Overview

- What we mean by sustainability
- Livestock sector trends and drivers
- Mapping livestock distributions and production systems
- Livestock and livelihoods
- Livestock and the environment
- Livestock, health and nutrition
- Conclusions
What does sustainable mean?

- Equity and growth
- Livestock production
- Climate and natural resource use
- Health and nutrition
Drivers of change

- Policies and institutional change
- Economic growth
- Changing diets
- Transportation
- Globalisation
- Livestock production
- Climate and natural resource use
- Health and nutrition
- Urbanisation
- Energy prices
- Trade and marketing
- Population growth
- Climate change
- Feed prices
- Policies and institutional change
- Economic growth
- Changing diets
- Transportation
- Globalisation
- Livestock production
- Climate and natural resource use
- Health and nutrition
- Urbanisation
- Energy prices
- Trade and marketing
- Population growth
- Climate change
- Feed prices
Surface temperature projections

Source: IPCC's Fifth Assessment Report
World population projection (UN 2012)

<table>
<thead>
<tr>
<th>Year</th>
<th>Total population (billions)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>7 Billion</td>
</tr>
<tr>
<td></td>
<td>9.5 Billion</td>
</tr>
<tr>
<td></td>
<td>11 Billion</td>
</tr>
</tbody>
</table>

Source: Gerland et al. 2014
Continental population projection

Source: Gerland et al. 2014
GDP growth in sub-Saharan Africa

Per capita GDP (US$ ppp 2009)

Year

Source: IMF WEO, Standard Chartered Research 2011
GDP growth in sub-Saharan Africa

Selected African countries

Source: Standard Chartered Research 2011
Drivers of change

Source: FAO 2009
The changing livestock sector

- Demographic and social drivers
  - Population: + 32% or 9.6 billion people by 2050
  - Income growth: + 2% per year by 2050
  - Urbanization: 70% will live in cities by 2050

  ➜ Growth in demand for animal source foods
    - + 70% by 2050
    - + 200 million tonnes of meat

  ➜ Structural changes in the livestock sector
    - Shift from ruminant to monogastric
    - Intensification of production

  ➜ Impinges on global public goods
    - Equity and growth
    - Health and nutrition
    - Climate and natural resource use
African livestock futures

- GLOBIUM: partial equilibrium model to determine consumption, production, prices and trade for different livestock commodities
- Projections to 2050 were based on a spectrum of Shared Socioeconomic Pathways (SSPs)

Source: Herrero et al. 2014
Some key results

- 3 fold increase in milk consumption to 2050 – especially high growth in East Africa
- 6-7 fold increase in consumption of pork and poultry meat – especially high growth in West Africa
- Overall, poultry consumption exhibits the highest rates of growth throughout SSA
- The consumption of meat from pigs and chickens will exceed red meat consumption by 2030 in most sub-regions of SSA
- Smallholder mixed crop-livestock systems are, and will remain, the main producers of ruminant products to 2050, under all scenarios
- Under SSP1 a low trade deficit (10%) can be maintained to 2050
- Under SSP2 imports of milk and meat from monogastrics will double in relation to production
- Any negative deviation (SSP3) would make African livestock production largely uncompetitive – negative outcomes for producers, consumers and continental food security

Africa’s food importation bill

<table>
<thead>
<tr>
<th>Category</th>
<th>Amount</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>US$ 44 billion</td>
</tr>
<tr>
<td>Meat</td>
<td>US$ 5 billion</td>
</tr>
<tr>
<td>Milk</td>
<td>US$ 4 billion</td>
</tr>
</tbody>
</table>

Source: Herrero et al. 2014
Sustainable intensification

- Sustainable intensification will be key to elicit a production response in most regions of Africa
- Need to achieve rates of annual growth in productivity of around 6% per year

Annual growth rates of livestock production:

SSP1: Sustainability scenario > 5-6%
SSP2: Business as usual 2-3%
SSP3: Fragmentation scenario 1.5-2.5%

→ Calls for an integrated, systems approach to sustainable livestock sector development
→ Need reliable data and information to guide policy
Distribution of cattle in Africa (2006)

Source: Robinson et al. 2014
Ruminant production systems (v5)

- Livestock only – arid & semi-arid
- Livestock only – humid & sub-humid
- Livestock only – tropical highlands
- Mixed rain-fed – arid & semi-arid
- Mixed rain-fed – humid & sub-humid
- Mixed rain-fed – tropical highlands
- Mixed irrigated – arid & semi-arid
- Mixed irrigated – humid & sub-humid
- Mixed irrigated – tropical highlands
- Urban areas
- Other (forest)

Source: Robinson et al. 2011
Monogastric production systems

- Extensive production
- Intensive production

Livestock distribution

% backyard

Mapped based on rural population

Difference (total – extensive)

% intensive
Chicken systems

Proportion of extensively raised chickens

Log per-capita GDP (US$/person/year)
From World Bank data

Source: Gilbert et al. 2015
http://www.livestock.geo-wiki.org

International Livestock Research Institute
Food and Agriculture Organisation of the UN
International Institute for Applied Systems Analysis
Université Libre de Bruxelles
Wageningen University
University of Oxford
Mapping poor livestock keepers

165 million poor people in Africa depend on livestock for their livelihoods

<table>
<thead>
<tr>
<th>Livestock system</th>
<th>PLK</th>
</tr>
</thead>
<tbody>
<tr>
<td>Livestock only – arid &amp; semi-arid</td>
<td>22,582,000</td>
</tr>
<tr>
<td>Livestock only – humid &amp; sub-humid</td>
<td>7,456,000</td>
</tr>
<tr>
<td>Livestock only – tropical highlands</td>
<td>653,000</td>
</tr>
<tr>
<td>Mixed rain-fed – arid &amp; semi-arid</td>
<td>51,394,000</td>
</tr>
<tr>
<td>Mixed rain-fed – humid &amp; sub-humid</td>
<td>41,647,000</td>
</tr>
<tr>
<td>Mixed rain-fed – tropical highlands</td>
<td>28,343,000</td>
</tr>
<tr>
<td>Mixed irrigated – arid &amp; semi-arid</td>
<td>432,000</td>
</tr>
<tr>
<td>Mixed irrigated – humid &amp; sub-humid</td>
<td>139,000</td>
</tr>
<tr>
<td>Mixed irrigated – tropical highlands</td>
<td>179,000</td>
</tr>
<tr>
<td>Other (forest)</td>
<td>11,701,000</td>
</tr>
</tbody>
</table>

Increases to 230 million PLK using the international $2.00 per day poverty rate

Source: Robinson et al. 2011
Livestock emissions per unit of land

Source: Gerber et al. 2013
Livestock emissions per unit of edible protein

Source: Gerber et al. 2013
Nutrition: the double-edged sword

• We live in a world more than with 800 million hungry and 165 million stunted children
• Animal-Source Foods provide 17% of calories and 26% of protein
• Animal-Source Foods provide valuable micronutrients to the poor

• Over one third of all adults across the world – 1.46 billion people – are obese or overweight
• Between 1980 and 2008, the numbers of people affected in the developing world more than tripled, from 250 million to 904 million

Livestock are key to both sides
More than 2 billion are sickened each year from the food they eat.
Millions more die from zoonotic diseases that emerge from, or persist in, agricultural ecosystems.
Diseases recently emerged from animals make up 25% of the infectious disease burden in least developed countries and kill one in ten people who live there.

We have proven agricultural interventions which can tackle the diseases associated with agriculture.

$25 billion invested in zoonotic disease control would bring benefits worth $125 billion.

Source: Grace 2012
Emerging infectious diseases

Zoonoses from wildlife

Zoonoses from non-wildlife

Drug-resistant pathogens

Vector-borne pathogens

Global distribution of relative risk of an EID event

Source: Jones et al. 2008
Sources of antimicrobial resistance

- Antimicrobial (ab)use in medicine
- Intensive livestock and aquaculture
  - growth promotion
  - prophylaxis and metaphylaxis
  - Therapeutic use
- Natural phenomenon in environment

Source: P. Huey (Science)
Antimicrobial resistance

The O’Neill Report (2014)

- AMR infections currently claim at least 50,000 lives each year across Europe and the USA alone ..... with many hundreds of thousands more dying in other areas of the world
- In 15 European countries more than 10% of bloodstream *Staphylococcus aureus* infections are caused by methicillin-resistant strains (MRSA) ..... closer to 50% in several of these

Source: O’Neill 2014
Intensification trajectories

- Model described in Gilbert et al. (2015) to estimate current proportions of extensively raised chickens (globally)

- GDP PPP values and projections until 2020 from the IMF

- Projections beyond 2020 are based on regional growth rates and convergence scenarios (Leimbach et al. 2015)

- Poultry intensification trajectories, highlighting the changes in Nigeria, South Africa and Ethiopia as examples
Intensification trajectories
Intensification trajectories

![Graph showing the proportion of extensively raised chicken vs. GDP per capita (PPP; log10(x)) for different countries in 2020. The graph includes markers for countries such as ETH (Ethiopia), NGA (Nigeria), and ZAF (South Africa). The countries are represented by varying sizes of bubbles indicating different population sizes (1 billion, 0.5 billion, 0.2 billion, 50 million).]
Intensification trajectories

GDP per Capita (PPP; log10(x))

Proportion of extensively raised chicken

2030

ETH

NGA

ZAF

1 billion
0.5 billion
0.2 billion
50 million
Intensification trajectories

Proportion of extensively raised chicken vs. GDP per Capita (PPP; log10(x)) for countries like ETH, NGA, and ZAF. The graph shows different population sizes indicated by the size of the bubbles, with 1 billion being the largest and 50 million the smallest.
Intensification trajectories

Proportion of extensively raised chicken vs. GDP per Capita (PPP; log10(x)) for 2050.

Countries represented:
- ETH
- NGA
- ZAF

Legend:
- 1 billion
- 0.5 billion
- 0.2 billion
- 50 million
Antimicrobial use in livestock

- Total consumption in the livestock sector in 2010 estimated at 63,151 tons
- Global antimicrobial consumption will rise by 67% by 2030
- It will nearly double in BRICS (Brazil, Russia, India, China, and South Africa) countries
Antimicrobial resistance

Global antimicrobial consumption in livestock
(mg per 10km pixel)

Source: Van Boeckel et al. 2015
Antimicrobial resistance

- The European Union banned the use of antibiotics to boost animals' growth in 2006
- There is a ‘voluntary’ ban in the USA ...... Chick-fil-A, McDonalds and Costco
- Very difficult to regulate in the developing and emerging economies
  - Concerted action – multi-stakeholder platforms
  - Strengthen the evidence base linking agricultural use to AMR in the medical sector
  - Appropriate approaches in different settings – poor countries may not have the ‘resilience’ or ‘capacity’ of Europe in Withstanding a blanket ban, for example
  - This is a global issue and calls for a coordinated, global response
In conclusion

- Rapid demand growth for Animal Source Foods in Africa – especially milk, pork and poultry
- African production can only meet this demand, avoiding a growing trade deficit, under a sustainable growth scenario (SSP1)
- The required annual growth in productivity is around 6% per year
- Sustainable intensification will be needed to achieve this: equity – environment – health
- This calls for integrated, systems-based solutions to guide sector development along a sustainable pathway
- The need for action is urgent if African livestock production is to meet its growing demand
Thank you!