The GLEAM dashboard for livestock GHG emission data

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A brief history of livestock GHG assessments at FAO

Pre-GLEAM
Non-spatial
IPCC. 1997.
Revised 1996 IPCC guidelines for national GHG inventories

GLEAM 1
base year 2005
2006 IPCC Guidelines for GHG Inventories

GLEAM 2
base year 2010
IPCC 2006, 2006 IPCC Guidelines for National GHG Inventories

GLEAM – i
Online app for mitigation options
Default data: GLEAM 2
Baseline and scenario: user-defined
Non-spatial

GLEAM 3
base year 2015
IPCC 2019, 2019 Refinement to the 2006 IPCC Guidelines for National GHG Inventories

2006
IPCC TAR (2001)
GWP_{100}(\text{CH}_4 = 23, \text{N}_2\text{O} = 296)

2010-2013
IPCC AR4 (2007)
GWP_{100}(\text{CH}_4 = 25, \text{N}_2\text{O} = 298)

2017
IPCC AR5 (2014)
GWP_{100}(\text{CH}_4 = 34, \text{N}_2\text{O} = 298)

2022
IPCC AR6 (2021)
GWP_{100}(\text{CH}_4 = 27, \text{N}_2\text{O} = 273)
• Life cycle assessment, global scale, pixel based (~ 10km)
• Base year: 2015
• IPCC guidelines 2019
• Cattle, buffaloes, sheep, goats, pigs, and chicken
• Animal distribution from Gridded Livestock of the World (GLW4)
• Feed trade from FAOSTAT
• Land use change and pasture expansion
• Post-farm (processing transport)
• Allocation to meat, milk, and eggs
GLEAM dashboard - concept and implementation

- Interactive tool to explore GLEAM results online:
  - Animal population
  - Animal production
  - Emissions
  - Emission intensity
- Central website for data dissemination
- Online on-the-fly analysis and visualization
- Scaleable application
- Hosted at shinyapps.io
- Interactive online maps through FAO’s HiH geospatial platform
GLEAM dashboard- main pages

Emissions
Emissions from livestock for Southern Africa in 2015

59.27M Total emissions [tonnes CO2 eq.]
38.72M Direct emissions [tonnes CO2 eq.]
0.1 percent of total global GHG emissions

Emissions by species
Animal
- Cattle
- Sheep

Emission sources
- Gas
- Methane
- Nitrous Oxide

GLEAM v3.0 dashboard
GLEAM dashboard - main pages

Emissions

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Total emissions (tonnes CO₂ eq.)

38.72M
Direct emissions (tonnes CO₂ eq.)

0.1%
percent of total global GHG emissions

Emissions by species

Animal
- Pigs
- Chicken
- Cattle
- Goats
- Sheep

Emission sources
GLEAM dashboard - main pages

Animal Population
Animal population for Southern Africa in 2015

- Cattle: 97.16
- Sheep: 18.01M
- Goats: 27.54M
- Pigs: 10.03M
- Chicken: 1.74M
- Total: 173.17M

Animal Population Map
GLEAM dashboard - main pages
GLEAM dashboard - main pages

Emission Intensities

Emission intensities for Southern Africa in 2015

173.1 kg CO2 eq per kg meat protein
56.3  
21.1 kg CO2 eq per kg milk protein
126.6 kg CO2 eq per kg animal protein

Emissions intensity of animal products

- Cattle
- Pigs
- Chicken
- Sheep
- Goats
- Beef
- Dairy
- Poultry

Production systems

- Dairy
- Feedlot
- Intensive
- Grassland
- Mixed

References

- Annual Emission Intensities
- IPCC Dg 5.2
- Emissions from feed production
- Emissions from manure
- Emissions from enteric fermentation

Pie chart:

- Manure-N2O: 8.53%
- Manure-CH4: 9.29%
- Feed-CH4: 4.71%
- Feed-N2O: 10.8%
- Pasture Expansion: 8.29%
- Postfarm: 4.7%
- DirectOnFarmEnergy: 2.14%
- LandUseChange: 1.39%
- EmbeddedOnFarmEnergy: 0.452%
GLEAM dashboard - data analysis example

Data analysis example:
*Milk yield vs emissions and emission composition*
GLEAM dashboard - main pages

Animal Products

Production of animal products for Southern Africa in 2015

- 1.99M: Tons of meat
- 4.21M: Tons of milk
- 215.74K: Tons of eggs
- 468.23K: Tons of animal protein

Production of animal products

- Animal: Cattle, Buffalo, Goats, Sheep, Pigs, Chicken

Production of animal products

- Product: Meat, Milk, Eggs

Notes:
- Animal, Herd, Production system, Connectivity
GLEAM dashboard: High resolution spatial data

Total livestock emissions
GLEAM dashboard: High resolution spatial data

- Emission intensity

![Map showing emission intensity from global livestock supply chains per unit of edible protein](image)

**Emission intensity from global livestock supply chains per unit of edible protein**

(Kg of CO₂ eq per kg of edible protein)

- < 50
- 50 - 100
- 100 - 150
- 150 - 200
- 200 - 250
- 250 - 300
- 300 - 350
- > 350

< 1 Livestock Unit

Source: GLEAMv3
Geospatial mapping (HiH application)

- Map viewer in the dashboard
Responsive application
GLEAM model and dashboard future plans

• **Full** environmental model with shared core data and engine
• Include data from other domains (water, carbon, biodiversity)
• Provide interface to cloud based model (scenario design)
• Online data upload for countries/project
  • crowd sourcing for global database/updates
• (Semi)-automated tools for consistency checks
Dashboard official launch

**gleam.fao.org**

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https://fao.zoom.us/webinar/register/WN_PKhmpC5wRkShp1g8cfsZ5A

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Thank you