# GHG emissions and mitigation options for livestock production in Europe, Africa and Latin America

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## Background

The global animal food production chain, including land use and land use changes, generates about 15% of global greenhouse gas (GHG) emissions. The contribution of livestock production is high, however variable across regions in the world. The largest contributors from livestock production to the global GHG budget are (i) methane ($CH_4$) emissions from ruminant production systems, (ii) nitrous oxide ($N_2O$) emissions related to manure management and feed production, and (iii) net $CO_2$ emissions from land use changes related to feed production. With increasing global food demand and stronger international GHG reduction targets, the pressure to reduce the GHG emissions of livestock production increases.

## Objective

The objective of this study was to provide quantitative estimates of GHG emissions from livestock production in the EU-27, Africa and Latin America and to identify and quantify relevant mitigation options.

## GHG emissions from livestock production

The GHG emission estimates and mitigation potentials are based on a review of available studies and calculations using the MITERRA-Global model. MITERRA-Global is an environmental impact assessment model at global scale, based on the MITERRA-Europe model [1]. The model calculates GHG and N emissions and soil carbon stock changes on a deterministic and annual basis, using emission factors, mainly based on the IPCC 2006 guidelines. Activity data are based on three year averages for the period 2007-2009.

Figure 1 shows the GHG emissions from livestock production for the three regions. For this study only the $CH_4$ and $N_2O$ sources are accounted for, emissions from land use change, soil C sequestration or fossil fuel use are not included. The variation in GHG emissions can be explained by differences in livestock numbers and systems.

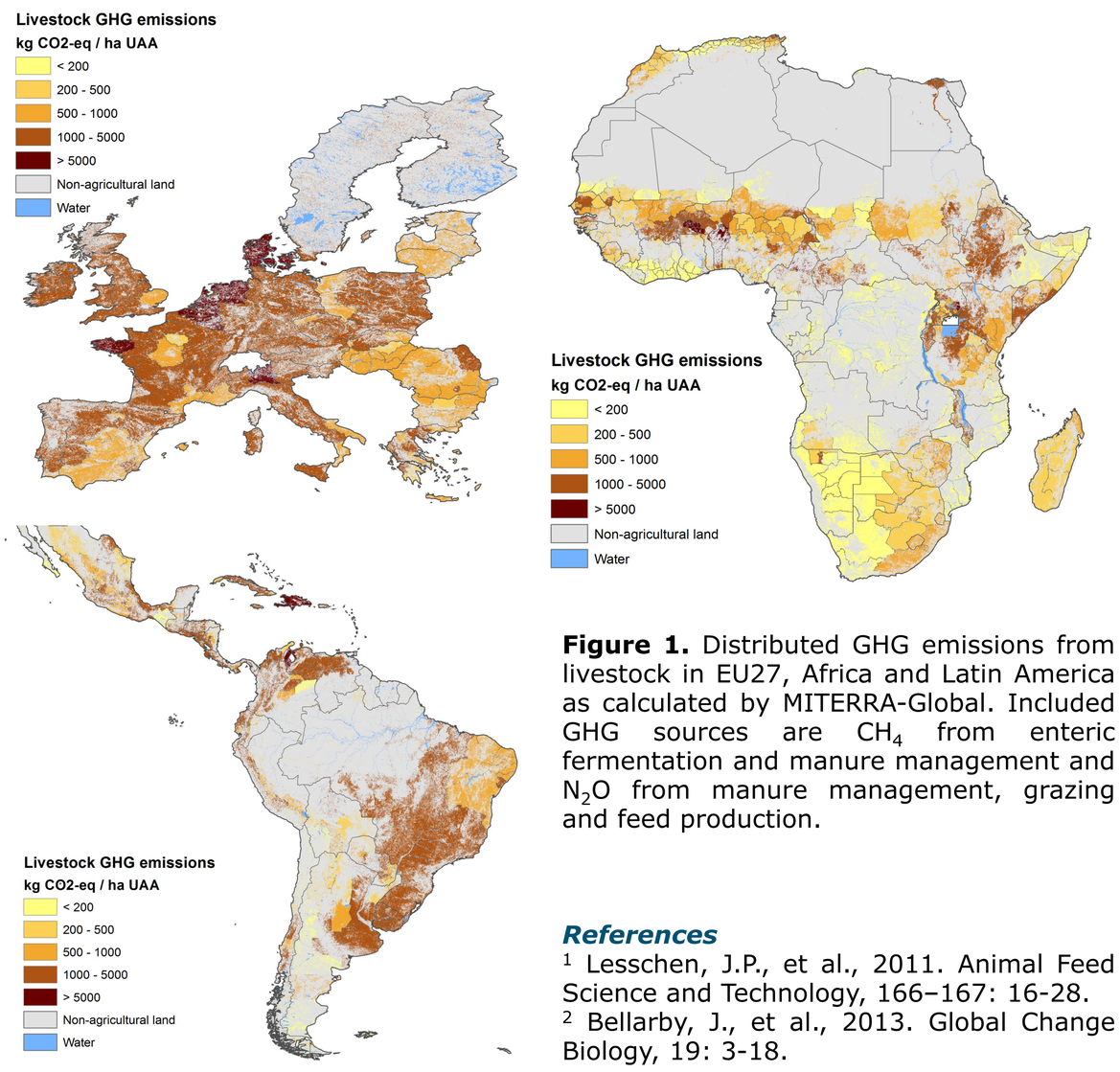


**Figure 1.** Distributed GHG emissions from livestock in EU27, Africa and Latin America as calculated by MITERRA-Global. Included GHG sources are $CH_4$ from enteric fermentation and manure management and $N_2O$ from manure management, grazing and feed production.

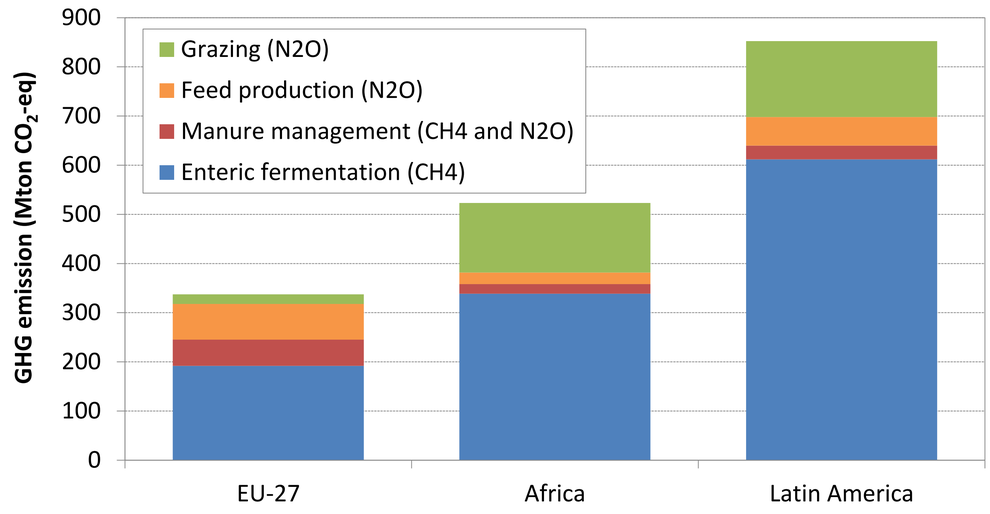


**Figure 2.** Total GHG emission from livestock production for the three regions

In Africa the main GHG sources from livestock production are enteric fermentation and $N_2O$ from grazing animals. Another important source not shown is savannah burning. Due to the low fertilizer use, the direct $N_2O$ soil emission is only a minor source. In Latin America enteric fermentation is by far the largest source, due to the large number of cattle, followed by $N_2O$ emissions from grazing and $CO_2$ from land use change and pasture degradation (not shown). In the EU the emissions from manure management and feed production are besides enteric fermentation important GHG sources.

## Main mitigation options

### *EU-27*

- Minimizing animal food waste
- Combinations of technical measures in animal production to reduce $CH_4$ and $N_2O$ emissions, e.g. anaerobic digestion, dietary additions
- Improving the efficiency of livestock production to reduce GHG emissions per kg of product
- Avoiding land use change outside the EU through lower feed imports
- Total mitigation potential is estimated at 300±80 Mton $CO_2$-eq [2]

### *Africa*

- Improvement of the livestock production efficiency, which will reduce the enteric fermentation emission intensity
- Restoration of soil carbon stocks in degraded pastures
- Improvement of manure and fertilizer management to increase crop and feed productivity

### *Latin America*

- Reduction of methane emissions from enteric fermentation by improving livestock productivity and diet improvements
- Reduction of deforestation and savannah conversion
- Restoration of degraded pastures by adoption of improved pastures

## Conclusions

- The GHG emission sources and GHG intensities differ substantially between the three regions, with Europe having the lowest per product GHG emissions and Africa the highest
- Due to major differences in livestock production systems for these regions, their respective mitigation options and potentials are different, which should be accounted for in climate policies
- The availability of studies and data on livestock GHG emissions and mitigation options is limited for Africa and Latin America, which makes further quantification challenging

## Acknowledgements

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### *References*

[1] Lesschen, J.P., et al., 2011. Animal Feed Science and Technology, 166–167: 16-28.
[2] Bellarby, J., et al., 2013. Global Change Biology, 19: 3-18.

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