification of animal production and of feed crop/pasture management combined with avoiding deforestation
- Conserve/restore C and N in **cultivated soils**
 - pasture improvement, minimum tillage, silvo-pastoral systems
- Reduce **enteric fermentation**
 - feed quality, formulation and additives (rumen manipulation/control)
- Improved **manure management**
 - feeding, storage, anaerobic digestion, fertilizer



Four main policy principles

- **Get prices right:** Inefficiencies in resource use, often increasing use and leads to misallocation of resources among competing uses (within and outside agriculture)
 - Apply “**Polluter pays, provider gets**” principles
 - Seek **livestock/ecosystem balances:** Bring livestock in balance with surrounding land
 - Develop **institutions** for environmental stewardship
- ▶ Recognize and balance multiple objectives



Policy instruments - mitigation

- Cap and trade policies
- Taxation of emissions
- International agreements on climate change
- Payment for environmental services – Clean Development Mechanism
 - emissions from animal waste management
 - avoided deforestation?
 - carbon sequestration in rangelands??
- **Good practices:** voluntary, regulated or condition to access subsidy schemes



What's in it for me(at)?

- Until now the production process after the farm gate has received little attention in our work

There are plenty of opportunities to support mitigation:

- International Dairy Federation:
 - supports elaboration of Livestock's Long Shadow
- International Dairy Federation and Sustainable Agriculture Initiative
 - develop common practice on Life Cycle Assessment of farm and industry processes



Conclusions



Conclusions

- Consumption and production is projected to **double by 2050**
- Environmental impacts will follow a similar trend under “business as usual” scenario
- **Technology options are generally available** to mitigate environmental impacts
- Development and **implementation of policy mixes are required**, especially in hotspots of environmental impact
- **Cooperation** between government, sector and industry is necessary.