ADDRESSING METHANE EMISSIONS FROM LIVESTOCK

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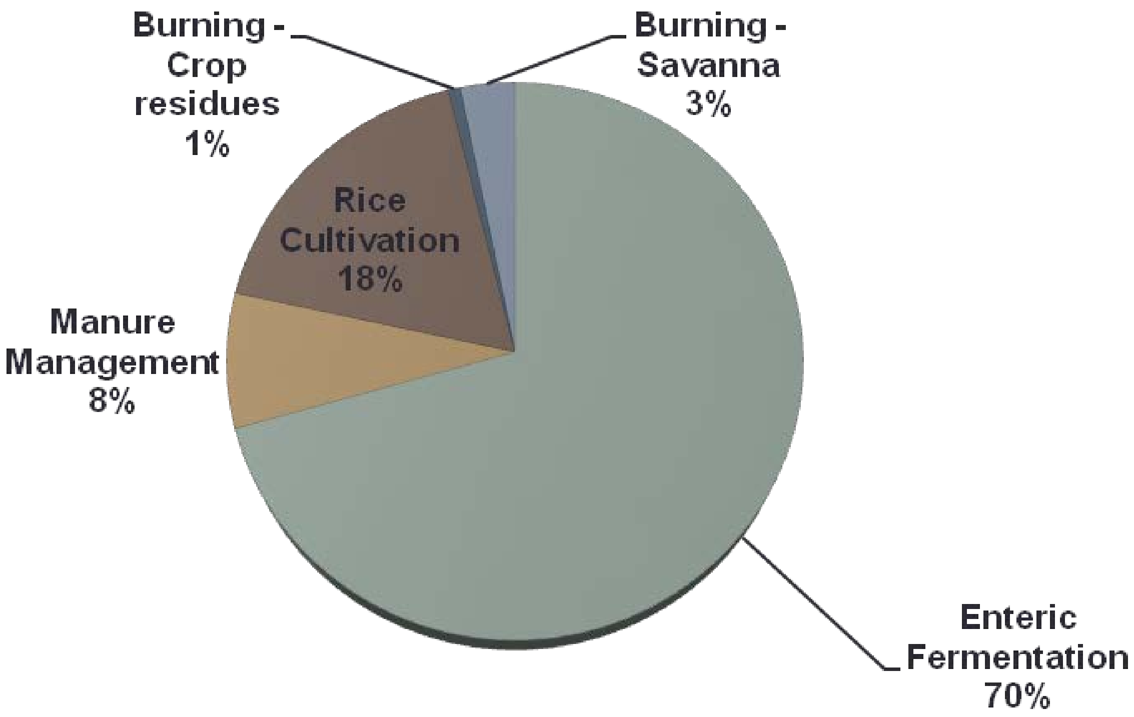
OUTLINE

- Methane emissions from livestock
- Why livestock is important for the methane discourse
- Addressing enteric methane from livestock
- From science to action
- Key messages

METHANE EMISSIONS FROM AGRICULTURE

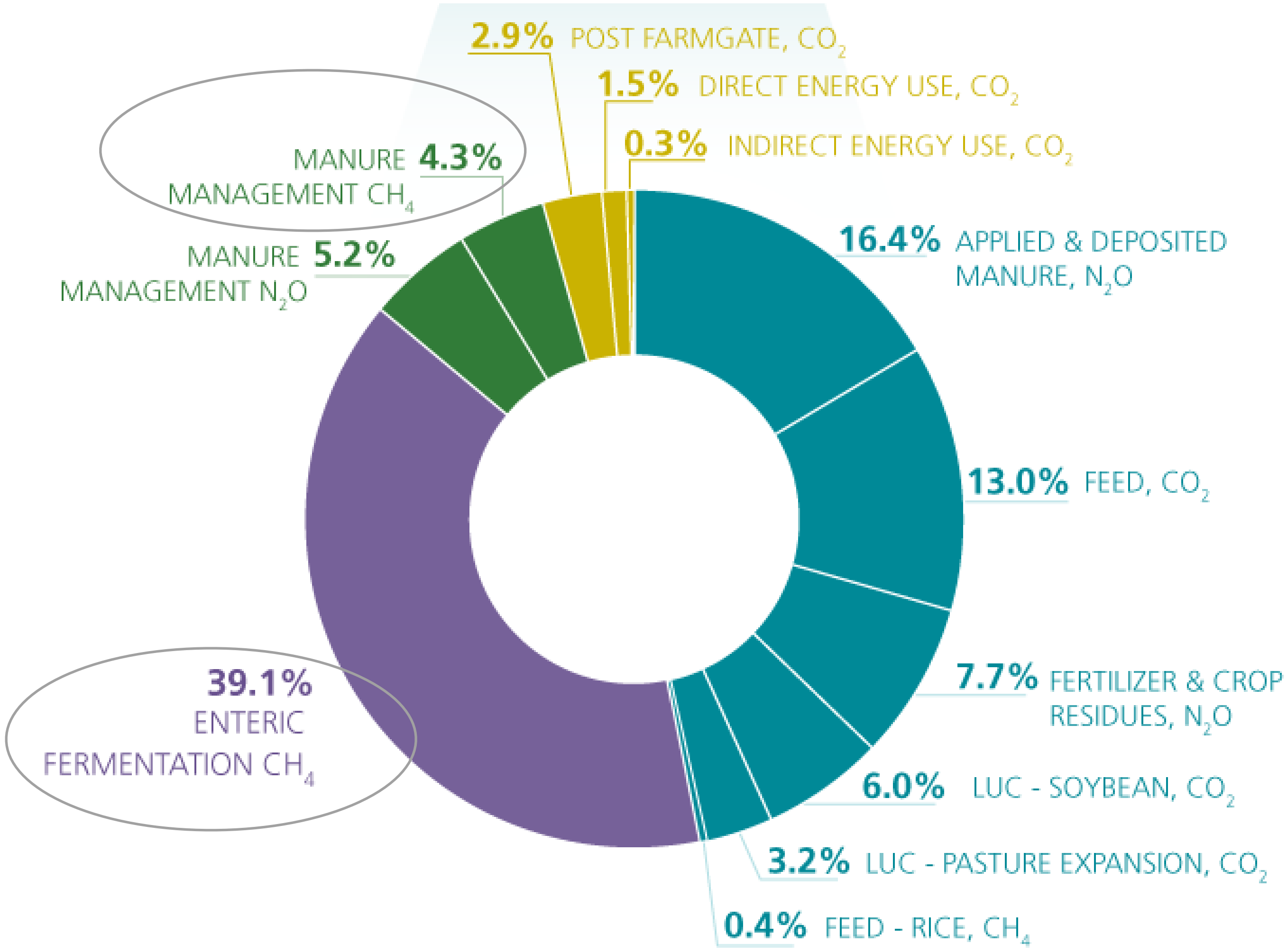
Agriculture accounts for 50% of global methane emissions

Within agriculture, 78% of methane emissions are from livestock



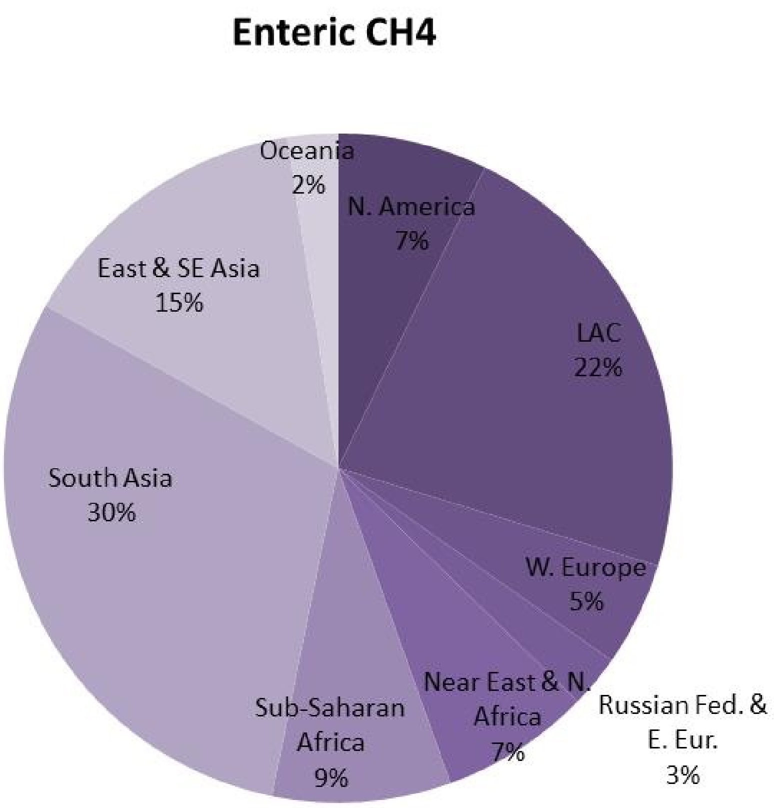
FAOSTAT, 2014

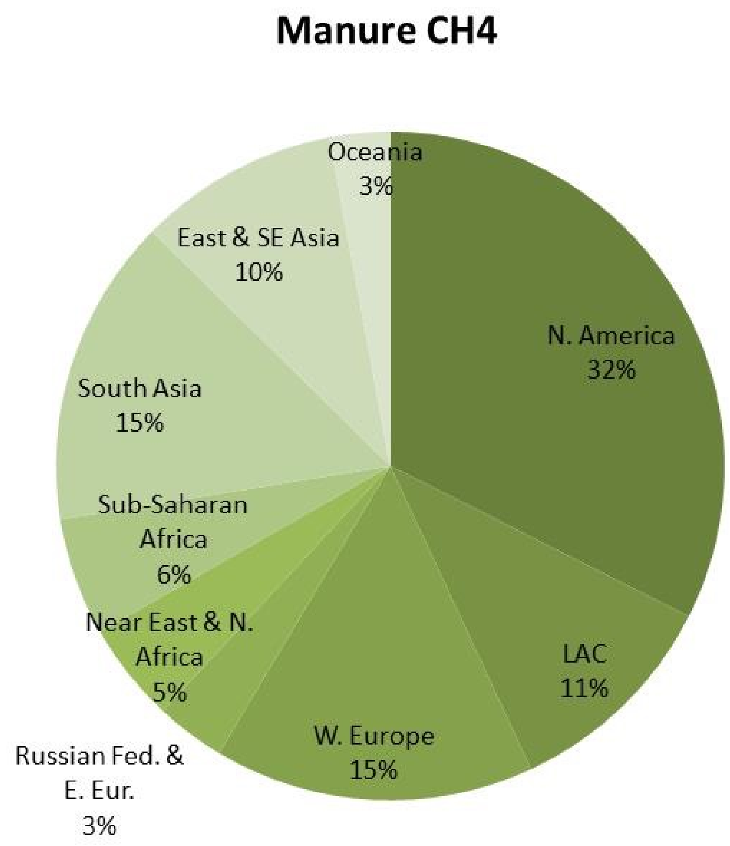
GHG EMISSIONS FROM GLOBAL LIVESTOCK SUPPLY CHAINS



GLEAM, 2013

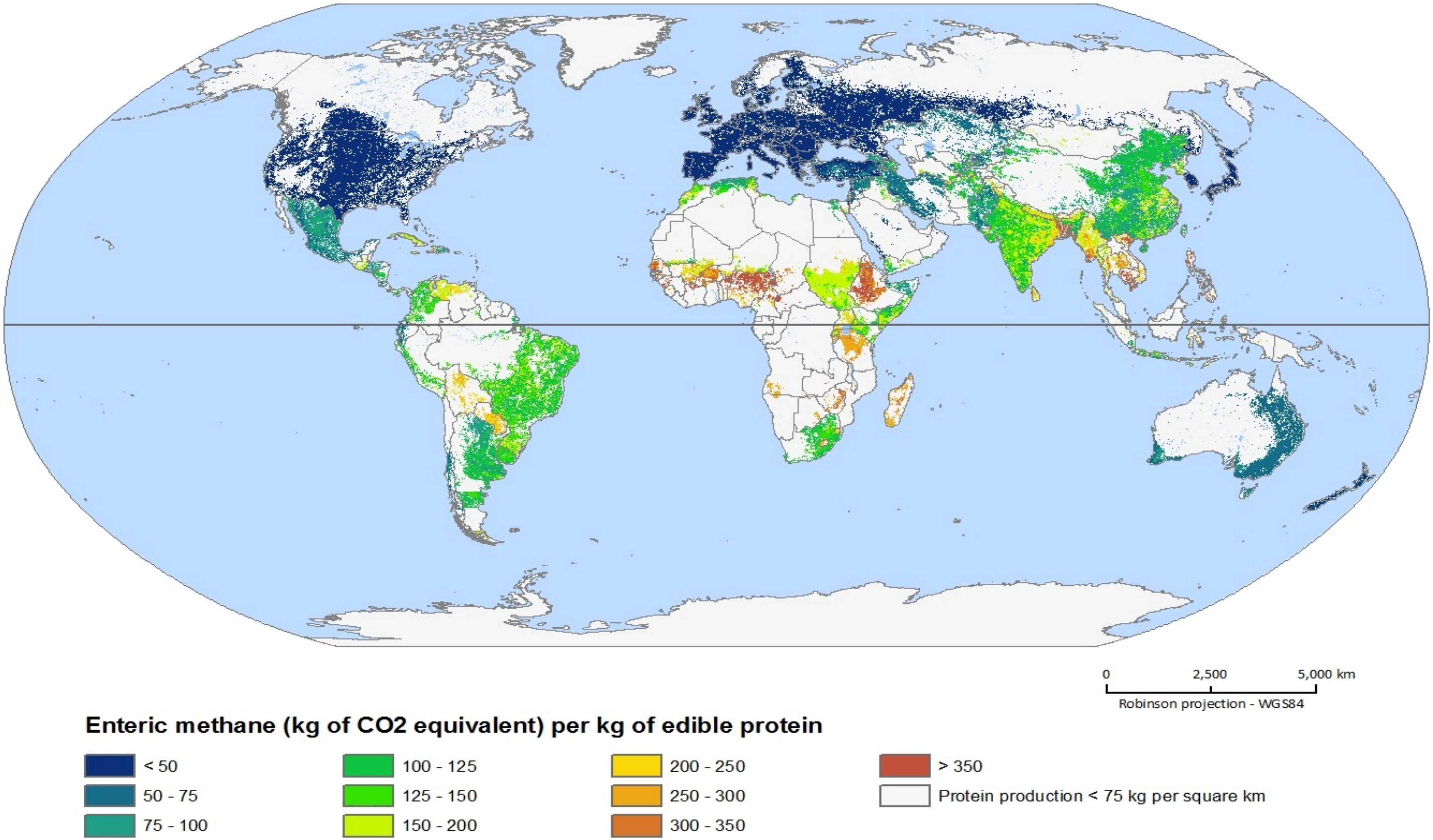
REGIONAL SHARE OF GLOBAL METHANE EMISSIONS FROM LIVESTOCK



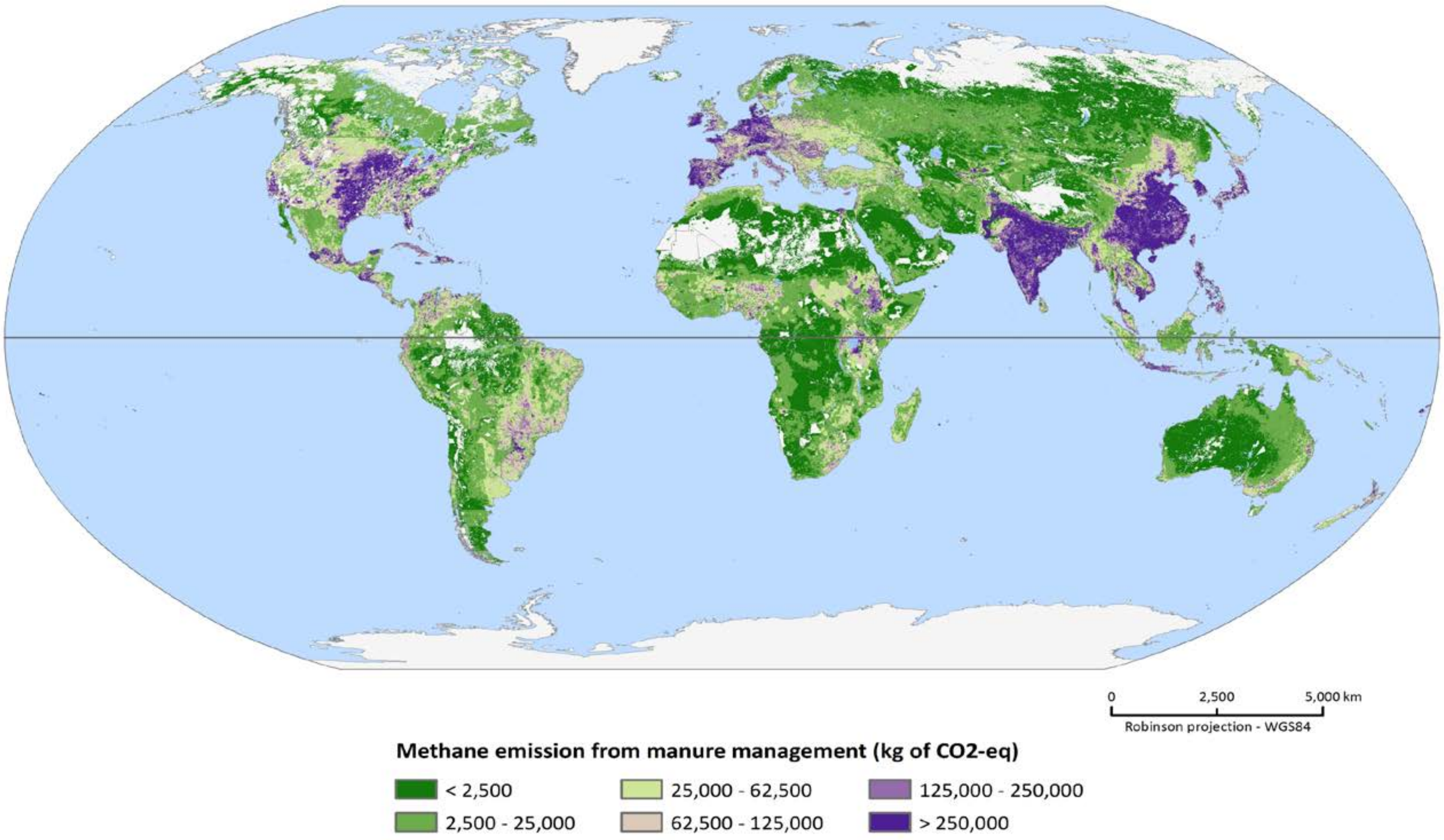


GLEAM, 2013

ENTERIC METHANE EMISSION INTENSITY



9.6 MILLION TONNES OF CH4 FROM MANURE MANAGEMENT (~240 MILLION TONNES CO2-e)

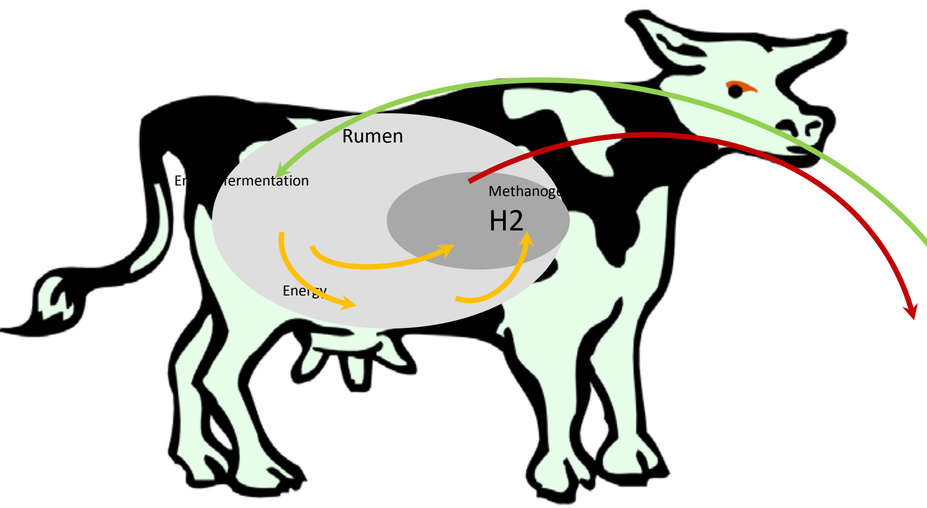


WHY FOCUS ON ENTERIC METHANE FROM LIVESTOCK?

THE RUMEN AND THE ESSENTIAL ROLE OF MICROBES

Enteric CH_4

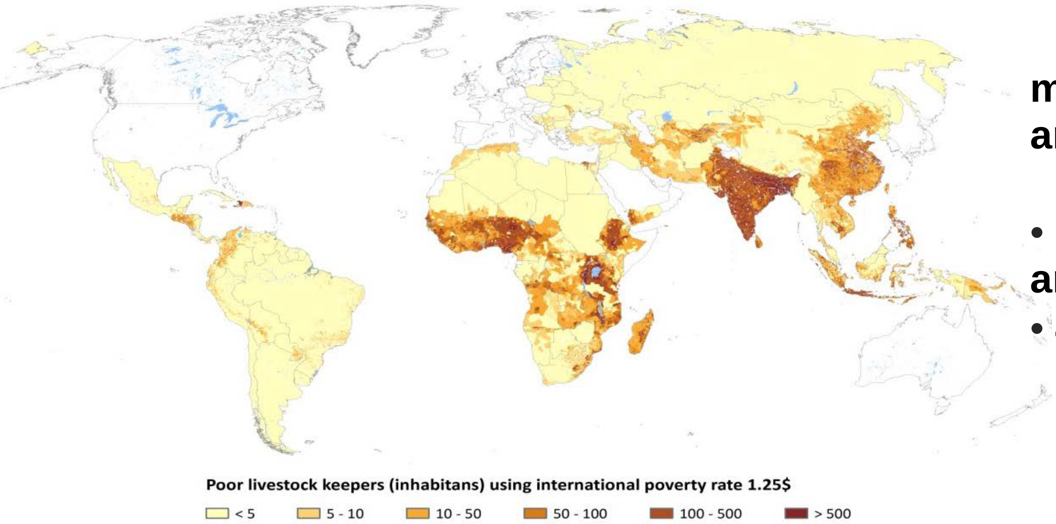
a by-product of rumination



- Influenced by diet and diet quality, other factors (animal type and weight, overall productivity, management)

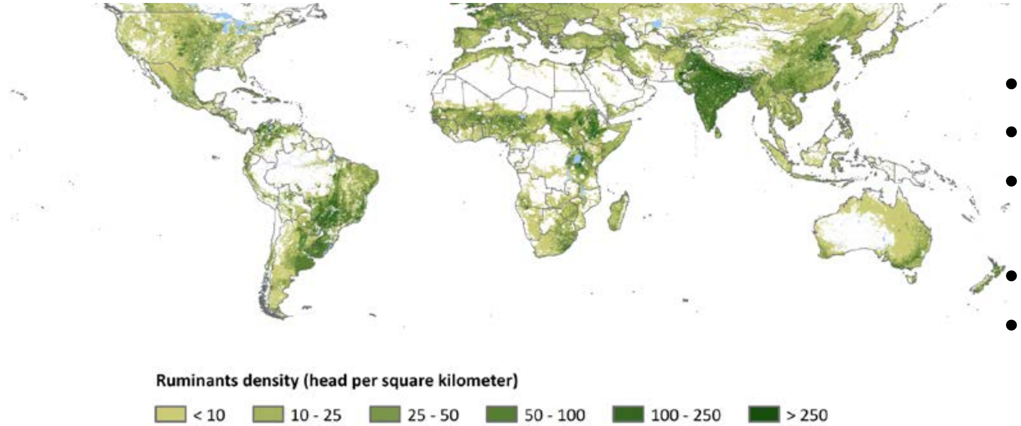
- takes place in the rumen
- “fermentation vat” containing billions of microbes
- efficient in digestion of cellulose rich diets
- converting human inedible products to high value protein
- process provides animal with nutrients: VFA and protein
- principal source of energy for animal: ~70% of energy
- symbiotic relationship between animal and microbes

ROLE OF RUMINANTS IN FOOD SECURITY AND LIVELIHOODS



many of people who depend on livestock are among the most vulnerable populations

- **730 million poor live in rural and marginal areas**
- **430 million are poor livestock keepers**



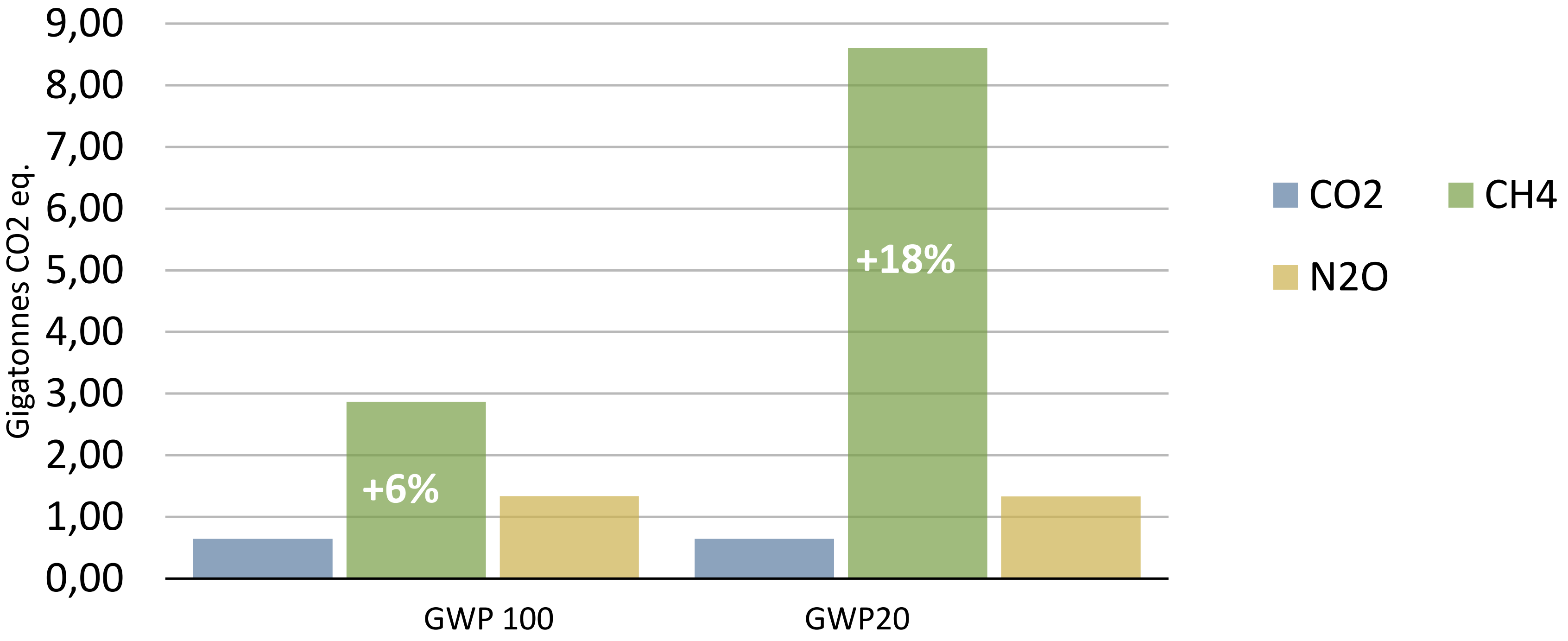
- **direct food - high value protein**
- **traction and nutrients for arable crop**
- **safety net/banking: animals sold during times of need**
- **household income - sale of products**
- **national economy**

SIGNIFICANT CONTRIBUTION TO GLOBAL WARMING

	Gt CO2 eq. GWP100
Global anthropogenic GHG emissions	49
Global methane emissions	6,9
Global enteric CH4 emissions	2,7
ENTERIC CH4 AS A SHARE OF …	**%**
Global human-induced emissions	6
Global CH4 emissions	30
CH4 from Agriculture	70
GHG emission from livestock	40

POTENTIAL FOR IMMEDIATE GAINS FOR GLOBAL CLIMATE

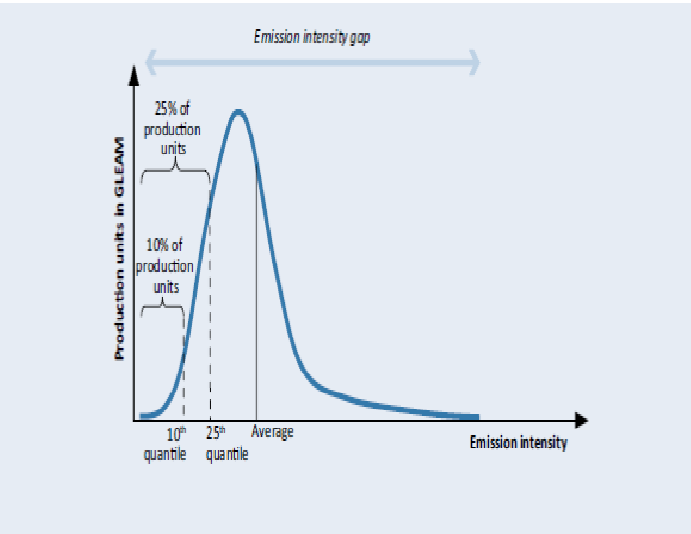
GLOBAL EMISSIONS FROM RUMINANTS WEIGHTED FOR TWO DIFFERENT GWPS (expressed in CO2-e)



- 100-year horizon: traps 28 times more heat than CO2
- 20-year horizon: 84 times more heat than CO2
- short life span: 12 years in atmosphere

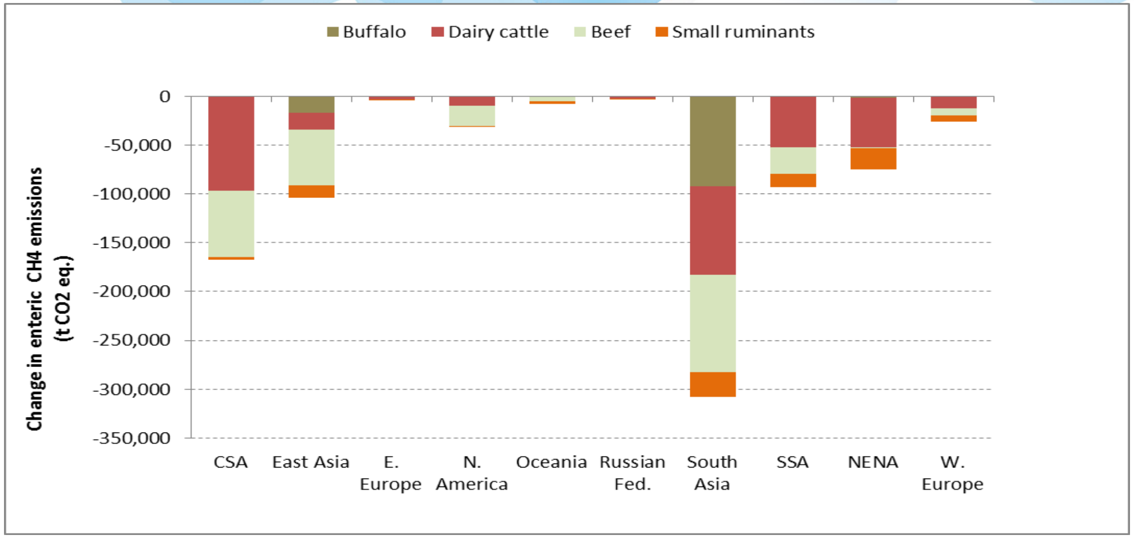
LARGE TECHNICAL MITIGATION POTENTIAL

Addressing the emission intensity gap

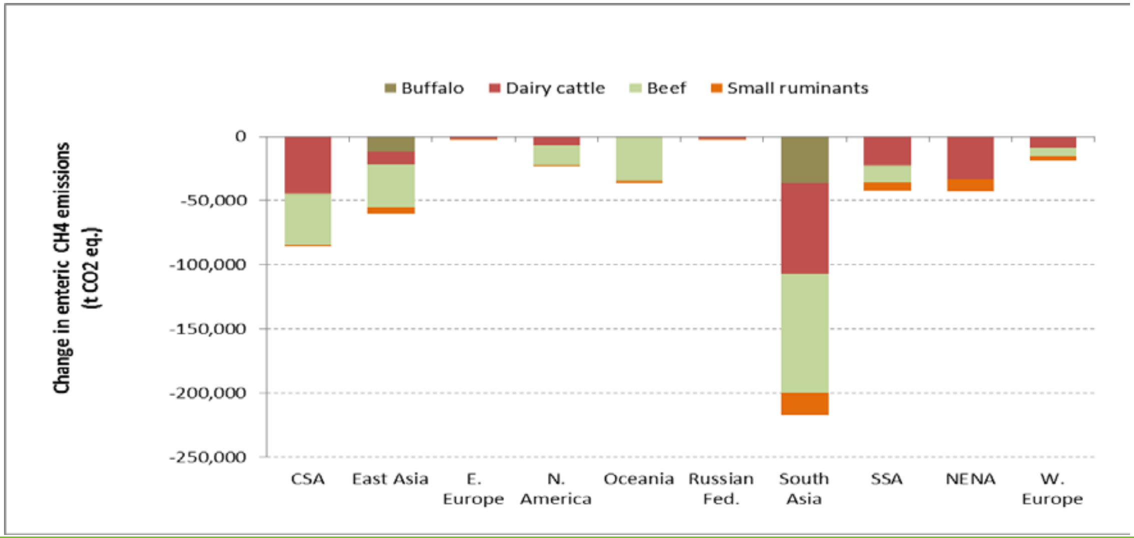


enteric CH4 emissions can be reduced by approximately between **22% and 33% (530 – 820 million tCO2 eq.) with no system change**

Production units aligned to average emission intensity of 10th percentile

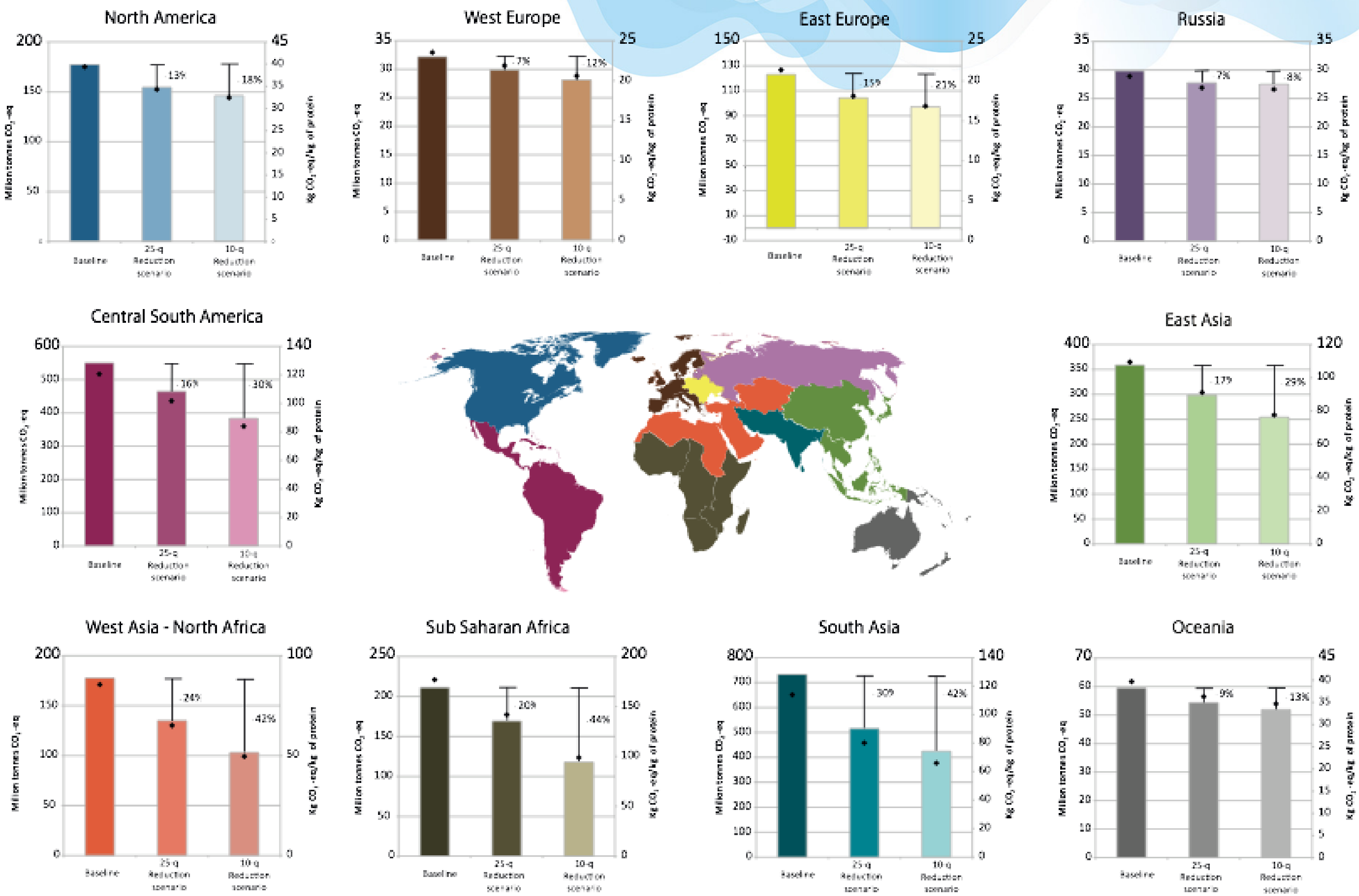


Production units aligned to average emission intensity of 25th percentile

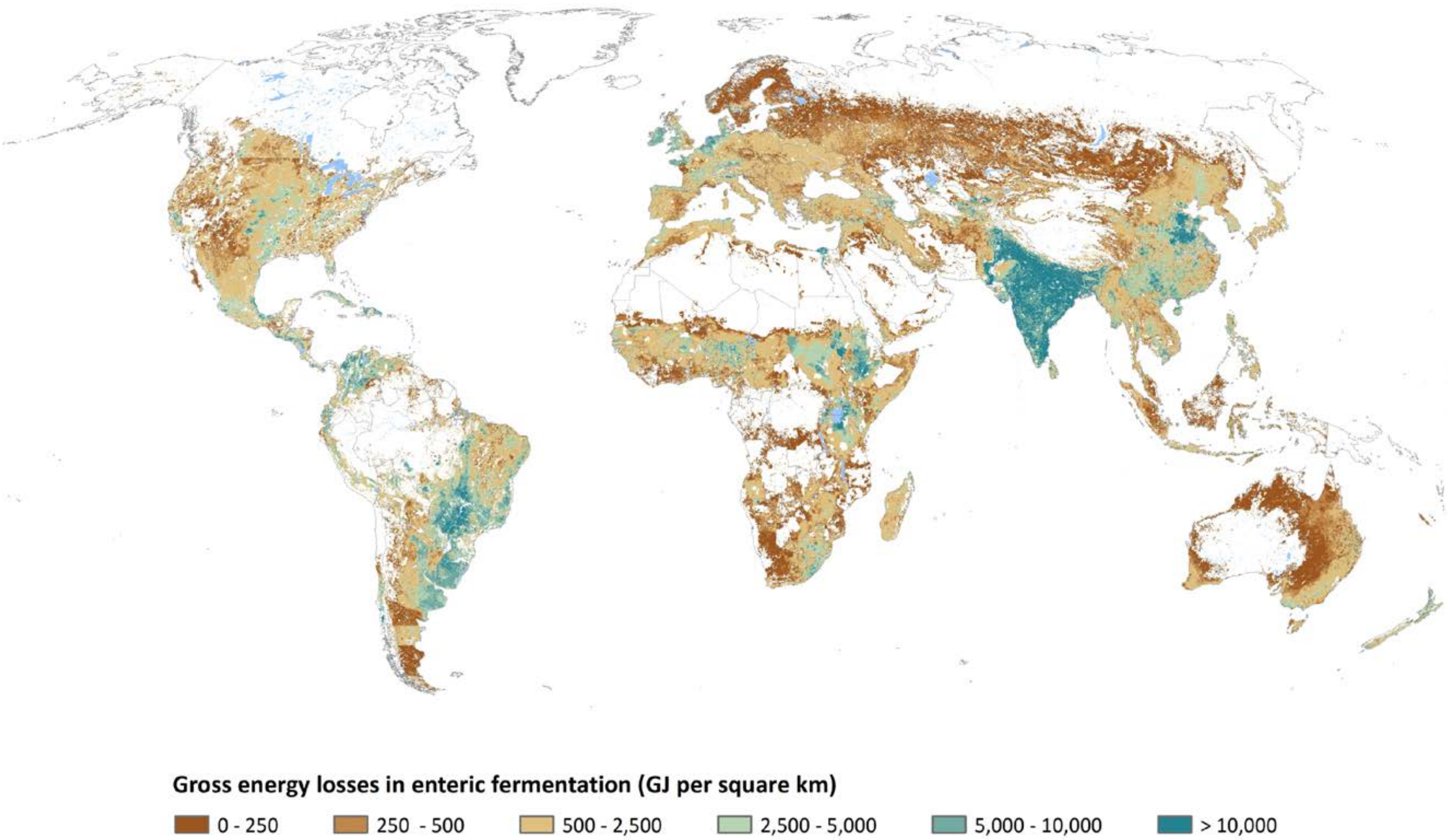


Food and Agriculture Organization of the United Nations

MITIGATION POTENTIAL

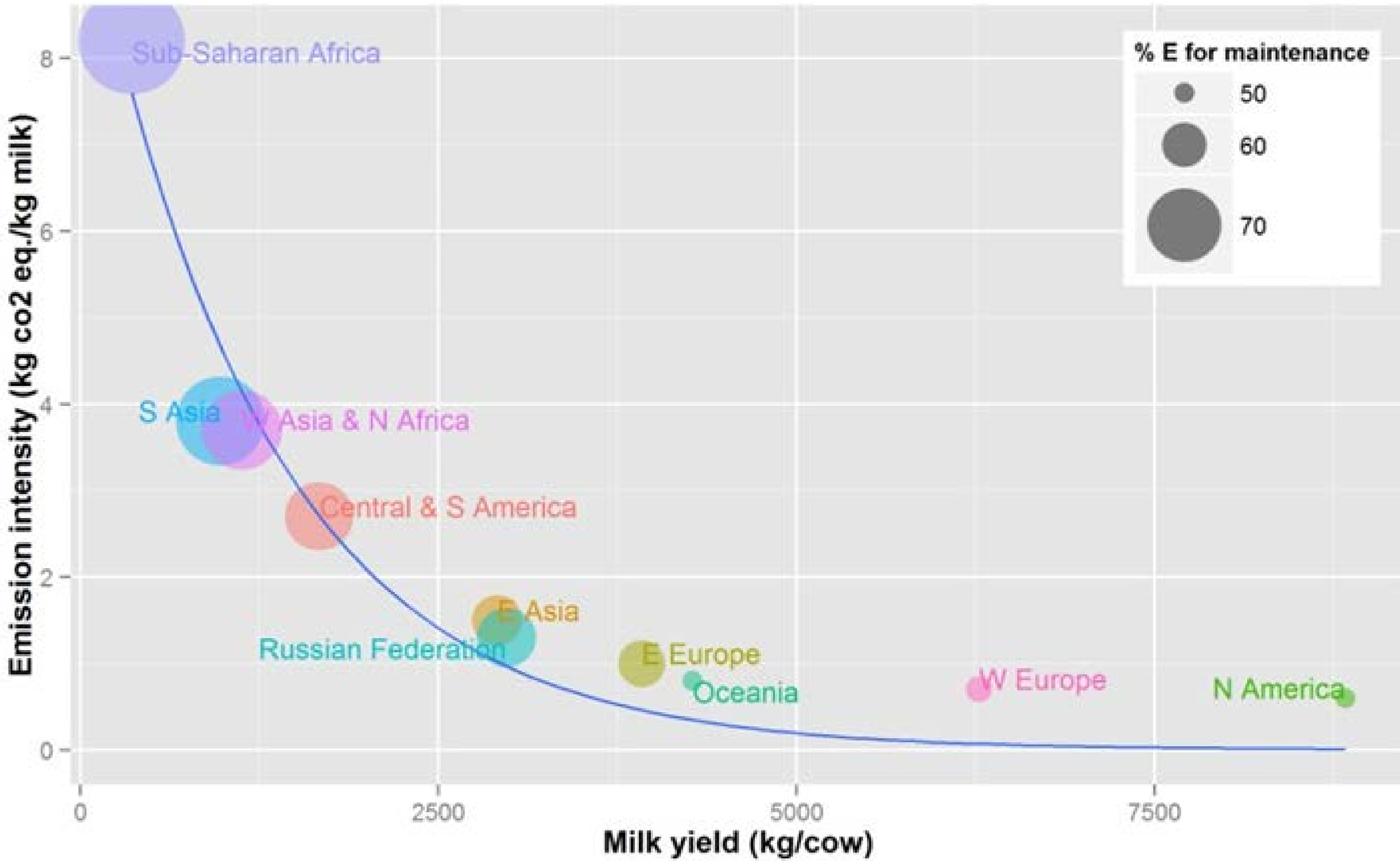


ENTERIC METHANE EMISSIONS ARE ENERGY LOSSES: 2-12% OF FEED ENERGY IS LOST



There is a strong link between GHG emission intensity and resource use efficiency

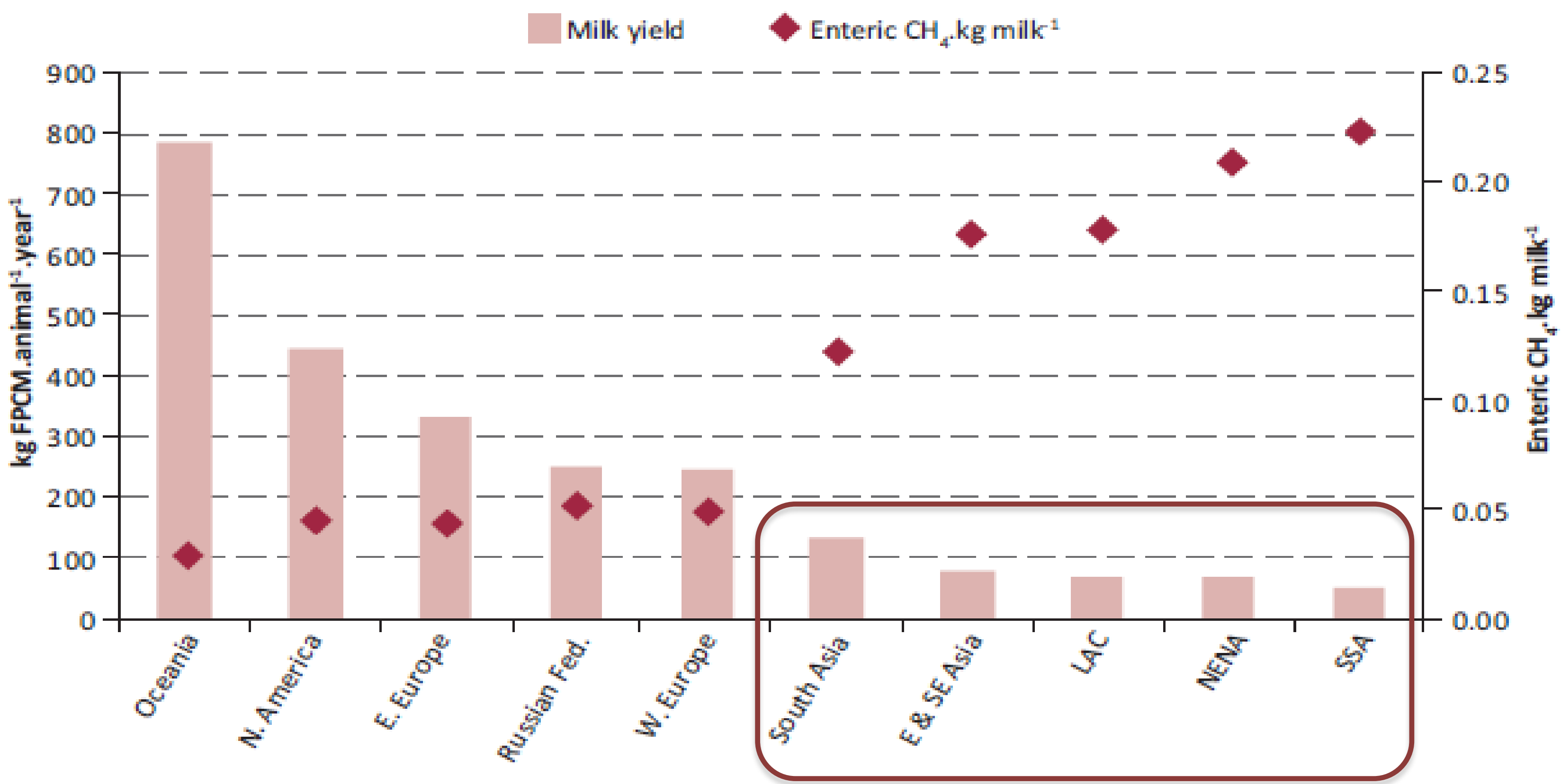
PARTITIONING OF FEED ENERGY



Ruminant animals with low levels of production efficiency have relatively high methane emissions per unit of product because these animals use a large fraction of their feed intake solely for maintenance.

REDUCTION IMPROVES PRODUCTIVITY

RELATIONSHIP BETWEEN MILK YIELD AND ENTERIC CH4 PER KG MILK



Source: GLEAM.

ADDRESSING ENTERIC METHANE FROM LIVESTOCK

A WIDE RANGE OF TECHNICAL INTERVENTIONS TO IMPROVE NATURAL RESOURCE USE EFFICIENCY & PRODUCTIVITY AND REDUCE EMISSIONS

Enteric CH4 : at animal AND herd level

- Improved feeding practices and feed processing (improving forage quality, feed processing, concentrate use)
- Supplementary feeding - interventions that act on rumen microbiology
- Improved herd management and animal husbandry (improved genetics, health, reproduction)

	Feeding practices						Supplements & additives								Herd mgt.		
	Improved forage	Feed processing	Feeding of concentrates	Nutrient balancing	Precision feeding	Alkaline treatment	Lipids	Nitrates	Ionophores	Growth hormones	Tannins	Probiotics	Halogenated compounds	Vaccination	Culling practices	Reproduction management	Improved genetics
Mitigation potential w/in the relevant production sector	**◯**	○	◯	◯	○	○	◯	**◯**	◯	○	○	○	○	○	◯	○	○
Size of the relevant production sector	◯	◯	◯	◯	○	◯	◯	◯	○	◯	◯	◯	◯	**◯**	◯	◯	**◯**
Level of certainty	✓	✓	?	?	✓	?	?	?	✓	✓	??	??	??	??	✓	✓	?
Productivity gains	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬆	⬇	–	⬇	–	–	⬆	⬆
Cost	$	$	$$	$$	$$$	$	$$	$	$$	$$	$$	$$$	$$$	$$$	$	$$	$$$
Risk / tradeoffs	•	•	•	•	•	•	•	●	●	●	●	•	⬤	•	●	•	●

- A wide range of mitigation options for reducing methane from enteric fermentation
- Many have some **mitigation uncertainty**, are **not cost effective**, have **poorly understood interactive effects with other emission sources, or other associated risk**.
- Interventions that have relatively small risk and are uniformly associated with increased productivity and high reduction potential
- In regions of the world that have not yet adopted these practices, significant GHG reductions are possible while also providing a steady or growing supply of animal protein.

Dickie et al. 2014

BENEFITS FROM ENTERIC CH4 REDUCTION

	Mixed dairy production in South Asia	Specialized beef production in South America	Notes
Global impacts			
Enteric Methane Baseline	213 (62%)	201 (50%)	- Million tonnes CO2 eq. - Percentage of enteric methane in total GHG mitigation
Enteric Methane mitigation	-54 (77%)	-95 (51%)	- Million tonnes CO2 eq. - Percentage of enteric methane reduction in total GHG mitigation
Total GHG mitigation	-70	-187	- -Million tonnes CO2 eq.
Human health impacts - (formation of tropospheric ozone)	18	32	- Thousands lives saved annually; - Mortalities avoided from reductions in ozone
Annually avoided crop yield losses due to Ozone	10.3	18.4	- Millions metric tons - Considers major stable crops including wheat, rice, maize, and soy
Local impacts			
Productivity increase	13 (+24%)	5 (+47%)	- Million tonnes of protein; - Percentage increase in milk and meat protein supplied
Livelihoods impacted	318	5	- Millions of poor livestock keepers impacted by intervention;

SUMMARY: WHY FOCUS ON ENTERIC CH4 ?

- Opportunity for high impact. 78% of agricultural and 30% of global methane emissions; expected to grow
- Low cost and wide range of co-benefits (climate, productivity, profitability, food security, nutritional benefits, human health benefits, adaptation (green energy), etc.)
- Technologies are available: Existing, cost-effective reduction opportunities (esp. for low productive systems) using relatively common practices >> number of barriers need to be overcome

FROM SCIENCE TO ACTION: ISSUES TO CONSIDER

- Importance of the sector: food security, livelihoods, income, economic development, exposure to CC
- Complexity added by the diversity and heterogeneity of livestock systems
- Barriers:limited awareness of emissions levels, reduction opportunities and benefits, lack of information on technologies and practices, lack of institutional capacity, etc.
- Finance and investment important for up-scaling and impact

WHAT IS REQUIRED FOR ACTION?

- Building of an evidence-base and tools for decision-making regarding the actions to address enteric methane and technologies and practices

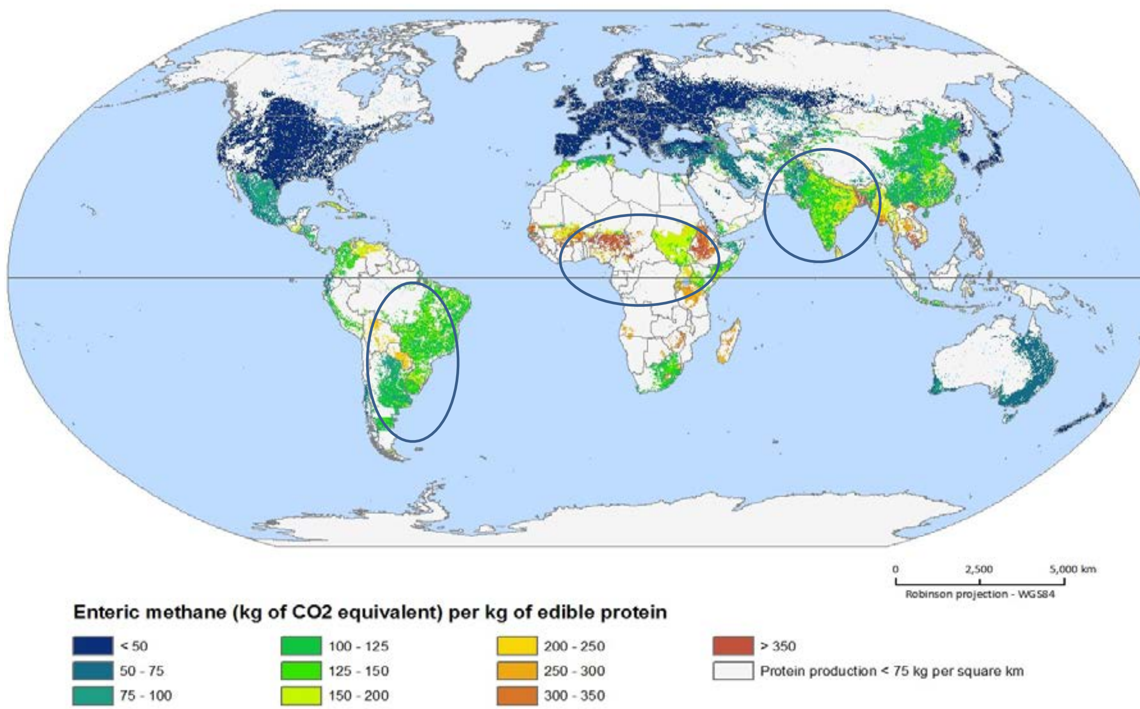
- Engaging with appropriate stakeholders and other relevant organizations to share knowledge, experiences, outcomes, and key recommendations

GLOBAL ACTION TO ADDRESS ENTERIC CH4 EMISSIONS

CLIMATE & CLEAN AIR COALITION
TO REDUCE SHORT-LIVED CLIMATE POLLUTANTS

New Zealand Government

GLOBAL RESEARCH ALLIANCE
ON AGRICULTURAL GREENHOUSE GASES



OBJECTIVES

- building knowledge and innovation through generation and dissemination of information and tools to support the identification and prioritization of high potential areas for intervention.

- enhancing policy capabilities and as well as building political will and action to address enteric methane emissions for improved food security and livelihoods and support to policy actions for mainstreaming enteric methane in regional and national frameworks.

- leveraging of partnerships and finance to overcome constraints to uptake and generate results at scale

GLOBAL ACTION TO ADDRESS ENTERIC CH4:PHASE 1

Engagement and Analysis

- ☐ Defining the ruminant production systems
- ☐ Identifying the existing and available technologies and interventions
- ☐ Understanding the constraints and barriers to intervention
- ☐ Identifying the key stakeholders

Identification of the intervention packages

- ☐ Assessing emissions, emission reduction potential
- ☐ Assessing the costs and benefits associated with interventions
- ☐ Assessing the barriers to uptake, opportunities for up-scaling
- ☐ Identifying relevant policy and institutional options to support adoption and up-scaling
- ☐ Investment and financial models for upscaling of interventions

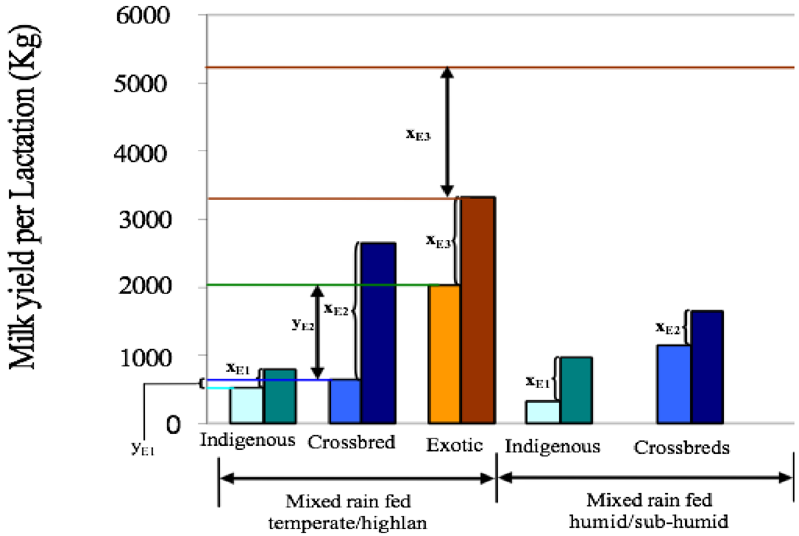
Identification of possible test sites and implementation partners

- ☐ Pilot test sites in regions to assess impact of selected interventions
- ☐ Identify regional partners for Phase 2

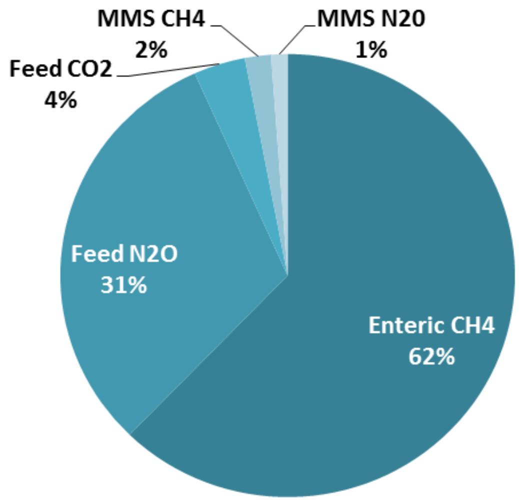
Dissemination and global outreach activities

TOOLS: LINKING PRODUCTIVITY GAINS TO EMISSIONS REDUCTION

Bridging the milk yield gap



Methane emissions = 64%



- xi= Yield gaps due to “animal husbandry practices”
- yi= Gap in productivity due to “genotype”

- A protocol and accounting tool, validated by third party, to certify emission reduction to support farmers in accessing climate finance (NAMA, carbon credit)
- Focus on dairy sector, in order to improve dairy productivity and reduce the intensity of GHG emissions pe kilogram of milk.
- Allows development of the sector while reducing the environmental impact of growth.

KEY MESSAGES

- Agricultural emissions are highly variable and reflect the diversity of production environments.
- Implementation needs to adapt to local conditions and technological solutions differ from place to place; blanket solutions are bound to fail.
- In developing countries, any mitigation strategy in agriculture needs to prioritize food security and livelihoods, with mitigation a co-benefit.
- In the case of ruminant livestock, the number of people involved and incidence of poverty are particularly high.
- In absence of direct incentives for mitigation, mitigation can only be pursued through productivity increases, allowing for necessary sector growth.
- The strong correlation between productivity increases and methane mitigation implies large opportunities for low-cost mitigation, and wide-spread social and economic benefits.
- Addressing enteric methane emissions will require specific scoping of the mitigation options, possible tradeoffs as well as barriers to adoption.
- Farm viability is key to successful adoption of mitigation technologies.

Thank you

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