Can the Livestock Revolution Continue?

About livestock, resources, and stakeholders

Henning Steinfeld, Carolyn Opio, FAO-AGAL
Brasilia, 17 May 2011
Quotes

- “Without livestock, we would not exist.”
- “Finally, there is meat on my plate”
- “A business, an export opportunity.”
- “it’s enough; perhaps too much. After all, other things count, too.”
Outline

- A new era of resource scarcity?
- Meat, Milk and Eggs: will demand continue to grow?
- How to accommodate sector growth?
- What are the concerns? And the solutions offered?
ARE WE RUNNING OUT OF RESOURCES?
Commodity prices on the rise
International prices for maize and soy

Source: FAO commodity prices, 2011
Land

- By 2050, 33 % more people need to be fed
- 70 % more meat and milk
- Expansion of biofuels will continue
- Uncertainties of climate change
- Potential for agriculture expansion is limited
Livestock and Land Use

- 26% of global land is pasture
- 12% of global land is crop land, 1/3 thereof is for feed
- Yield growth accounts for most of agric. production increases
- Area expansion into forests, mainly in Latin America
A Global Water Crisis

- 2 billion people lack access
- Demand is growing; freshwater is getting scarce
- 70% of total freshwater use is for agriculture
Livestock and Water

- Direct water use is small
- Indirect water use and impact on water cycles is huge:
  - Water for feed production
  - Impact grazing on water quantity and water quality
  - Water pollution from livestock waste
Livestock sector uses 20% of green water flows ~11,900 km³/yr

~10,300 km³/yr for grazing
~1,400 km³/yr for feed
~300 km³/yr for irrigation

Deutsch et al. 2010
Peak Oil

Exhibit 5
Global Oil Production – Onshore and Offshore, Conventional and Unconventional

Source: EnergyFiles, Energy Information Administration, BP Statistical Review of World Energy, Wood Mackenzie  As of 12/31/10
Climate Change

- 2007 IPCC report indicate that the global surface temperature is likely to rise a further 1.1 to 6.4 °C during the 21st century.

- The rate of warming over the last 50 years is almost double that over the last 100 years (0.13°C ± 0.03°C vs. 0.07°C ± 0.02°C per decade).

4th AR, IPCC 2007
Livestock and Climate Change

- Land use and land use change (deforestation and degradation)
- Nitrogen fertilizer production and use for feed
- Emissions from digestion
- Emissions from livestock waste
- Climate change to affect feed and water availability
- Pastures as a potential carbon sink
Implications for the Livestock Sector

- Resource constraints have started to “bite”
- Higher input prices trigger acceleration of technological change ("induced innovation")
- Sector growth has to be achieved through productivity gains
- Climate change adaptation

- Other resource issues: “peak phosphate”, biodiversity
The Livestock Revolution

WILL DEMAND CONTINUE TO GROW?
Key features of Livestock Revolution

The livestock revolution: rapid growth and transformation

- **Demand Side:**
  - income growth
  - population growth
  - urbanisation

- **Supply side:**
  - Shifts in species and feed resources
  - Technological change
  - Market integration
  - Upscaling
What happened so far...

- **LR in the US** (1950s): hybrid maize, nitrogen fertilizer
- **LR in Europe** (1960-70s): like US, plus protectionism
- **LR in Asia** (from 1980, still on-going): rapid economic growth, decline of Soviet Bloc
- **LR in Latin America** (slow moving, on-going): low production costs
- **LR in Africa and South Asia**?
Relationship between animal protein consumption and income

![Graph showing the relationship between per capita animal protein supply (gr/day) and per capita GDP (US$ PPP). The graph indicates a positive correlation, with higher GDP associated with higher animal protein consumption.](image-url)
Annual urban growth rate

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Per capita meat consumption (2)

- **Developed countries**
  - 2007: High consumption
  - 1970: Lower consumption

- **East & SE Asia**
  - 2007: Moderate consumption
  - 1970: Lower consumption

- **South Asia**
  - 2007: Low consumption
  - 1970: Lower consumption

- **Near East & North Africa**
  - 2007: Moderate consumption
  - 1970: Lower consumption

- **Latin America & Caribbean**
  - 2007: High consumption
  - 1970: Lower consumption

- **Sub-Saharan Africa**
  - 2007: Low consumption
  - 1970: Lower consumption

**kg/capita/year**

- Scale: 0 to 90
Annual growth in per capita consumption of livestock products

Annual growth rate (%)

Bovine meat
Ovine meat
Pig meat
Poultry meat
Milk
Eggs

Developing countries
Developed countries

Annual growth rate (%)
Distribution of livestock production systems
When it comes to accommodate sector growth,

EFFICIENCY IS KEY
Trends in land use area for livestock production and total meat and milk production

**South America**

- Improved feed efficiency
- Increased reliance on feed imports

**EU-15**
Intensification

![Graph showing CO2 emissions per kg of milk for different countries.](image)

- **Ethiopia**
- **Kenya**
- **Egypt**
- **Rwanda**
- **China**
- **South Africa**
- **Thailand**

**CO2 eq/kg milk** vs. **milk (kg/cow)**
Comparison of resource inputs and waste outputs: dairy production in 1944 and 2007 in United States

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<th>1944</th>
<th>2007</th>
<th>% of 1944</th>
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<tr>
<td>Milk produced, billion kg</td>
<td>53.1</td>
<td>84.2</td>
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<tr>
<td>Total dairy population (10^3)</td>
<td>948</td>
<td>202</td>
<td>21</td>
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<tr>
<td>Feed, kg (10^9)</td>
<td>8.26</td>
<td>1.88</td>
<td>23</td>
</tr>
<tr>
<td>Land, Ha (10^3)</td>
<td>1,705</td>
<td>162</td>
<td>10</td>
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<tr>
<td>Water, Liters (10^9)</td>
<td>10.76</td>
<td>3.79</td>
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<td>N excretion, kg (10^6)</td>
<td>17.47</td>
<td>7.61</td>
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<td>P excretion, kg (10^6)</td>
<td>11.21</td>
<td>3.31</td>
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<td>Manure, kg (10^9)</td>
<td>7.86</td>
<td>1.91</td>
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<td>Methane, kg (10^6)</td>
<td>61.8</td>
<td>26.8</td>
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<tr>
<td>Nitrous oxide, kg (10^3)</td>
<td>412</td>
<td>230</td>
<td>56</td>
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<td>Carbon footprint per billion kg of milk, kg of CO2 (10^9)</td>
<td>3.66</td>
<td>1.35</td>
<td>37</td>
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*Capper et al. 2009*
Efficiency across species

Efficiency is key to reducing the sector’s demand for resources
Productivity growth differs

Fig. 1. Industrialized countries (1961–2040): cumulative Malmquist index in agriculture and subsectors.

Ludena et al, 2007
Despite higher input costs, sector growth will continue
Intensive production is more efficient and has lower emissions
Huge performance gaps within systems and across countries
Technical solutions are available but incentives need to be better aligned
In search of a common perspective

HOW CAN WE MOVE FORWARD?
What solutions have been offered?

- No problem, no solution required – denial, business as usual
- Problems are local – technical fixes
- Problems are substantial and systemic – policies needed
- Problems are huge and can hardly be fixed – rein in growth
- Problems are beyond control - vegetarianism
An emerging consensus

- Curbing demand is difficult and slow; ethical problems
- Business as usual not an option either
- Large efficiency gains can be realized, and sector growth can be “accommodated”.

Requires:
- Alignment of incentives
- Rapid change of practices
- Continued technological innovation
- Development of institutions

- Large potential for the provision of environmental services (carbon sequestration, biodiversity, water)
Building an Agenda

State actors:
- Align incentives towards improved environmental outcomes
- Provide regulatory framework

Private sector:
- Improve practices through adoption, research and development
Building an Agenda

Civil Society:
- Advocacy, ”watchdogs”

Science:
- Research and development, independent public good research

Int’l organizations:
- Facilitation, coordination
Omissions

- Huge social dimension of livestock, mainly in Africa and Asia
- The economic dimension
- Non-food livestock products and services
- Consumption (over- and under-)
- Human health aspects (zoonoses, residues)
- Animal welfare
Wrap up

- Livestock is at the centre of most contemporary resource use issues (land, water, energy, nutrients, climate change)
- Demand for livestock products will likely continue to be strong
- Efficiency is key to reducing resource requirements and environmental impact; requires:
  - Technology adoption and development need to accelerate
  - Supporting policy frameworks
  - Stakeholder concertation
THANK YOU

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