Optimizing the environmental footprint of livestock production

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THE IMPORTANCE OF LIVESTOCK

For PEOPLE
- Employment, income
- Economy
- Food and nutrition
- Cultural value
- Resilience and risk management

And the PLANET
- Biggest land user
- Natural resources:
  - Manure, carbon in the soil, energy, ...
  - GHGe, water use/pollution, degradation, ...

OECD narratives mostly negative
Not much evidence from Low-Middle Income Countries

Sustainability is a big issue and needs to be managed
Optimize the environmental footprint

i.e.

“Goods” & “Bads”
THREE PILLARS IN THE RESEARCH PORTFOLIO

• Improved **foresight and assessments** (2-way GEC-livestock interactions) based on site-specific data

• Identify **solutions** and provide stakeholders with knowledge and incentives to implement solutions

• Foster an **enabling** policy and institutional environment

== GHGe, soil health/degradation, water, biodiversity ==
EXAMPLE 1: greenhouse gas emissions
Impacts of CC on Livestock

- **Hazards/stresses:**
  - $\Delta CO_2$, temperature, precipitation
  - Variability and extreme events

- **Direct impact**
  - Heat stress

- **Indirect impact**
  - Water
  - Diseases
  - Biodiversity, Soil
  - Feed and forages
  - Livelihoods and systems

Heat stress change – 2010-2035:


Ecocrop modeling (Hymann et al.)
GHG emission baselines and SSA-specific emission factors

• Tier 2 estimates of ruminant Emission Factors

• Difference due to assumptions about energy intake
  • Feed shortage/seasonal LW loss
  • Caution: only one location

• Countries in stronger position for climate finance

<table>
<thead>
<tr>
<th>Report</th>
<th>Region</th>
<th>Males</th>
<th>Females</th>
<th>Calves</th>
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<tr>
<td></td>
<td></td>
<td>kg CH$_4$ yr$^{-1}$</td>
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<td>IPCC</td>
<td>Africa</td>
<td>49</td>
<td>41</td>
<td>17.3</td>
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<tr>
<td>Goopy et al. (2017)</td>
<td>Nyando, Kenya</td>
<td>34.4</td>
<td>24.6</td>
<td>16</td>
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</tbody>
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**IPCC approach**

CH$_4$ = Energy intake $\times$ $Y_m$ ("methane conversion factor")
Integrating forages in African farming systems

On-station:
- Kenya, Tanzania, Uganda, Mozambique
- Demonstration plots and long-term trials
- Grasses/legumes
→ Towards advanced lines of breeding program

On-farm:
- Napier, Brachiaria, Desmodium in Tanzania
- Oats, Rye grass, Vetch in Central Kenya
- Grasses/legumes in Rwanda and Tanzania
EXAMPLE 2: Restoring degraded rangelands
Estimating SOC dynamics in a rangeland of Eastern Kenya - A DayCent model approach

- Soils as carbon sink
  - Mitigate CC
  - Improve soil fertility

- Rangeland sequestration potential
  - Improved management practices

- DayCent SOM model
  - Predicts SOC dynamics over time

MSc. thesis by Kate Blankson
1 Booklet (practical guidelines) on Sustainable Development of Lowland Pastures in NENA region
Exclosure improvement: *influence of context*
The CGIAR Research Program on Livestock aims to increase the productivity and profitability of livestock agri-food systems in sustainable ways, making meat, milk and eggs more available and affordable across the developing world.

livestock.cgiar.org

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