Developing livestock breeding strategies for enteric methane mitigation in developing countries: the case of Latin America

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- Mauricio Alvarez
- Sebastian Munilla
- Gabriel Ciappesoni
- Vicente Vega-Murillo
- Rodolfo Cantet
- René Calderón-Chagoya
- Moises Montaño-Bermúdez
- Alexandre Berndt
Livestock production in Latin America

One of the main providers of beef and dairy (larger net exporter)

Food security (region, world)

Livestock industries (GDP, livelihood, employment)

Biodiversity & ecosystem services

Transnational strategic ecosystems

Economic and social relevance
Latin America and greenhouse gas (GHG) emissions

International Agreements
- National GHG inventories
- Mitigations targets – National Direct Contribution (NDC)

AFOLU sector
- 20 to 70% of total GHG

Mitigation targets
- Proposed Reductions of GHG emission (2025, 2030)
- Emission intensities
Target: Reduction of methane emission intensity

Global growing demand for food and fibres
- Increasing agricultural production
- Opportunity for economic & social development

Environmental sustainability and GHG mitigation
- Conservation and biodiversity
- Reduction of methane emissions
- International agreements

Methane emissions
- Reproductive performance
- Growth, finishing
- Wool production & quality
- Beef production & quality
- Animal health

Animal Breeding

RFI
Animal breeding for lower emissions

**Feasibility:**
Methane emissions breeding values

**Adoption:**
Valorisation of genetics as mitigation tool

**Impact:**
Beef producers for the region & world

Methane phenotyping platform

**GENETIC EVALUATION**
Main producers/exporters & national genetic evaluations

**Impact:**
Beef producers for the region & world

### Top Beef Producers

<table>
<thead>
<tr>
<th>Country</th>
<th>Beef produced (million tons)</th>
<th>Cattle heads (millions)</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>12.89</td>
<td>92.08</td>
</tr>
<tr>
<td>Brazil</td>
<td>10.35</td>
<td>193.78</td>
</tr>
<tr>
<td>China</td>
<td>7.18</td>
<td>98.17</td>
</tr>
<tr>
<td>India</td>
<td>4.35</td>
<td>306.7</td>
</tr>
<tr>
<td>Argentina</td>
<td>3.14</td>
<td>53.4</td>
</tr>
<tr>
<td>Mexico</td>
<td>2.18</td>
<td>17.31</td>
</tr>
<tr>
<td>Australia</td>
<td>1.88</td>
<td>23.04</td>
</tr>
<tr>
<td>France</td>
<td>1.58</td>
<td>17.4</td>
</tr>
<tr>
<td>Canada</td>
<td>1.41</td>
<td>11.51</td>
</tr>
<tr>
<td>Russia</td>
<td>1.32</td>
<td>17.79</td>
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</tbody>
</table>

### Top Beef Exporters

<table>
<thead>
<tr>
<th>Country</th>
<th>Thousands of tons</th>
</tr>
</thead>
<tbody>
<tr>
<td>BR</td>
<td>3,012</td>
</tr>
<tr>
<td>IN**</td>
<td>1,475</td>
</tr>
<tr>
<td>US</td>
<td>1,422</td>
</tr>
<tr>
<td>AU</td>
<td>1,400</td>
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<tr>
<td>AR</td>
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<tr>
<td>NZ</td>
<td>645</td>
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<tr>
<td>EU</td>
<td>625</td>
</tr>
<tr>
<td>CA</td>
<td>585</td>
</tr>
<tr>
<td>UY</td>
<td>485</td>
</tr>
<tr>
<td>PY</td>
<td>445</td>
</tr>
<tr>
<td>Others</td>
<td>1,182</td>
</tr>
</tbody>
</table>

* As of April 2023
** Exports “carabef” or buffalo meat
Sources: U.S. Department of Agriculture, Foreign Agricultural Service
Main producers/exporters & national genetic evaluations

Impact:
Beef producers for the region & world

Feasibility:
Methane emissions breeding values

National genetic evaluations for 30 years
- Bos taurus
- Bos indicus
- Synthetics (taurus x indicus)

<table>
<thead>
<tr>
<th>Breeds</th>
<th>Argentina</th>
<th>Brazil</th>
<th>Uruguay</th>
<th>Mexico</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angus</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
</tr>
<tr>
<td>Hereford</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td></td>
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<tr>
<td>Limousin</td>
<td>x</td>
<td></td>
<td>x</td>
<td>x</td>
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<tr>
<td>Brahman</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Nellore</td>
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<td>Simmental</td>
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<td>Simbrah</td>
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<tr>
<td>Charolais</td>
<td></td>
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<td></td>
<td>x</td>
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<tr>
<td>Brangus</td>
<td>x</td>
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Main producers/exporters & national genetic evaluations

Feasibility:
Methane emissions
breeding values

Impact:
Beef producers for the region & world

- National genetic evaluations for 30 years
  - Bos taurus
  - Bos indicus
  - Synthetics (taurus x indicus)

- Genomic predictions in many of the breeds

- Feed efficiency integrated in breeding programs
  - Growth, finishing
  - Reproductive performance
  - Beef production & quality
  - Animal health

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Integration of methane measurements

In association with RFI

Animals in or linked to genetic evaluations

In grazing conditions

Information Nucleus

Feed Intake ➔ Methane production ➔ Production

Methane yield
Methane intensity
Feed efficiency

Rodeo Glencoe
Rodeo Las Brujas
Kiyú
Communication with stakeholders

- Impact: Beef producers for the region & world
- Feasibility: Methane emissions breeding values
- Adoption: Valorisation of genetics as mitigation tool

Breeding tools

National Research Institutes & Universities

Responsible for genetic evaluations

Animal breeding as cost-effective tool for mitigation and productivity

Links with: policy makers, GHG inventories, regional forums

Incentives

Adoption

Long lasting collaborations with breeder societies and private sector

Value
Final comments

Comprehensive phenotyping
Animal DNA genotyping
Microbiota sequencing
Linked to genetic evaluations

Scientific knowledge
Genetic improvement tools
Training and development
Collaboration with other WGs

Contribution to mitigation goals without compromising food and fiber production

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- Collaboration with other WGs
- Training and development
- Scientific knowledge
- Genetic improvement tools
- Microbiota sequencing
- Animal DNA genotyping
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Many thanks

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