

- Burps, Belches and Bovine Health -

Climate smart cattle production

Linking health, productivity and reduction of methane emissions in cattle

Ensuring livestock health and welfare is fundamental to sustainable production and is a critical pathway to achieving climate change mitigation and adaptation, safeguarding food security and livelihoods, and reducing the environmental footprint of livestock systems. Diseases have an obvious effect on health and thus productivity of livestock, which are often rural people's most valuable assets. Animal health (AH) improvements benefit livelihoods by providing high value protein for nutrition, securing income, savings and stability in rural areas, providing organic fertilizer, draught power and enhancing resilience.

The effect of animal health on methane emissions is less obvious: Ruminants have a high environmental impact, as they belch out enteric methane, contributing ~10% of global anthropogenic greenhouse gas (GHG) emissions. As demand for milk and meat is increasing, so will herd sizes and emissions unless productivity improves and emission intensity (EI) ($kgCO_{2eq}$/kg product) decreases (Figure 1). Healthy animals with adequate nutrition and management achieve higher productivity and lower EI (Figure 2). Currently the EI in Africa is high in comparison to other regions due to disease burden, inadequate animal nutrition and other management factors which thereby link animal health, productivity and methane emissions.

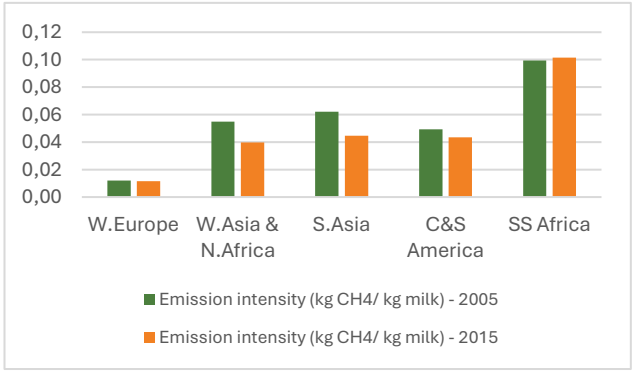


Figure 1: EI in dairy cattle sector in 2005 and 2015 (FAO & GDP, 2018)

Methane emissions are linearly correlated with feed energy intake as they essentially constitute energy losses during digestion. Methane emissions are also influenced by feed quality, intake level and genetics. Intake and requirements for maintenance (basic life functions) and (re-)production (calf, milk, meat, power) hence are good proxies for methane emissions. Maintenance accounts for 30–70% of lifetime emissions, depending on the livestock system

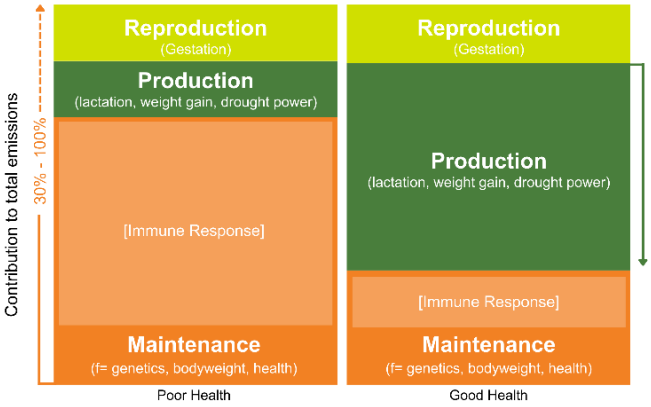


Figure 2: Simplified emission model from dairy cow for constant energy intake (Author's illustration)

(Gerber et al. 2013; Feyissa et al. 2023). Reducing this proportion of maintenance emissions is therefore the aim of sustainable intensification. This encompasses extending productive lifespan to dilute rearing emissions, preventing mortality (which results in 100% maintenance emissions and no production) and reduced immune system demands through AH measures and improved management practices. By reducing disease-related energy losses, healthier animals therefore convert more feed energy into productive output, reducing EI and improving farmer livelihoods.



LiveSys
Catalysing Transformation towards Sustainable Livestock Systems

Disease & Country	Intervention	Mortality Risk (No Intervention)	The Green Win (With Intervention)	
			Productivity	Emission Intensity
Nagana	Drug + Trap	20% (Calves)	+50%	-36%
GI Worms	Deworming	12% (Calves)	+27%	-20%
Redwater	Vaccination Drug	75% (Calves)	+50%	N/A
ECF	Vaccination Drug	30% (Adult) - 90% (Calves)	+27%	-40%
FMD	Vaccination	14% (Adult) - 29% (Calves)	+19%	-13%
CBPP (West African countries)	Vaccination Quarantine	8% (Adult) - 2% (Calves)	+21%	-19%
RVF (West African countries)	Vaccination	10% (Adult) - 20% (Calves)	+21%	-19%

Table 1: Estimated productivity gain and emission intensity reduction from selected cattle diseases intervention, and mortality rate in the absence of intervention. GI (gastro-intestinal), ECF (East Coast fever), FMD (foot-and-mouth disease), CBPP (contagious bovine pleuropneumonia), RVF (Rift Valley fever) Sources: FAO & NZAGRC (2017-2019); Rebuma et al. (2024); Surve et al. (2023); Kabaka et al. (2014); Tinto et al. (2023); Hartman (2017); Rodríguez-Vivas et al. (2017); Moulin (2011); Thumbi et al. (2013); York et al. (2017)

Determinants of animal health

Disease burden is influenced by the presence of pathogens but also by immunological factors (susceptibility) such as stress, nutritional status and genetic factors such as disease tolerance or resistance. Animal health interventions and systems strengthening target all these areas to reduce animal morbidity and mortality.

"Better, not fewer, livestock is the key to a greener future in Africa" (Dr. Huyam Salih, Director of African Union Inter-African Bureau for Animal Resources)

As antimicrobial resistance spreads, preventive rather than adaptive measures that reduce exposure and susceptibility are needed. Exposure can be reduced through controlled grazing and livestock biosecurity including improved hygiene and disease control measures. While susceptibility reduction includes suitable breeds, balanced nutrition and vaccination. These interventions require adequate animal health services focusing on animal disease and injury prevention, proper treatment and tracking of outbreaks, thereby supporting overall herd health and sustainable, resilient livestock systems.



Impacts of cattle health interventions

Diseases not only increase GHG emissions but also cause considerable productivity losses due to morbidity and mortalities (Table 1). In Mexico, damages associated with ticks have been estimated at $574M annually (Rodríguez-Vivas et al., 2017) while bovine pleuropneumonia across several African countries costs economies ~$3M per year (Tambi et al. 2006). Conversely, the eradication of rinderpest increased gross domestic product in Kenya and Ethiopia by 0.5–1.5%, with positive spillover effects on incomes (Omiti and Irungu, 2010).

Animal health as a big win

These figures highlight the need to strengthen animal health systems for progress toward the Sustainable Development Goals (SDGs). Improved animal health contributes to multiple dimensions of sustainability: animal welfare, livelihoods and productivity of livestock keepers, climate change mitigation and adaptation by improving production efficiency and reducing EI. Yet animal health financing remains fragmented and insufficient at average 0.05% of GDP (WOAH 2026). Reductions in methane EI in livestock and avoided future emissions due to reduced need to increase herds represent an opportunity to mobilize long-term public and private investments, positioning animal health as a strategic lever for achieving sustainable livestock systems.

LiveSys Project
Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH
Friedrich-Ebert-Allee 32 + 36
53113 Bonn, Germany
T +49 228 44 60-0
F +49 228 44 60-17 66

E livesys@giz.de
I www.giz.de

Picture credit:
Front: © Freepik
Back: © Roberto Marcon, GIZ

This brief was prepared under the 'Catalysing transformation towards sustainable livestock systems (LiveSys)' project commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ) and implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ).

© GIZ

Authors:
Julia Doldt (GIZ)
Aziza Benrahhou (GIZ)

It was supported by the International Livestock Research Institute (ILRI) and the African Union – Interafrican Bureau for Animal Resources (AU-IBAR).