Global Livestock: Methane Impact Analysis

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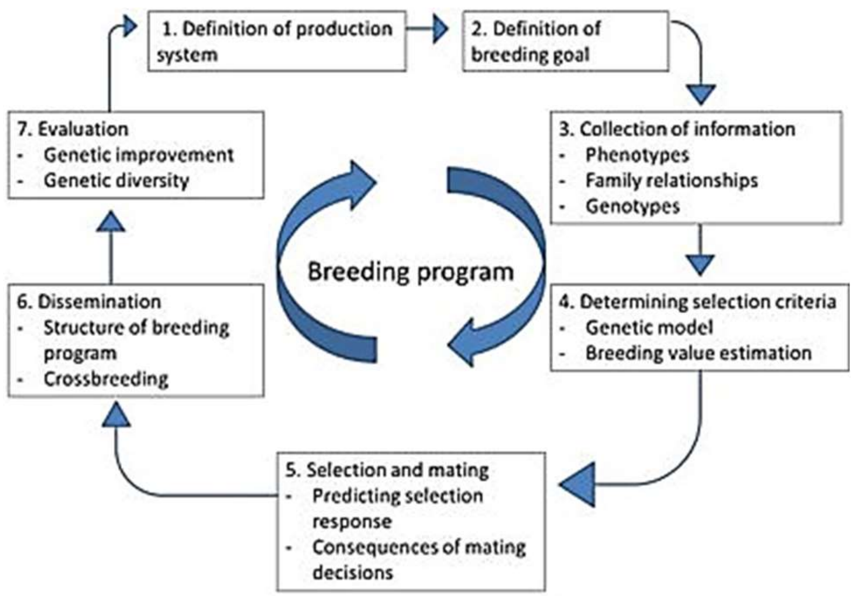
Building a Solution

Genetic strategies **NEED** genetic evaluations

- Identify, select and disseminate low methane genetics



Our task

Identify priority livestock industry segments to accelerate the reduction in global enteric methane emissions via genetic improvement

Based on criteria that consider a variety of relevant industry assessment criteria

SH0 Important to acknowledge the role that imports can play leveraging evaluations in GN countries
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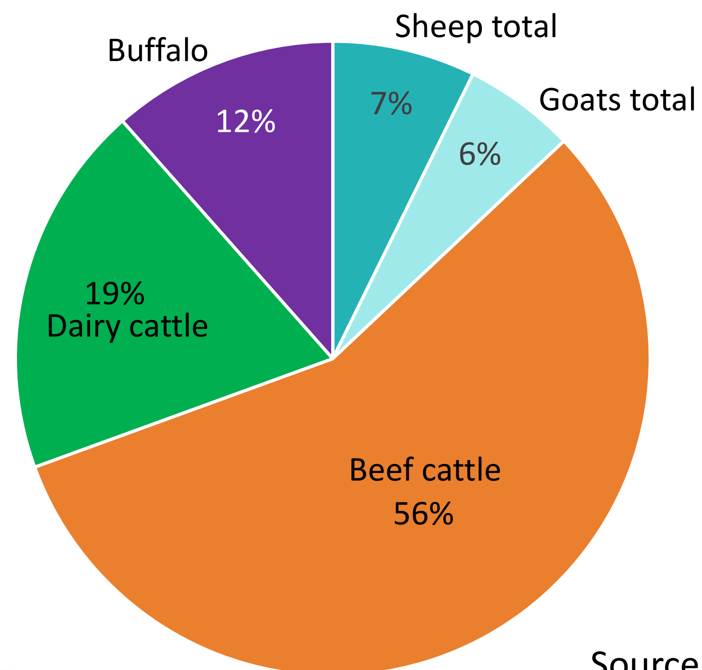
2021 FAO Livestock e-Methane (kt)

- Total enteric methane emissions from **5 major livestock species** was 97,384 (kt) in 2021.

Species	Enteric Methane Emissions (kt)
Beef cattle	54,973
Dairy cattle	18,550
Buffalo	11,217
Sheep	7,088
Goats	5,556



Source: FAO

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SH0 Note that some of the beef cattle emissions are Indian cattle not used within dairy production but also not used for beef. I'll confirm the CH_4 tonnage and %

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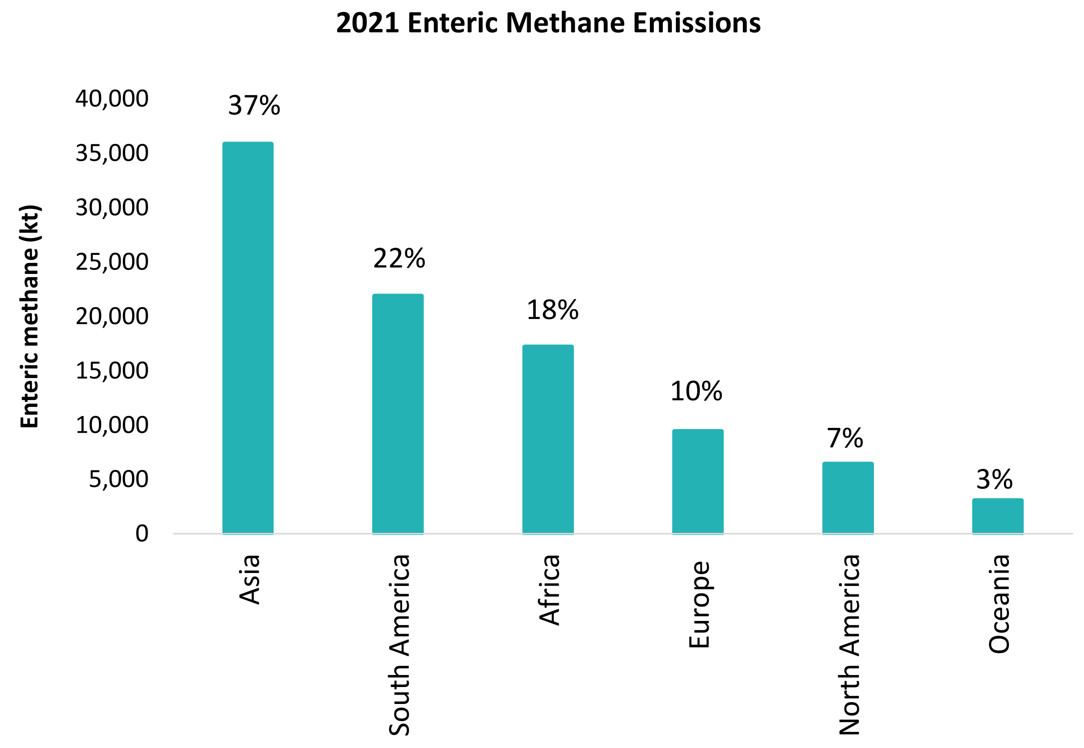
Regional Livestock e-Methane

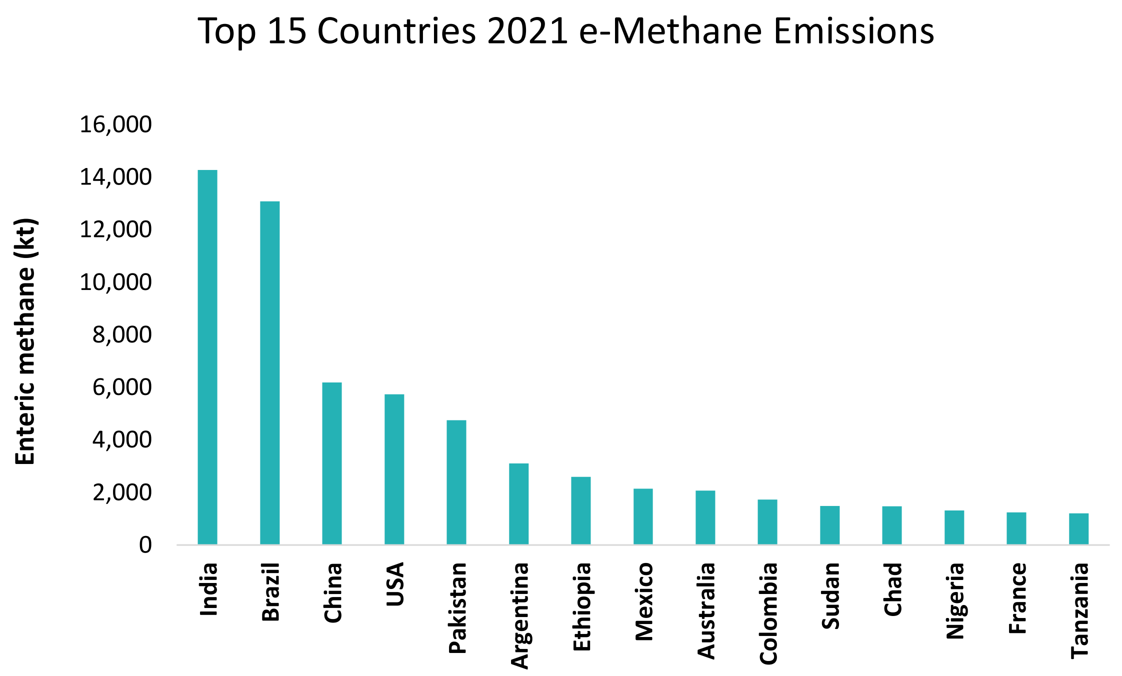
- One third of **livestock e-methane emissions** are from Asia (of which India contributes 40%, China 17%, Pakistan 13%).
- **South America** contributes 22%. (Brazil 60%, Argentina 14%, Colombia 8%)
- **Africa** contributes 18%. (Ethiopia 15%, Chad 9%, Sudan 9%, Nigeria 8%, Tanzania 7%)



Source: FAO

National Livestock e-Methane

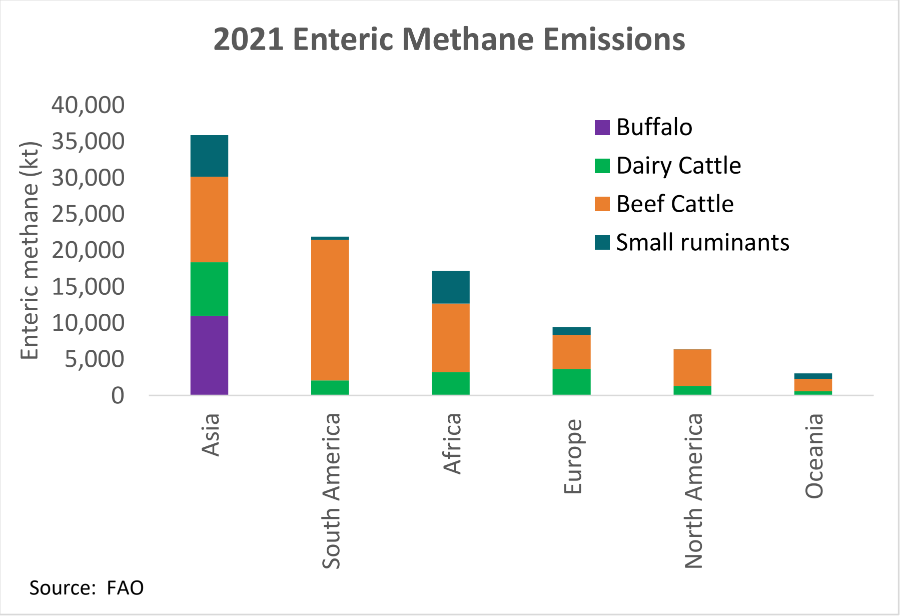
- Top 5 Countries produce 45% of global e-methane emissions - 3 countries in Asia
- Top 10 Countries produce 57% of global e-methane emissions
- Top 15% Countries produce 63% of global e-methane emissions

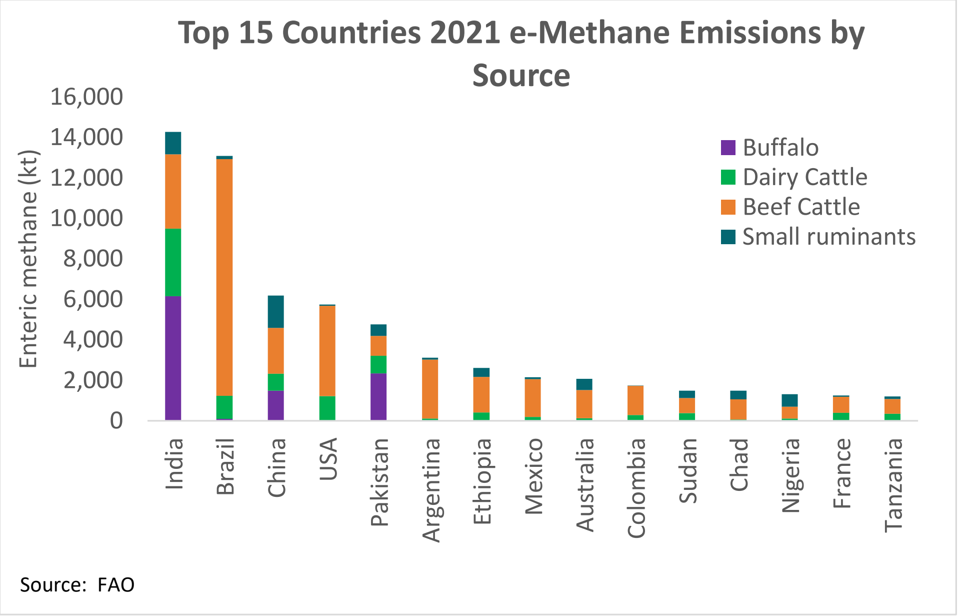


Source: FAO

Livestock e-Methane by Livestock Class

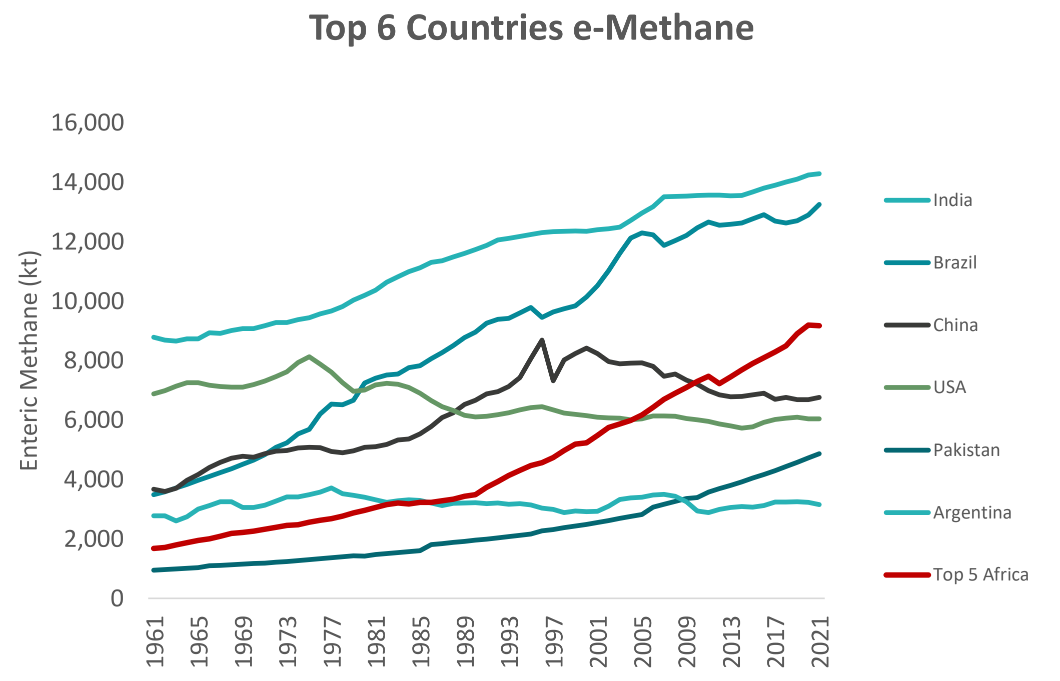
- Buffalo e-methane emissions: **Asia** 98% (India 55%, Pakistan 21%, China 13%).
- Dairy cattle e-methane emissions: **Asia** 40%, (Europe 20%, Africa 17%, South America 11%).
- Beef cattle e-methane emissions: **South America** 35%, (Asia 21%, Africa 17%, North America 9%).
- Small ruminants e-methane emissions: **Asia** 45% (China 35%, India 24%, Pakistan 12%) and **Africa** 36%.





Time Series of e-Methane Emissions

- Of the 6 largest countries, Pakistan (+2.8% CAGR) and Brazil (+2.3% CAGR) grew the fastest since 1961.
- The fastest growing (CAGR) top 15 countries over the last decade were Chad (+6.1%), Tanzania (+3.3%), Pakistan (+3.1%), Ethiopia (+2.8%).
- Sudan (-1.8%), Australia (-1.3%), France (-1.0%) and China (-0.3%) reduced e-methane over last decade.
- The 5 largest African e-methane countries, all grew at over 2% CAGR over last 60 years (Chad +4.1%, Ethiopia +3.3%, Nigeria +3.0%, Sudan +2.5%, Tanzania +2.3%).

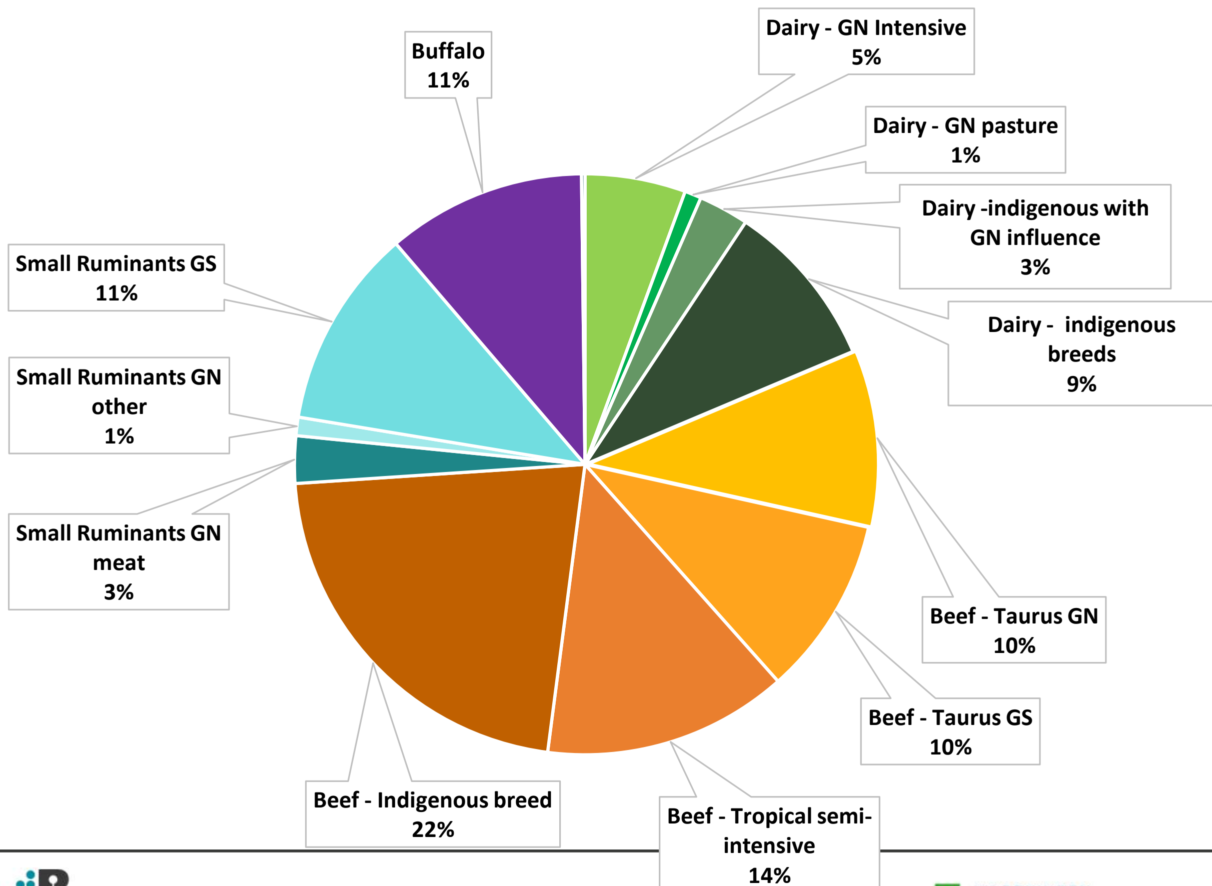


Source: FAOSTAT

Animal Segment Emissions Clusters

	Cluster	Description
1	Dairy GN Intensive	Intensive, Holstein-dominated dairy systems in GN
2	Dairy GN Pastoral	Intensive, Holstein and crossbred pastoral dairy systems in GN
3	Dairy GS with GN Influence	GS systems with crossbred herds influenced by GN genetics
4	Dairy GS	GS systems incorporating a diverse range of indigenous breeds
5	Buffalo	Buffalo (milk & meat) predominately in GS
6	Beef Taurus GN	Intensive beef systems based on *Bos taurus* breeds in GN
7	Beef Taurus GS	Intensive and semi intensive beef systems based on *Bos taurus* breeds in GS
8	Beef Tropical semi-intensive	*Bos indicus* and tropical *Bos taurus* breeds managed in semi intensive systems in both GN and GS
9	Beef Indigenous	GS systems incorporating a diverse range of indigenous breeds
10	Small Ruminants GN meat	Intensive lamb and dual purpose systems in GN
11	Small ruminants GN other	Fibre and milking small ruminant systems in GN
12	Small ruminants GS	GS systems incorporating a diverse range of indigenous breeds

Comparison of e-Methane per group



Livestock Segment	Enteric methane Emissions (kt)
Dairy GN Intensive	5,565
Dairy GN Pastoral	928
Dairy GS with GN Influence	2,783
Dairy GS	9,275
Beef Taurus GN	9,888
Beef Taurus GS	13,548
Beef Tropical semi-intensive	21,761
Beef Indigenous	2,603.70
Small Ruminants GN meat	1,027.40
Small ruminants GN other	11,055.80
Small ruminants GS	11,027
Buffalo	9,776

Impact Assessments Criteria

Criteria 1: Scale of problem

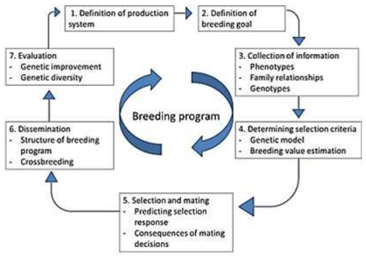
- Size of bubble = methane emissions

Criteria 2: Capacity to make improvement via genetics

- Access to genetic evaluation
- Capacity to develop methane traits
- Potential to leverage imports from other clusters?

Criteria 3: Reliance on genetics as a source of methane mitigation

- Applicability of other interventions
- Other policy levers/options



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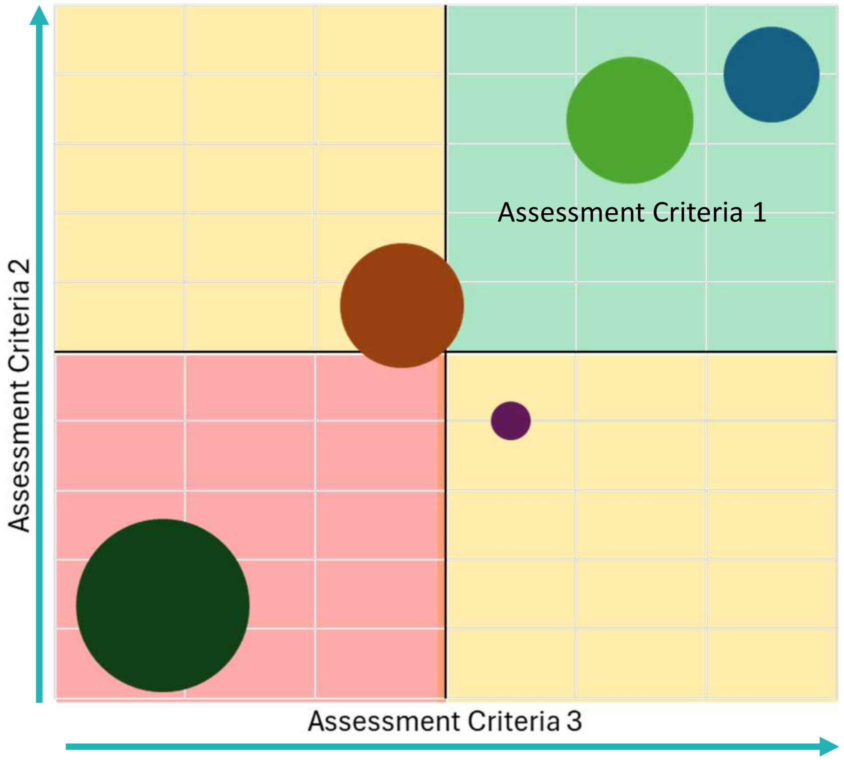
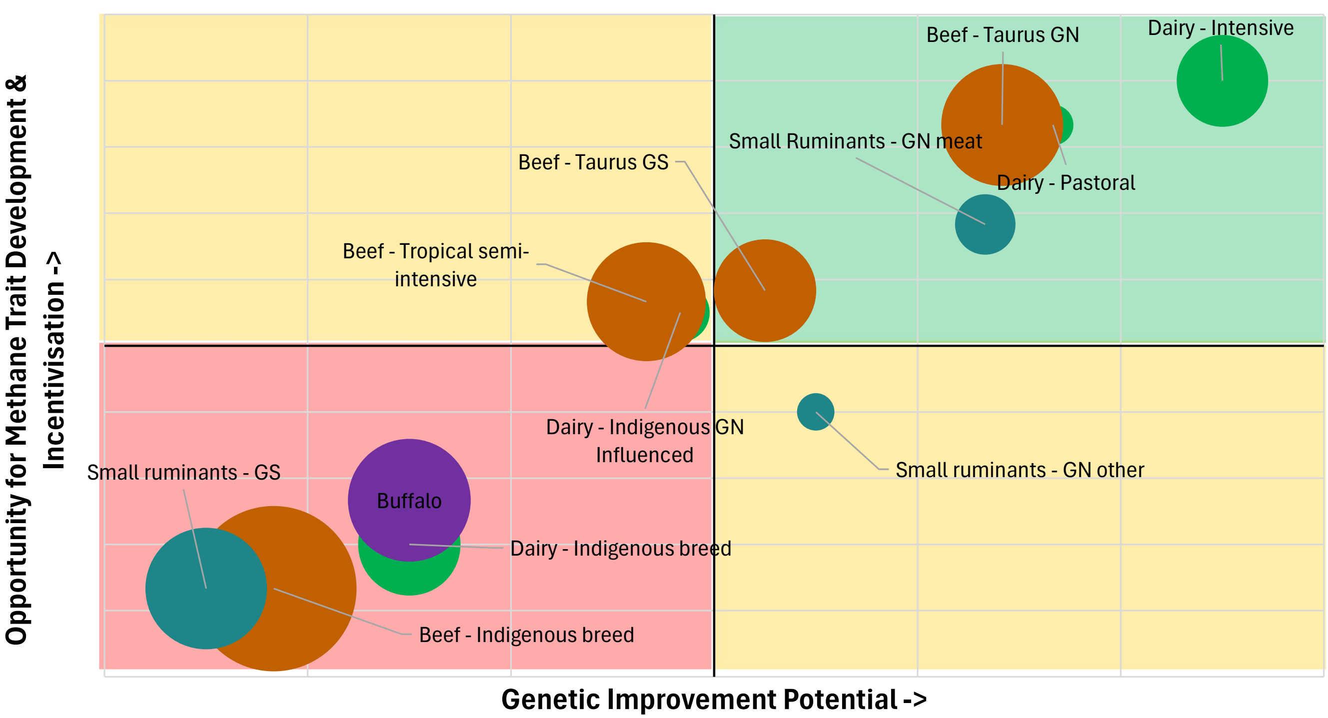


Impact – Ease Matrix

Genetic improvement potential (Impact) versus **Opportunity for trait development** (Ease)



Impact Criteria

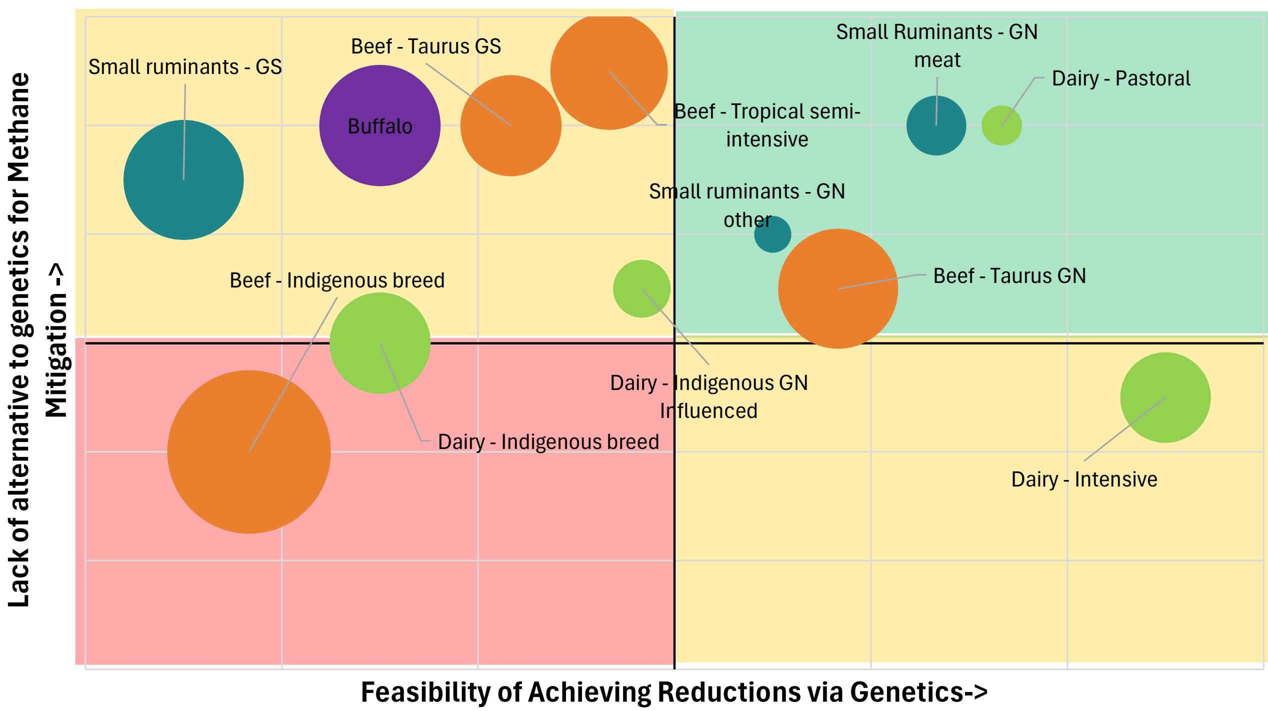
- Structure, alignment and coordination of genetic improvement sector
- Scale of addressable market
- Potential rate of genetic gain

Ease Criteria

- Industry complexity for methane trait development
- Access to infrastructure, research capability and resources
- Capacity to measure and incentivise emission reductions

Feasibility - Alternative Matrix

Feasibility of achieving methane reductions (via genetics) versus **Lack of alternative to genetics for methane reductions**



Feasibility Criteria

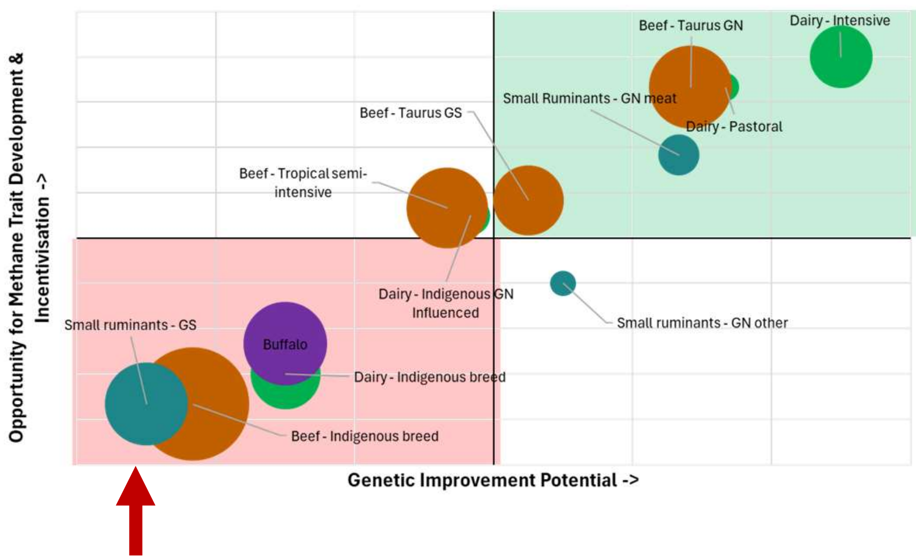
- Structure, alignment and coordination of genetic improvement sector
- Scale of addressable market
- Potential rate of genetic gain
- Industry complexity for methane trait development
- Access to infrastructure, research capability and resources
- Capacity to measure and incentivise emission reductions

Lack of Alternative Criteria

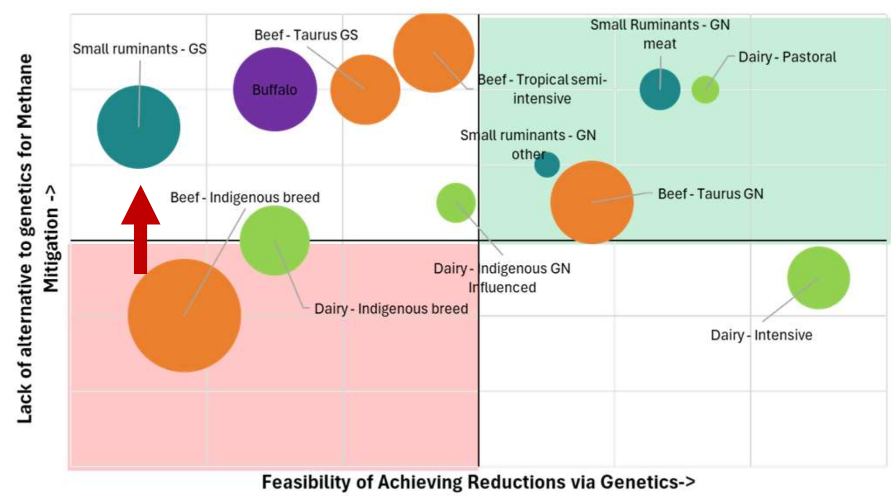
- Applicability of other interventions
- Management opportunities

What does this tell us?

Genetic improvement potential (Impact) versus Opportunity for trait development (ease)



Feasibility of achieving methane reductions (via genetics) versus lack of alternatives to genetics



Other Matrix?

Dissemination of genetics globally

- Where are the genetic used vs where the genetic progress is realized
- X% of NA is exported

Feasibility of genetic-based management practices

- Sexed semen

Source of animal production

- Beef cattle coming from dairy bull calf population

Human diet impacted by reduction

- Reliance of diet on animal production
- Lack of alternative land uses

Local importance of animals

- Unattainable de-stocking and de-intensification
- Maintain biodiversity

?

Many options to segment the different criteria

How do we decrease methane?

Global North – Dairy and small ruminants

- Collaboration very important
- Competing mitigation opportunities, so need to accelerate
- Need methane pricing, audit and incentive systems

Beef and Buffalo

- Projects need to link in and strengthen existing infrastructure efforts
- Need to leverage knowledge from dairy in GN
- Need lower phenotyping costs and proxies

Global South - Indigenous breeds

- Breed fragmentation is a big issue
- Link in and foster existing infrastructure efforts
- Need to leverage knowledge and efforts in the GN

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