Food and Agriculture Organization of the United Nations

LIVESTOCK & CLIMATE CHANGE

FAO'S work on climate change *Livestock*

Smallholder livestock keepers, fisherfolks and pastoralists are among the most vulnerable to climate change. Climate change impacts livestock directly (for example through heat stress and increased morbidity and mortality) and indirectly (for example through quality and availability of feed and forages, and animal diseases). At the same time, the livestock sector contributes significantly to climate change. In fact, 14.5 percent of all human-caused greenhouse gas (GHG) emissions come from livestock supply chains. They amount to 7.1 gigatonnes (GT) of carbon dioxide equivalent (CO_2-eq) per year.

The main sources of emissions are feed production and processing, and methane from ruminants' digestion. The good news is that wider adoption of existing best practices and technologies in animal feeding, health and husbandry, and manure management could help the global livestock sector be more resilient and cut its emissions of greenhouse gases by as much as 30 percent.

The Food and Agriculture Organization of the United Nations (FAO) provides support to countries to address the impacts of climate change on livestock production and to reduce the contribution of domestic animals to greenhouse gas emissions.

FAO helps countries to identify and conserve livestock breed diversity, which allows for evolution in line with environmental changes. Regional and global gene banks provide the maintenance of backup collections of genetic material that can be drawn upon to support climate change adaptation measures.

FAO supports the generation, application and dissemination of knowledge in order to strengthen the capacity of its Member Countries in addressing issues related to livestock and climate change. It implements on-the-ground projects and programmes to support countries response to climate change through practice and policy change.

Vulnerability of livestock keepers to climate change

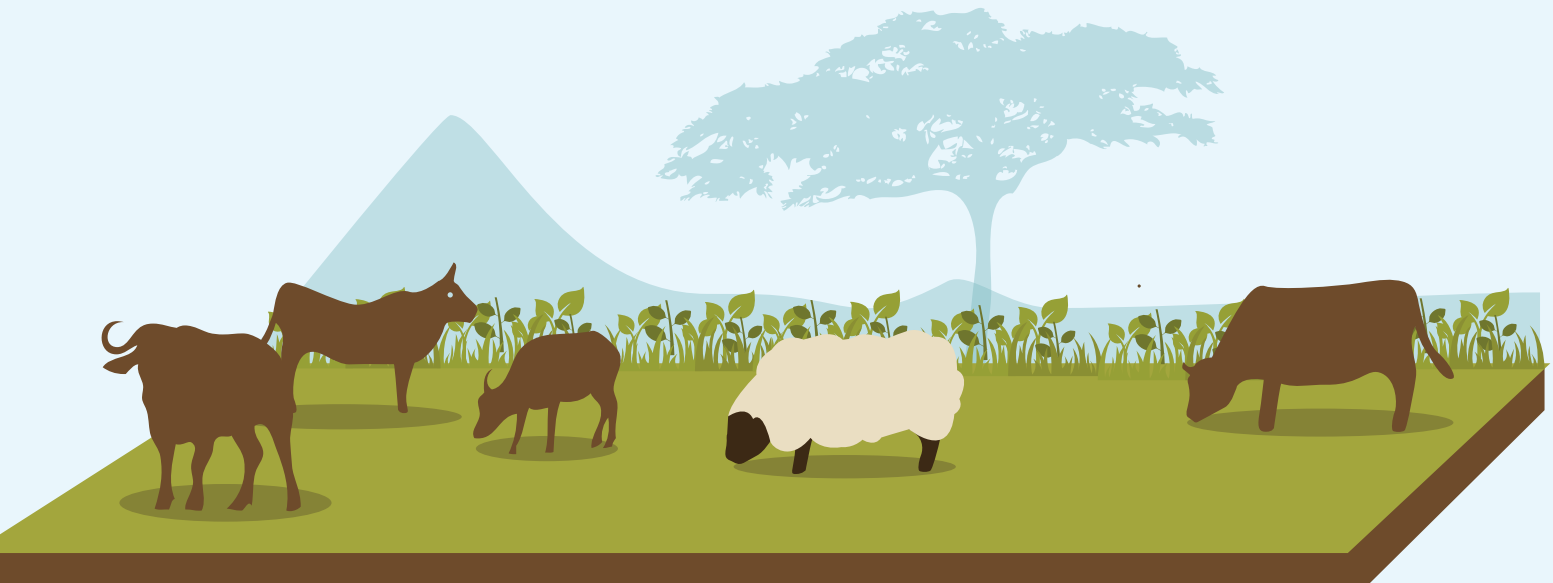
Climate change has major impacts on livestock keepers and on the ecosystems goods and services on which they depend.

730 million poor live in rural and marginal areas

430 million are poor livestock keepers

Regions identified as the most vulnerable to climate change, such as Sub-Saharan Africa and South Asia, are also regions where farmers and rural communities rely the most on livestock for food, income and livelihoods, and where livestock is expected to contribute increasingly to food security and better nutrition.

Livestock systems in these regions have evolved based on the availability and opportunities afforded by the natural resource base.



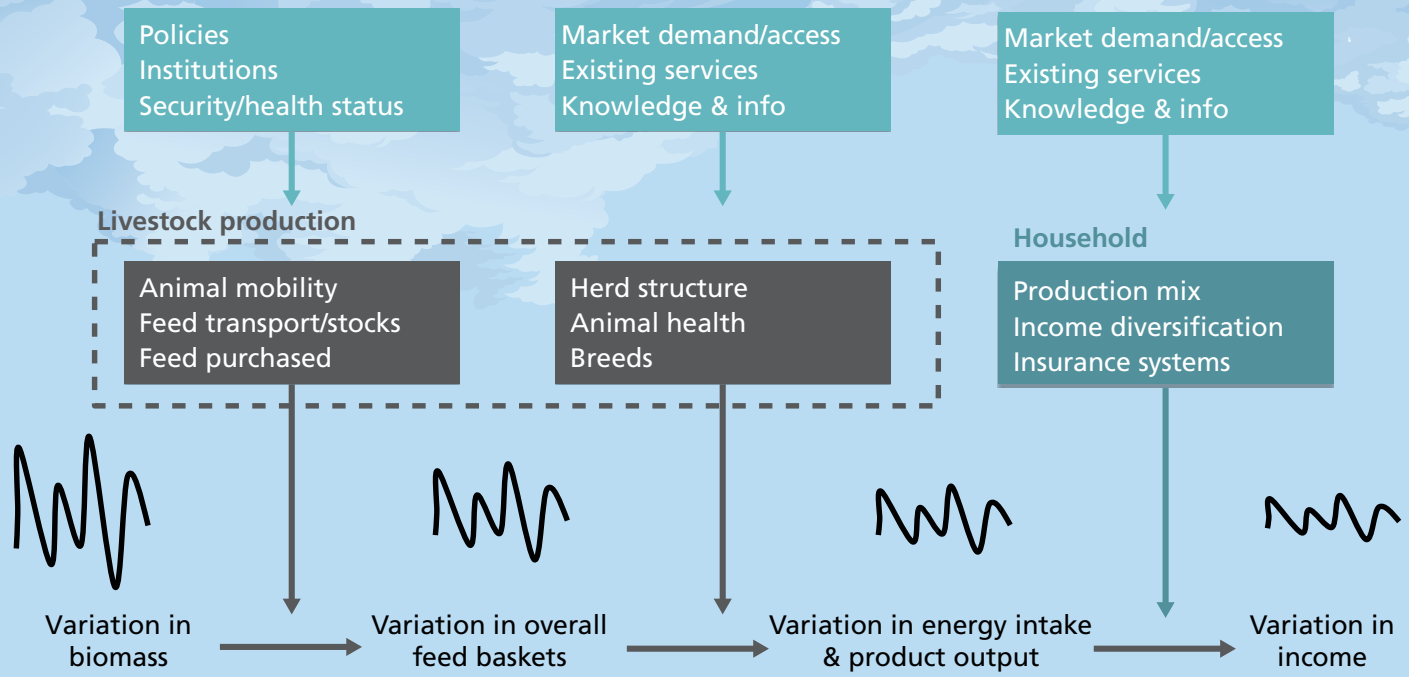
How does climate change affect livestock keepers and production?

	Animals	Forages and feed crops	Labor force & capital
Variability in rainfall	Shortages in drinking & servicing water Diseases - Increased pathogens, parasites & vectors. - Changed distribution & transmission. - New diseases	Decreased yields Decreased forage quality Changes in pasture composition (species, communities) Changes in production system (e.g. from mixed crop-livestock to rangelands)	Altered human health & resources allocation to livestock Decreased productivity Migration Conflict for resources
Temperature	Heat stress - Decreased feed intake & livestock yields - Decreased conception rates - Altered metabolism & increased mortality Diseases - Increased pathogens, parasites & vectors - Decreased resistance of livestock - New diseases Domestic biodiversity loss	Decreased yields Decreased forage quality Change in pasture composition	
CO_2 in the atmosphere		Partial stomata closure & reduced transpiration Change in pasture composition	

A range of climate change adaptation solutions exist for livestock production

Animals	Forages and feed crops	Labor force & capital
Water management (e.g. boreholes) Breed for resistance to drought, heat and harsh environments Shifts in species, breeds and/or production system (e.g. small ruminants, poultry) Disease control & animal health Cooling (indoor systems) or provide shade (e.g. trees)	Irrigation Purchase feed Breed feed crops & forage resistance to drought and heat Changes in cropping calendar Agroforestry Increase mobility for resources	On and off farm diversification Insurance Reconversion (in the context of national/regional production zoning) Institutional changes (e.g. trade, conflict resolution, income stabilisation programs)

Livestock as a tool for adaptation to climate change



A large potential for sector growth is possible if accessibility to feed resources is improved: In the African drylands interventions to improve feed accessibility can result in **an increase** in output of livestock products between **5 to 20 percent**.

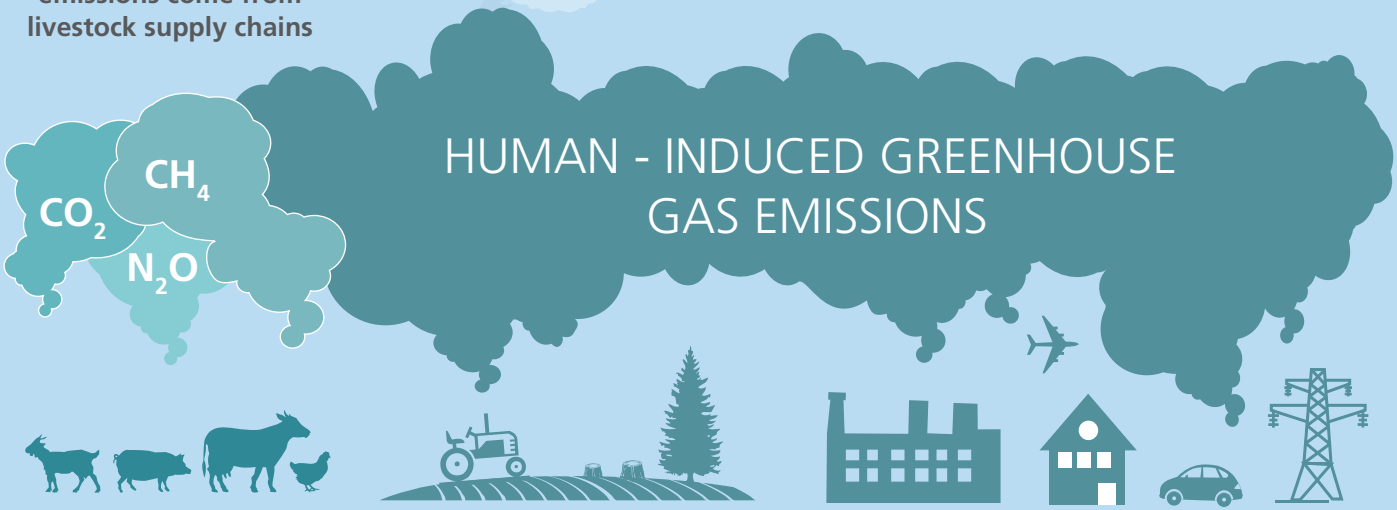
Shocks brought about by climate-driven variability on livestock production can be buffered by livestock production through animal movements, adjustments in feed baskets, health interventions and animal off-take for market.

Source: www.fao.org/3/a-i5188e.pdf

Livestock's contribution to GHG emissions

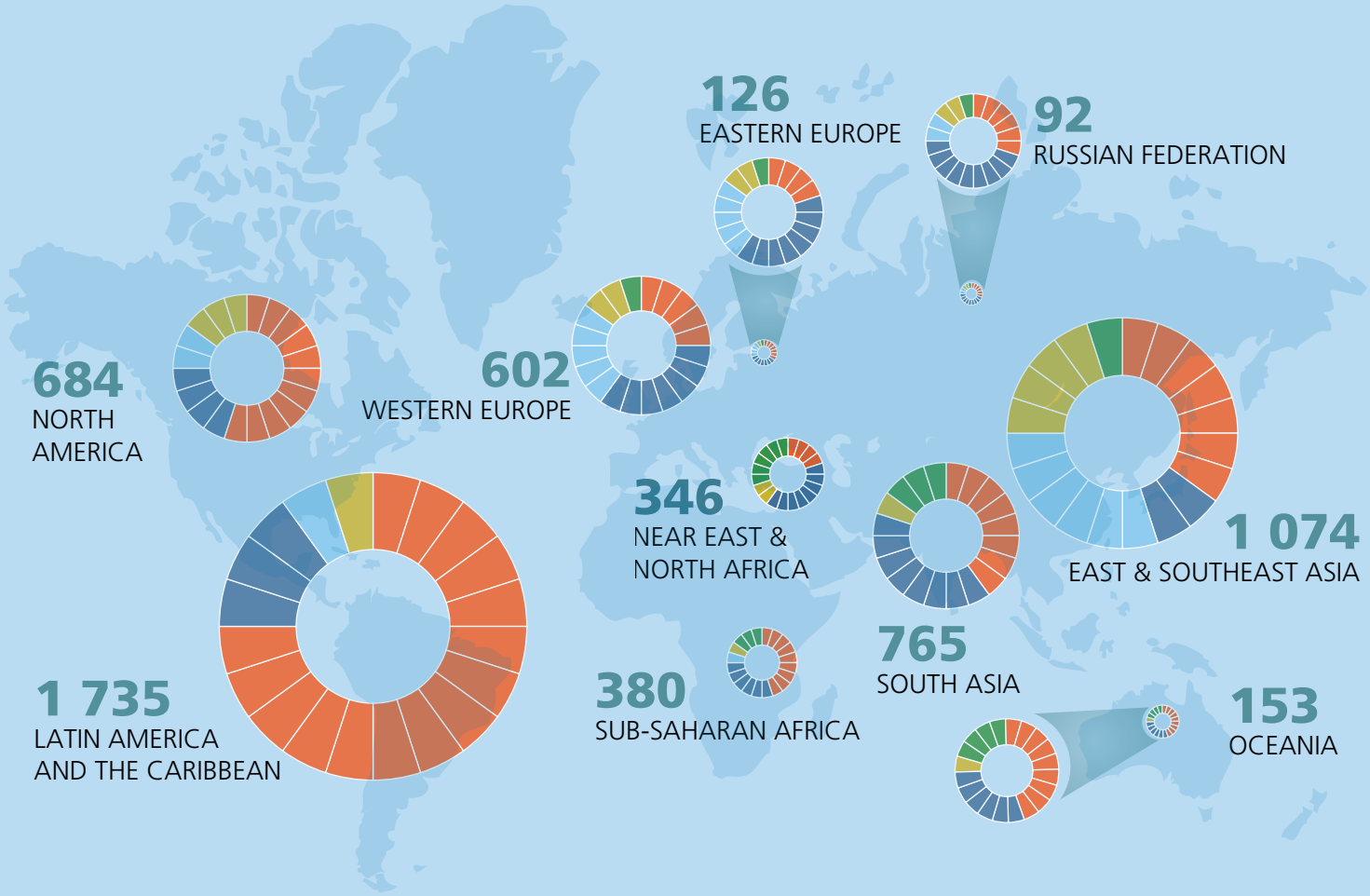
14.5%
of all anthropogenic GHG emissions come from livestock supply chains

It amounts to **7.1 gigatonnes CO_2-eq** per year



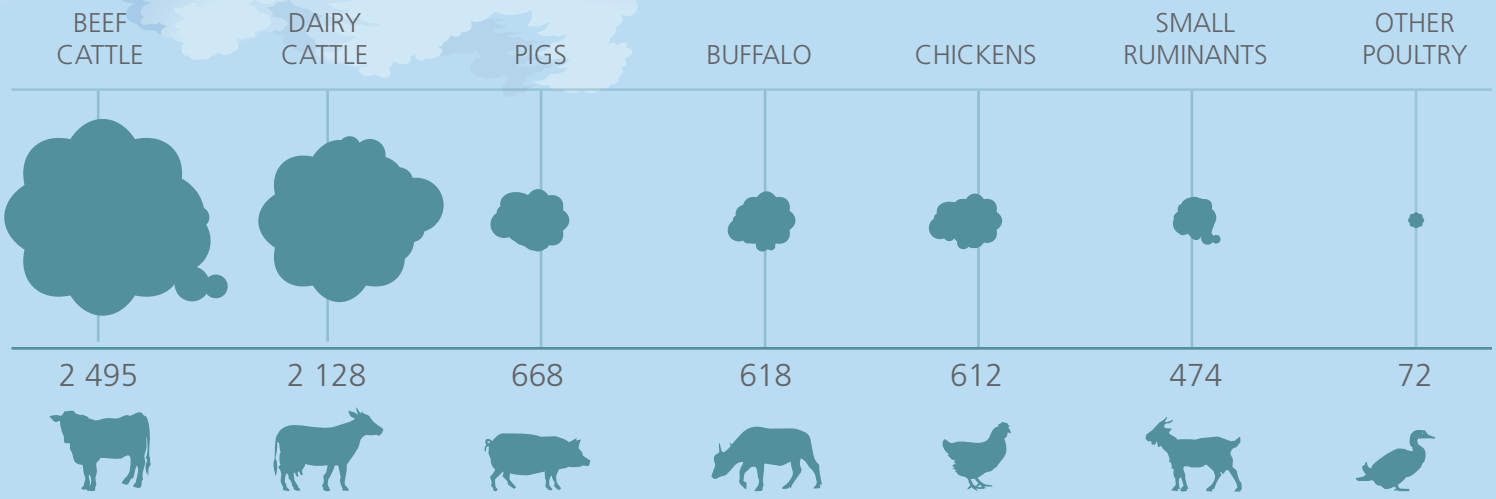
Source: www.fao.org/gleam

Regional distribution of emissions from livestock



Source: www.fao.org/gleam

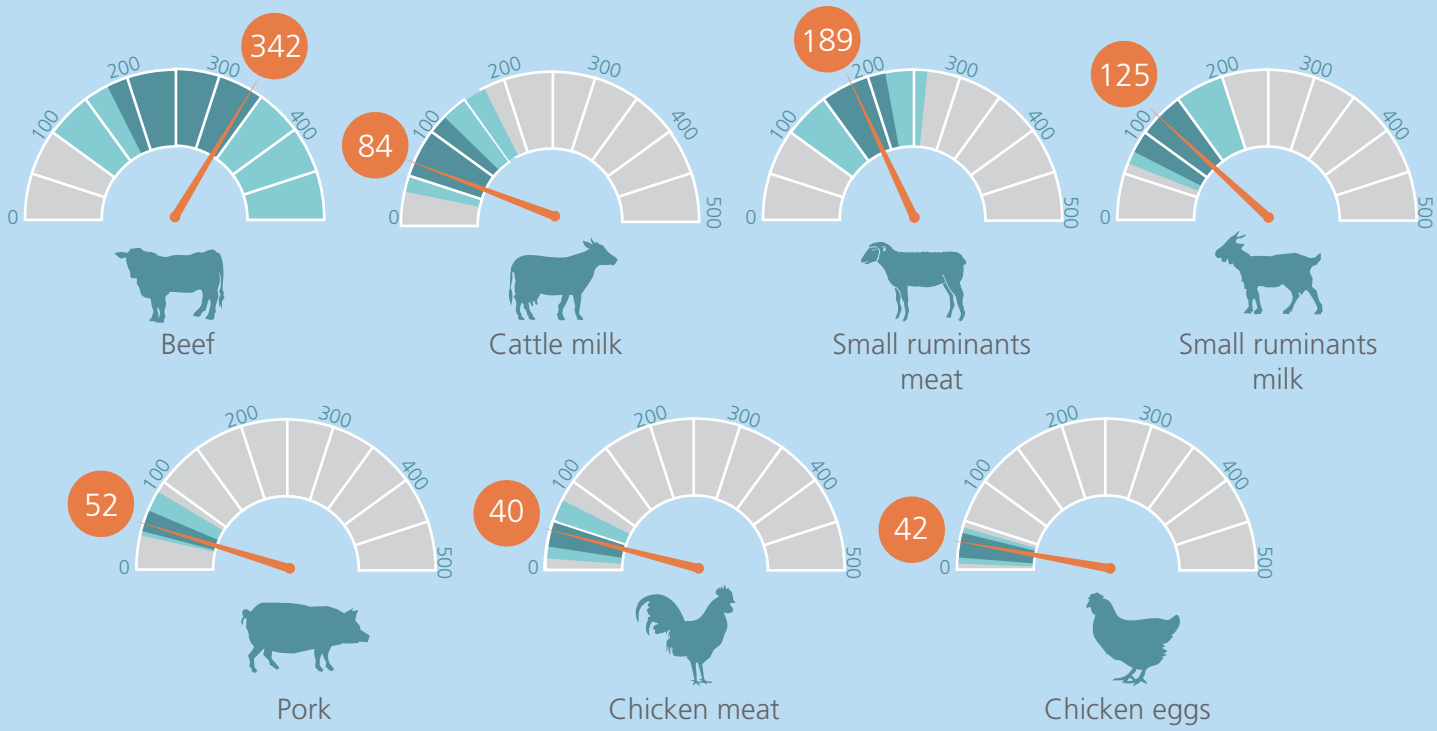
Global emission intensities by commodity



Million tonnes CO_2-eq

Source: www.fao.org/gleam

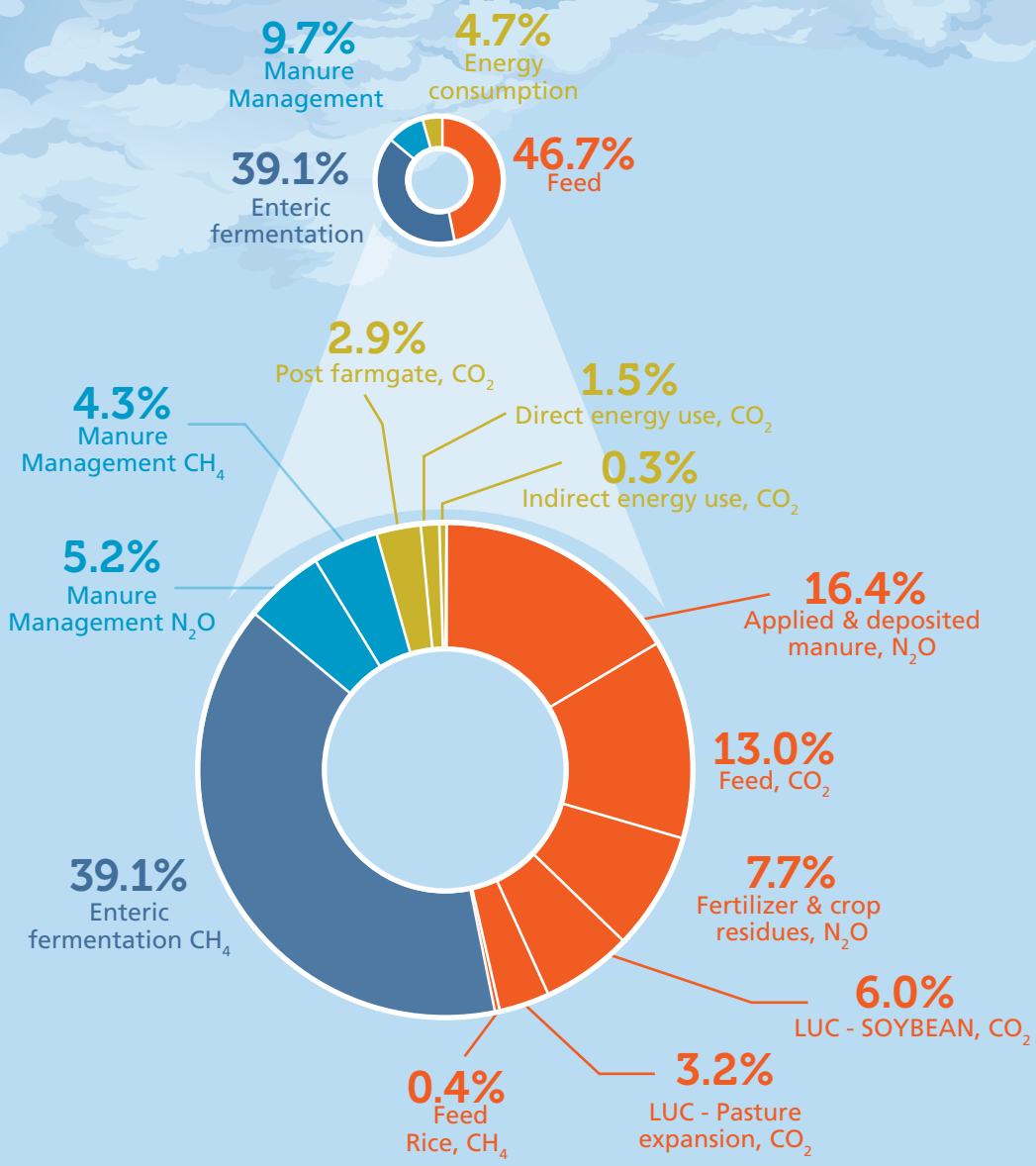
Emission intensities vary greatly among different commodities



This reflects different **agro-ecological** conditions,
farming practices and **supply chains management**.
It is within this gap between high and low emission intensities
where **opportunities for mitigation** can be found.

Source: www.fao.org/gleam

Sources of emissions in livestock supply chains



The particular case of methane from enteric fermentation

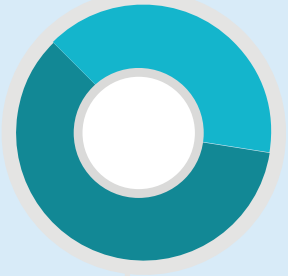
When ruminants digest, the greenhouse gas methane is produced.
This process is called enteric fermentation.

Why is methane important?

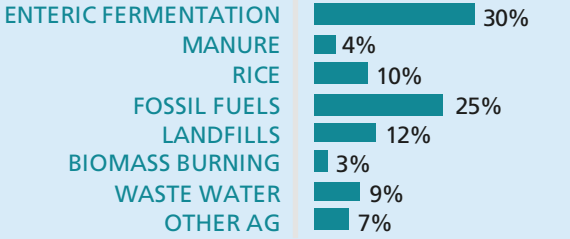
- Methane (CH_4) traps 84 times more heat than Carbon Dioxide (CO_2)
- Accounts for 1/3 of climate forcing
- Responsible for half of the observed rise in ozone levels
- Short-lived climate pollutant, with atmospheric life span of 12 years

Anthropogenic sources of methane

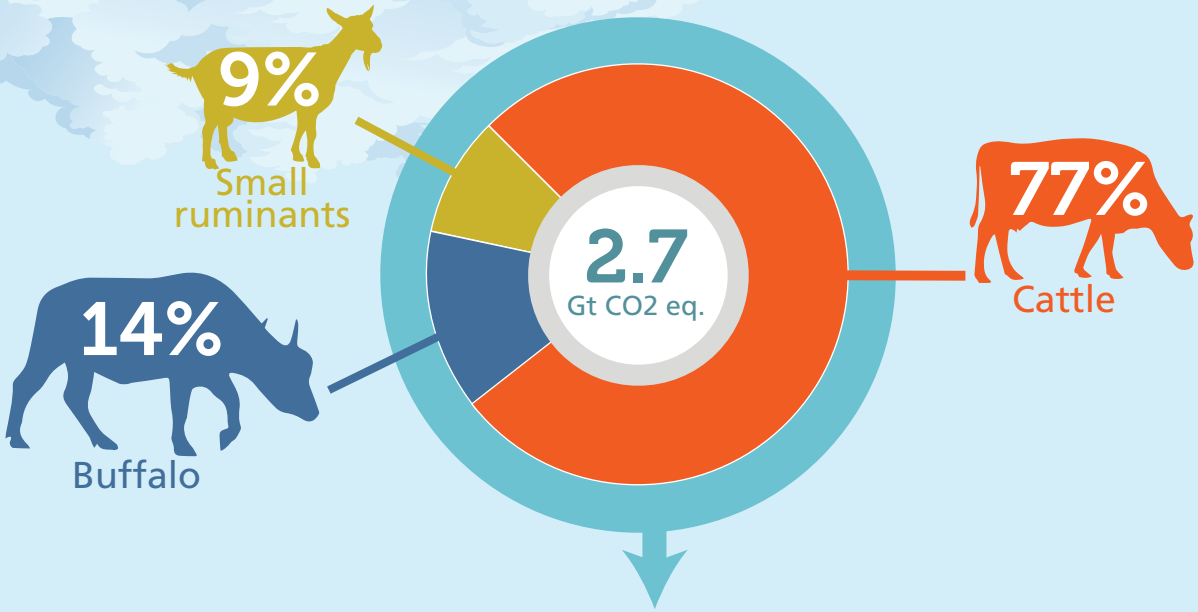
40% NATURAL SOURCES



60% HUMAN ACTIVITY



Reducing enteric methane can deliver quick and immediate gains for food security and climate change mitigation



Contribution to global GHGs

6%
Global Warming Potential 100

18%
Global Warming Potential 20

At global level, enteric fermentation comprise

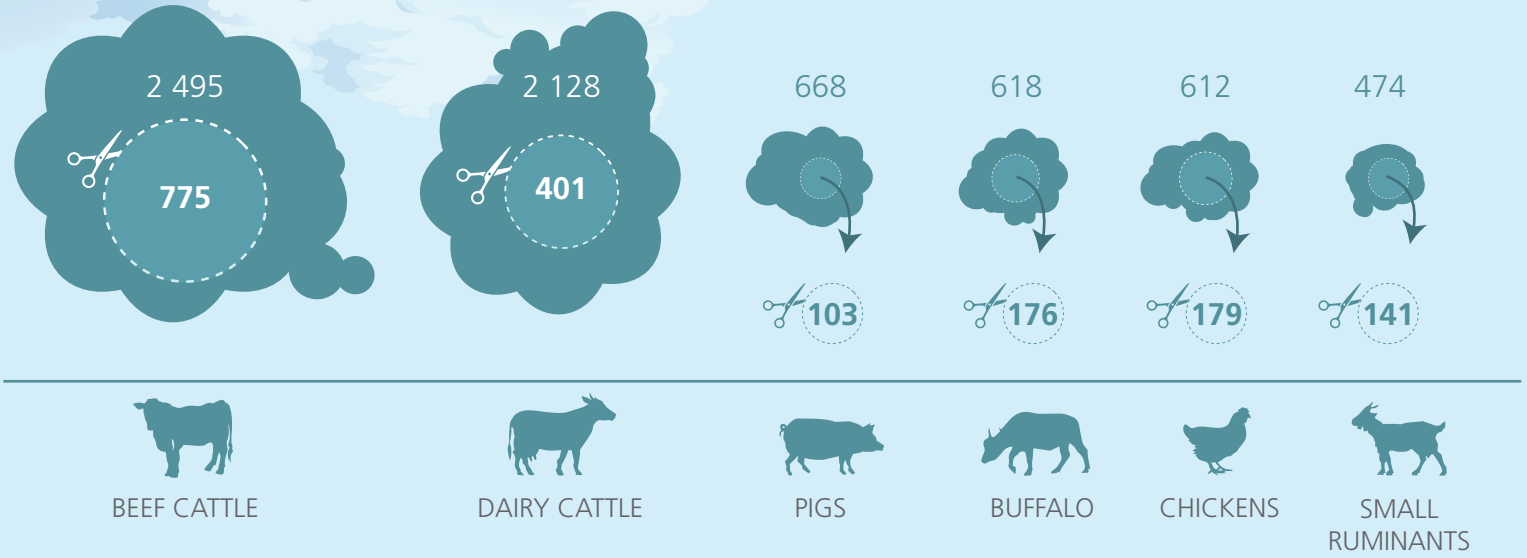
6%
of the global greenhouse gas anthropogenic emissions

70% of the methane emissions from agriculture

40% of GHG emissions from livestock supply chain

Source: www.fao.org/in-action/enteric-methane

Bridging the efficiency gap



Greenhouse gas emissions in the livestock sector could be cut by **30 percent** (1.8 gigatonnes CO_2-eq) through a wider use of already existing best practices and technologies.

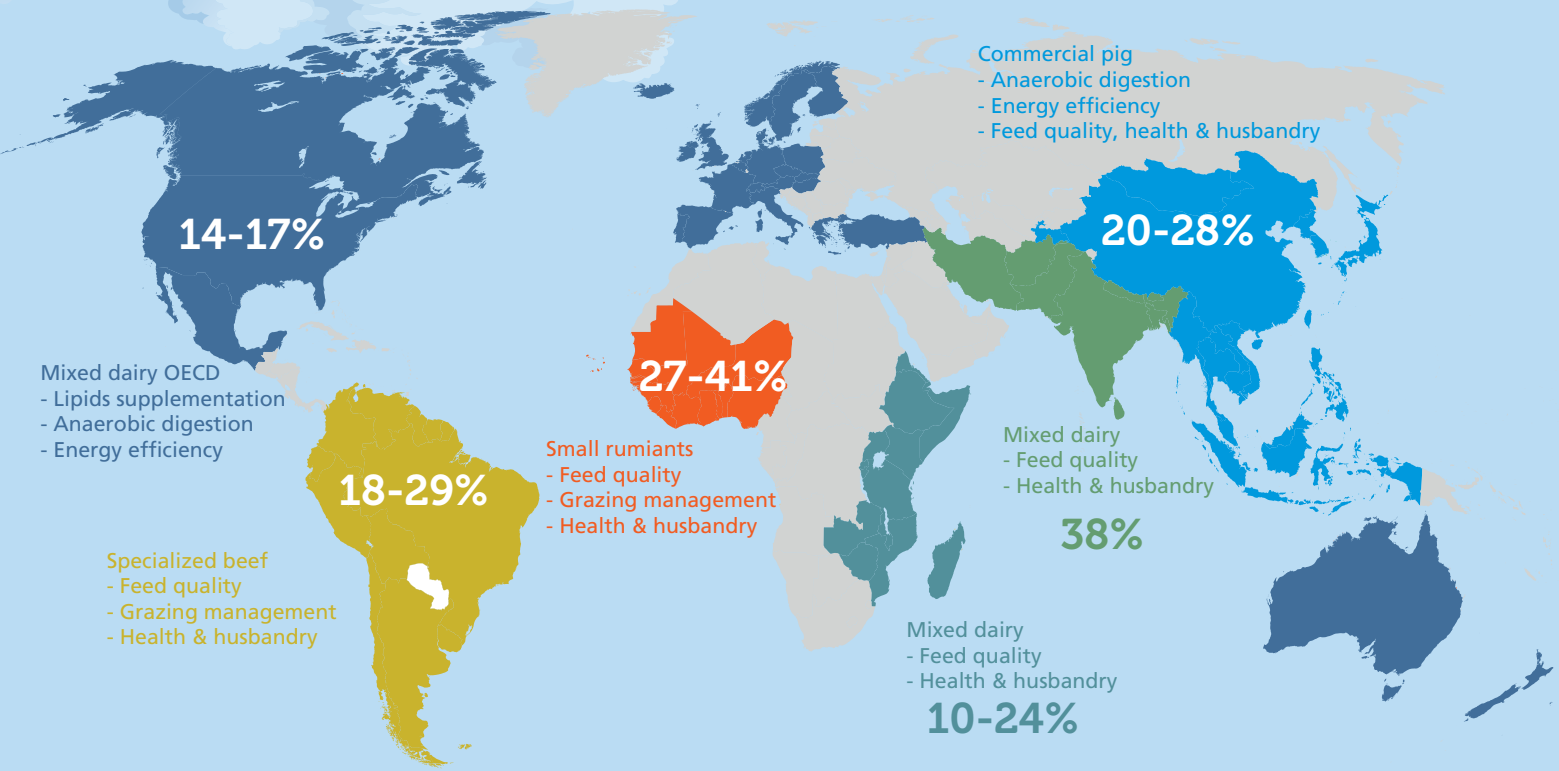
Source: www.fao.org/gleam

Efficient practices key to reducing emissions

Greenhouse gas emissions in the livestock sector can be reduced by

14-41% through adoption of feasible improvements in:

feed quality | animal health and husbandry
manure management | energy use efficiency



Soil carbon sequestration in pasture and grasslands is an additional practice with promising mitigation potential.

Adjustments in grazing pressure can sequester 148.4 Tg CO_2 per year in grazing lands worldwide

64% of the C sequestration potential is found in Central and South America (42.7 Tg CO_2), East and SE Asia (20 Tg CO_2) and sub-Saharan Africa (33 Tg CO_2)

FAO's tools for decision making under climate change

The Global Livestock Environmental and Assessment (GLEAM) model was developed by FAO to support the assessment of adaptation and mitigation scenarios in the livestock sector.

It calculates livestock production, GHG emissions and mitigation potential with IPCC Tier 2 methods.

An open and user-friendly version is available for download to support governments, project planners, producers, industry and civil society organizations in the preparation of national inventories and in ex-ante project evaluation for the assessment of intervention scenarios in animal husbandry, feed and manure management.

www.fao.org/gleam

The Livestock Environmental Assessment Performance (LEAP) Partnership develops comprehensive guidance and methodology for understanding the environmental performance of livestock supply chains to shape evidence-based policy measures and business strategies.

LEAP Partnership has developed 6 sector specific guidelines that provide harmonized accounting rules for the quantification of greenhouse gas emissions from livestock supply chains.

www.fao.org/partnerships/leap

www.fao.org/climate-change

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