Food and Agriculture Organization
of the United Nations

# Livestock and Environmental Impact: a Global Livestock Environment Assessment Model (GLEAM)

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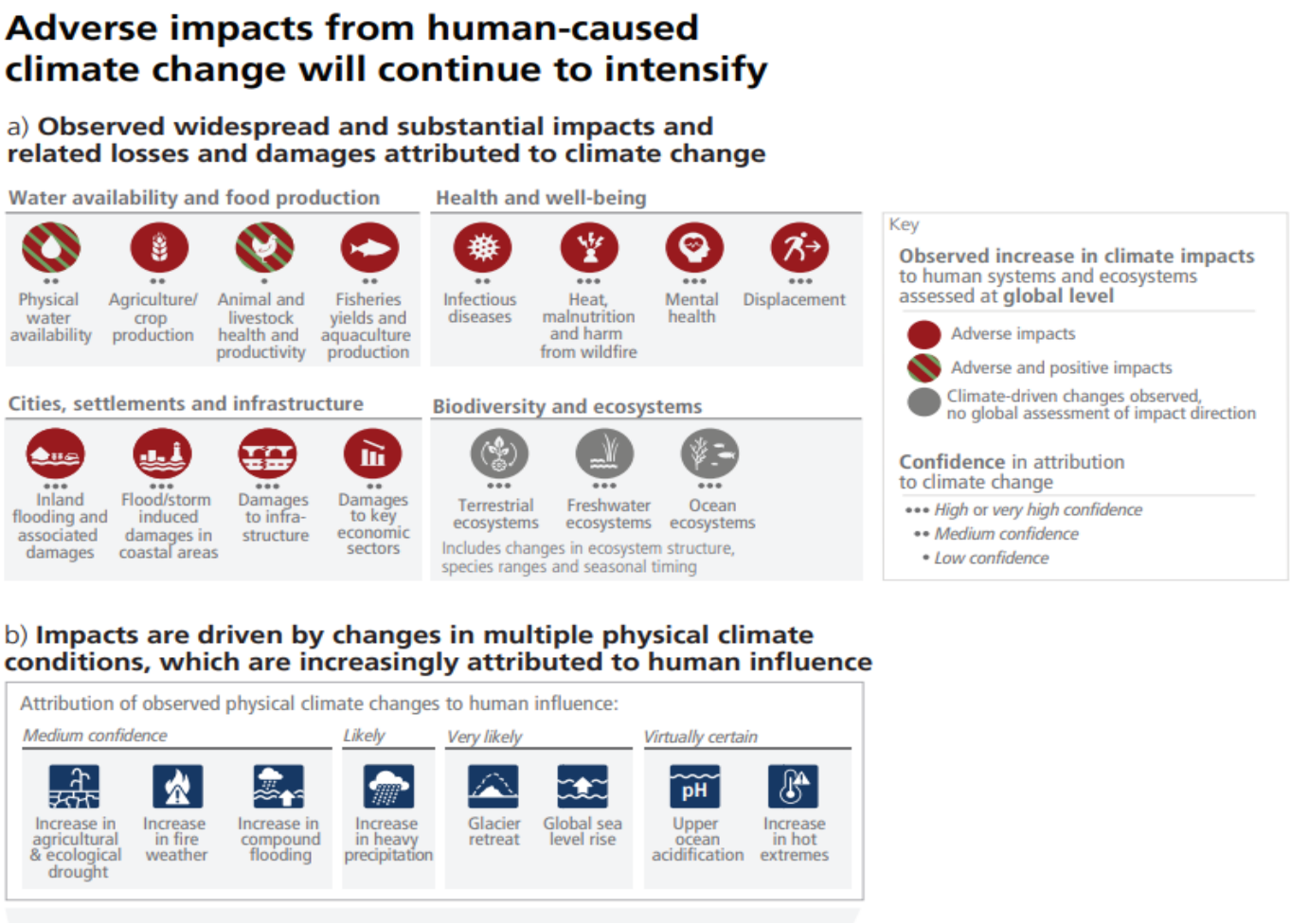
Dr. Erda Celer
GHG Emissions Assessment Specialist

# Outline

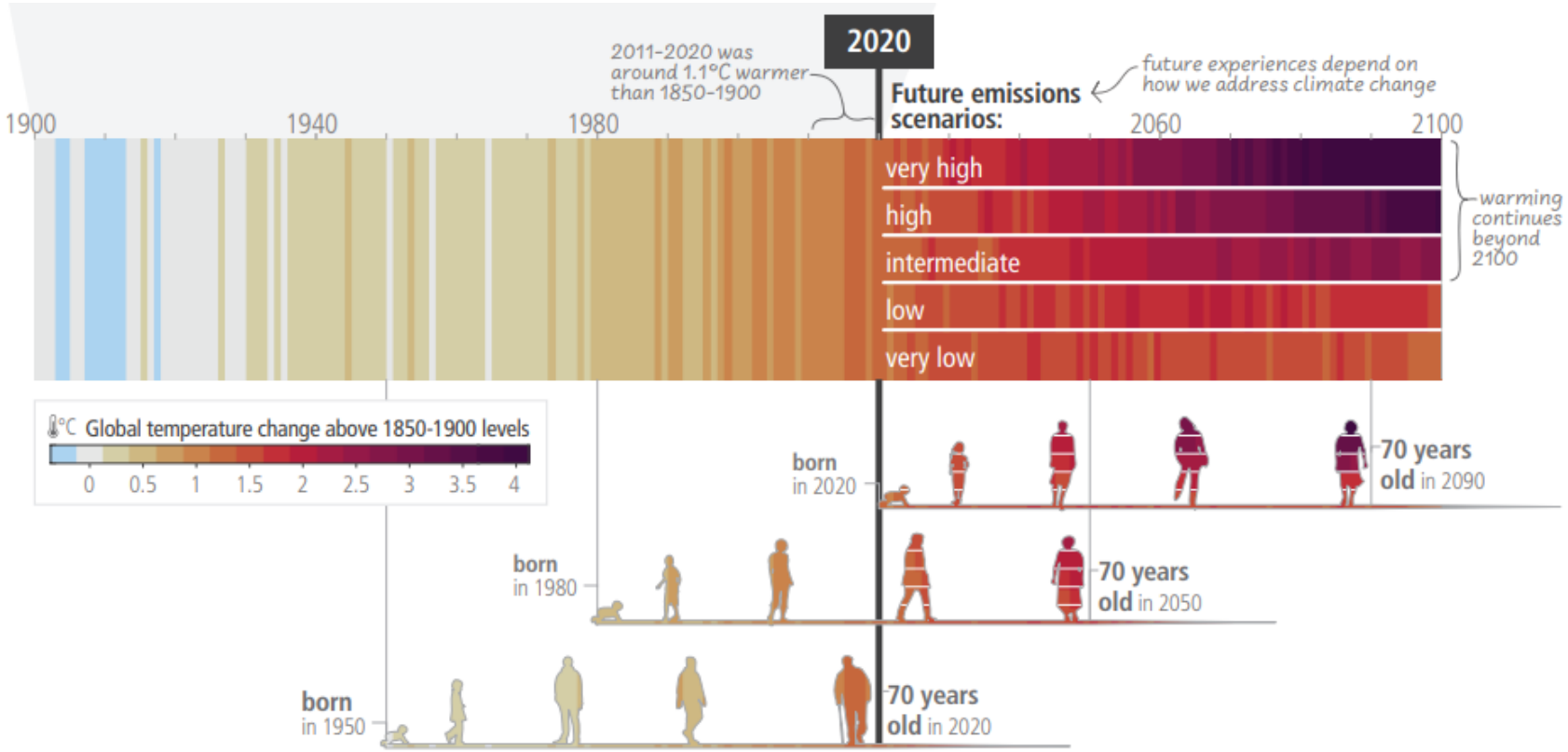
- Impacts of climate change
- IPCC 2006
- Global Livestock Environmental Assessment Model (GLEAM)
- GHG emissions assessment
- Potential impact of climate change on the livestock supply chains
- Pathways to lower emission livestock

# Impacts of climate change




**Source:** IPCC, 2023: Summary for Policymakers. doi: 10.59327/IPCC/AR6-9789291691647.001

# Impacts of climate change

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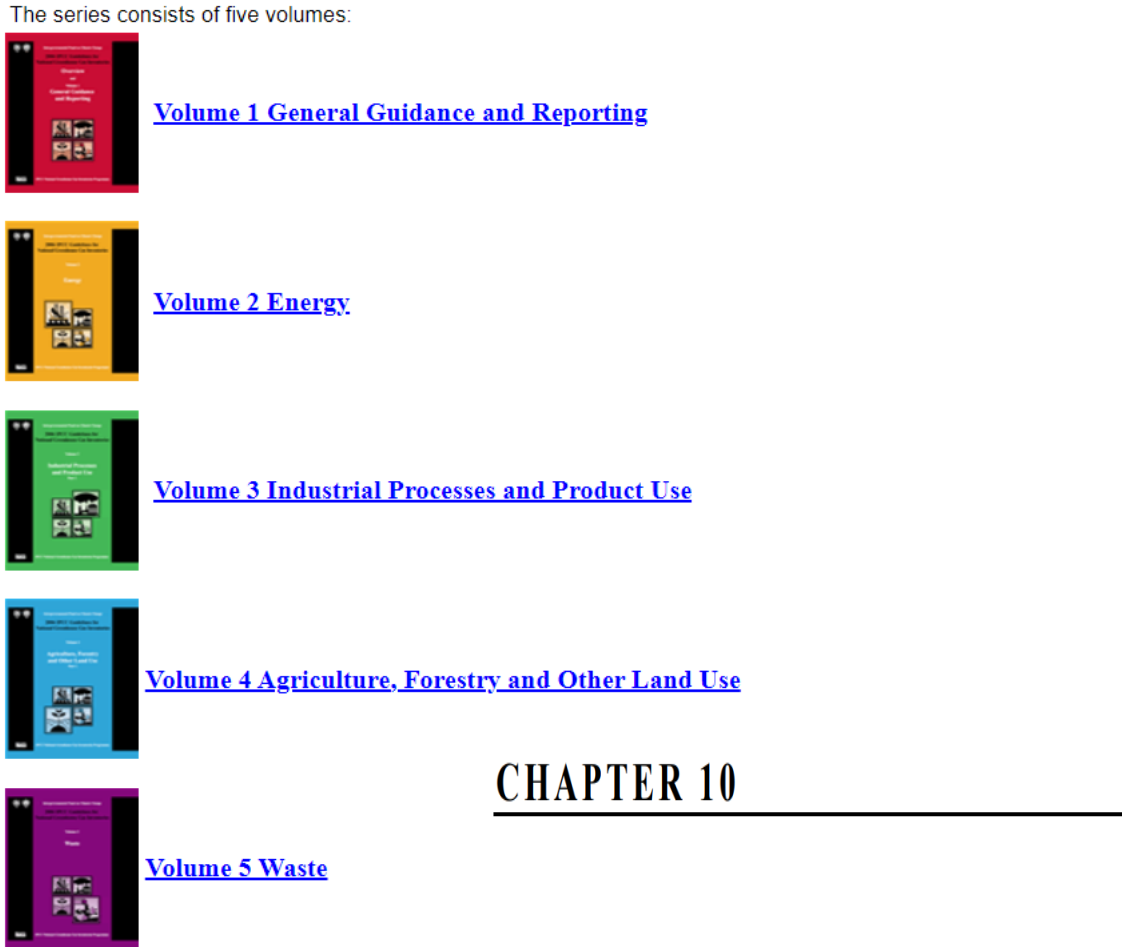
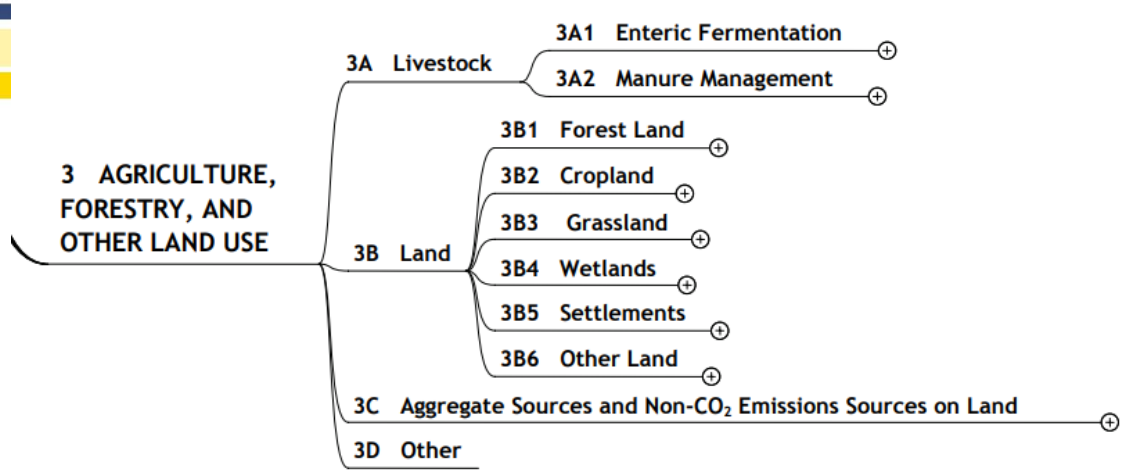
# IPCC 2006




**Source:** https://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html

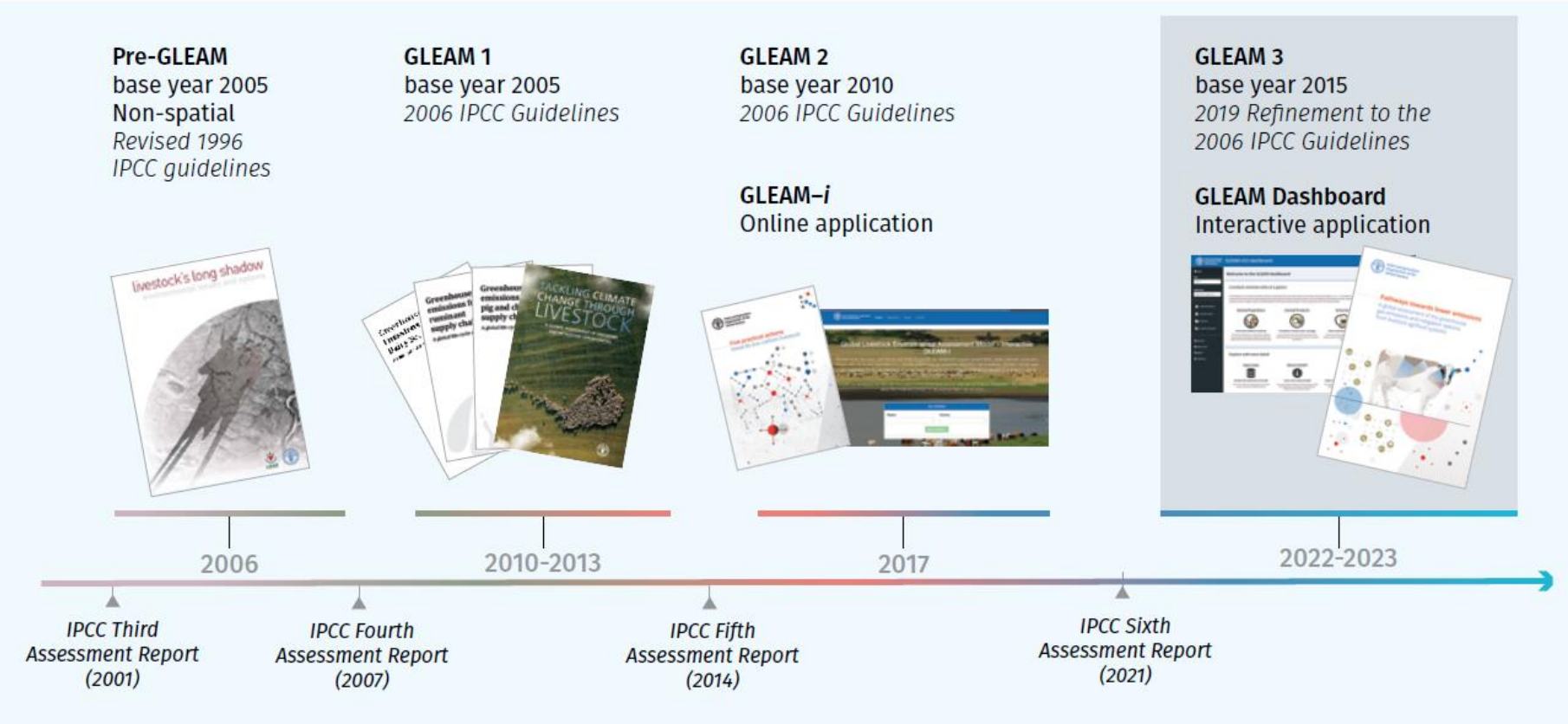
# IPCC 2006




IPCC highlighted the substantial contribution of fossil fuel use and agriculture, predominantly by livestock, to the increase in atmospheric methane (CH4) emissions (IPCC, 2021).

**Source:** https://www.ipcc-nggip.iges.or.jp/public/2006gl/vol4.html

# Global Livestock Environmental Assessment Model (GLEAM)



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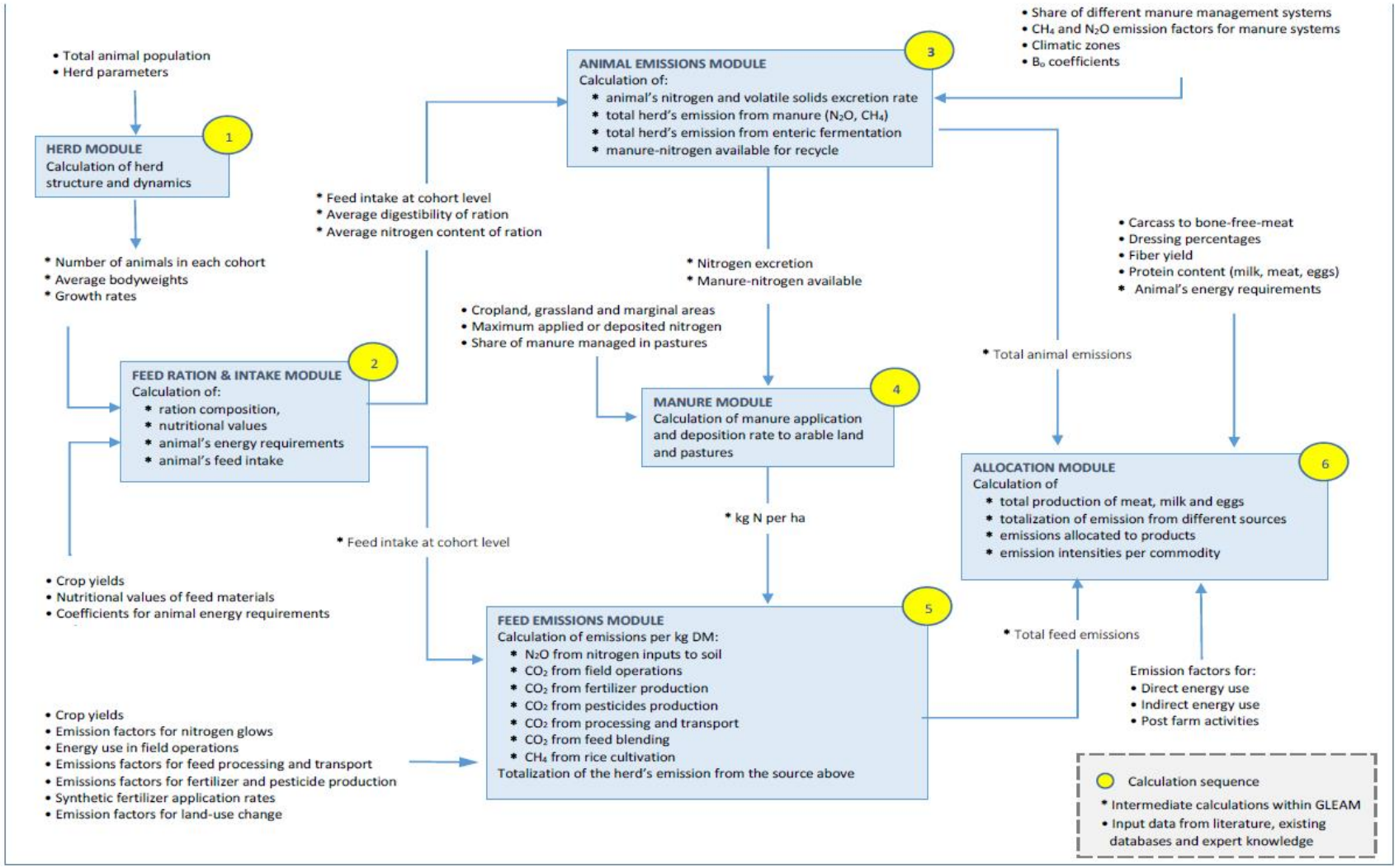
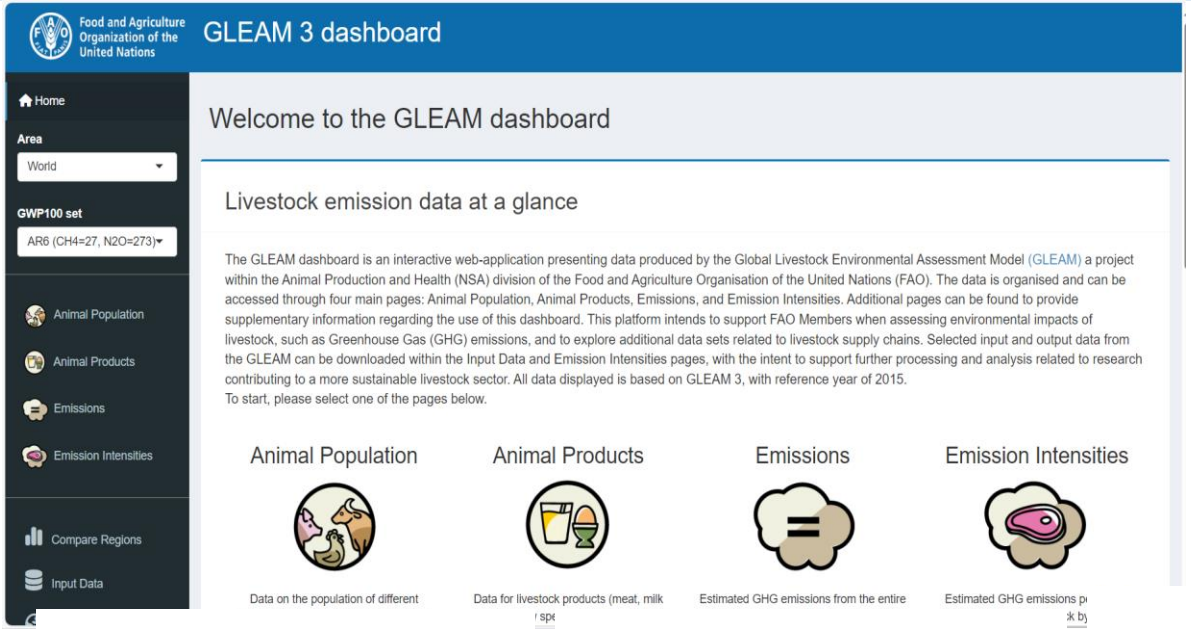


# Global Livestock Environmental Assessment Model (GLEAM)

- GLEAM is a modelling framework that simulates the interaction of activities and processes involved in livestock production and the environment. The model can operate at (sub) national, regional and global scale.

- to quantify production and use of natural resources in the livestock sector and to identify environmental impacts of livestock in order to contribute to the assessment of adaptation and mitigation scenarios to move towards a more sustainable livestock sector.

# GLEAM 3 dashboard




## GLEAM v3 Dashboard

foodandagricultureorganization.shinyapps.io/GLEAMV3_Public/

### Animal Population

Data on the population of different livestock species, herd, and production system. Animal population estimates are based on the Gridded Livestock of the World GLW4.

### Animal Products

Data for livestock products (meat, milk and eggs) by species, herd, production system and commodity, per unit of protein, and weight.

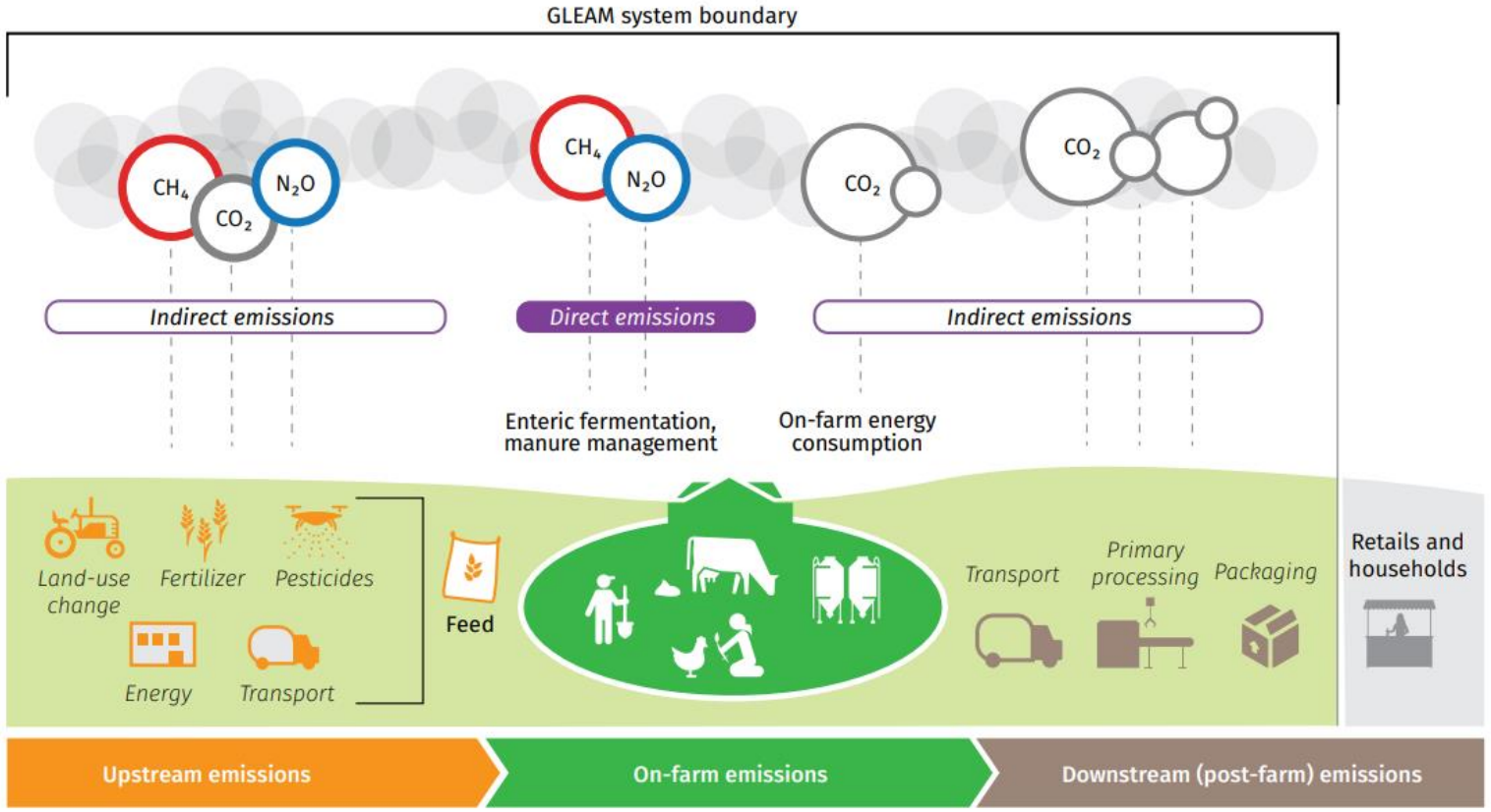
### Emissions

Estimated GHG emissions from the entire livestock supply chain by species, herd, production system, commodity, source, and gas.

### Emission Intensities

Estimated GHG emissions per unit of livestock product and stock by species, herd, and production system. Data is downloadable at a chosen geographic level.

# GLEAM system




**Source:** FAO. 2023. Pathways towards lower emissions – A global assessment of the greenhouse gas emissions and mitigation options from livestock agrifood systems. Rome
https://doi.org/10.4060/cc9029en
https://www.fao.org/gleam/ dashboard/en/

# Global Livestock Environmental Assessment Model (GLEAM)

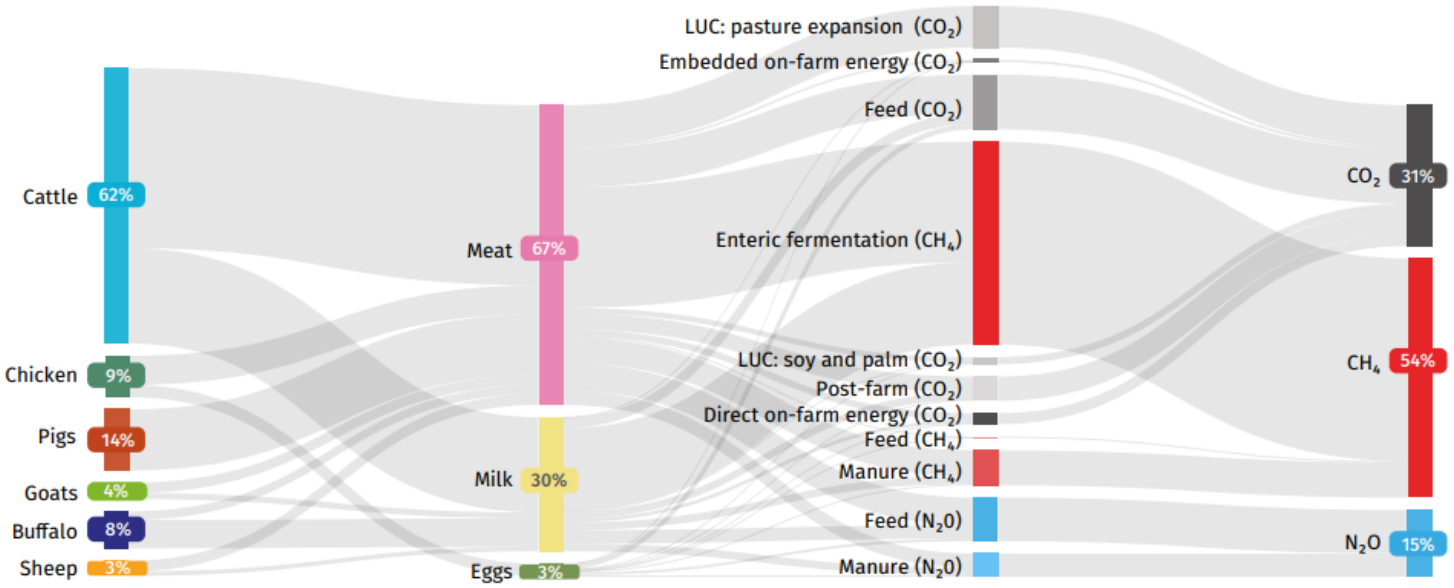
The Global Livestock Environmental Assessment Model (GLEAM) was developed to address the need for a comprehensive tool to assess interactions between livestock and the environment. The main features of the current version of GLEAM are:

- Systematic, global coverage of six livestock species and their edible products: meat and milk from cattle, buffalo, sheep and goats; meat from pigs and meat and eggs from chicken.
- Spatially explicit modelling of livestock distribution, climatic data, feed yields and biophysical processes that allows the capture of local production drivers and/or constraints, environmental impacts and identification of intervention measures.
- Estimation of greenhouse gas emissions from each stage of production. The model covers emissions of methane (CH4), carbon dioxide (CO2) and nitrous oxide (N2O), using an IPCC Tier 2 methodology, providing more accurate information on how animal feeding, herd and manure management options can help in mitigation.
- Can be used to run scenarios of interventions in the livestock sector and can be coupled with other models (e.g. grassland models for sequestration, economic data for cost of mitigation etc.)

# Global Livestock Environmental Assessment Model (GLEAM)

- livestock animal numbers, production systems and their spatial distribution
- production of manure and its management
- feed intake and animal feed rations composition and quality
- land use associated with feed intake
- production of livestock commodities
- GHG emissions arising from each stage of production
- nitrogen used at each stage of production

# GHG emissions assessment




**Global GHG emissions from livestock: 6.2 Gt CO2eq**

**Cattle- 3.8 Gt CO2 eq per year**

**CH4: 3.3 Gt CO2eq**
**-Enteric CH4: 85%**
**-Manure CH4: 15%**

**Source:** FAO. 2023. Pathways towards lower emissions – A global assessment of the greenhouse gas emissions and mitigation options from livestock agrifood systems. Rome
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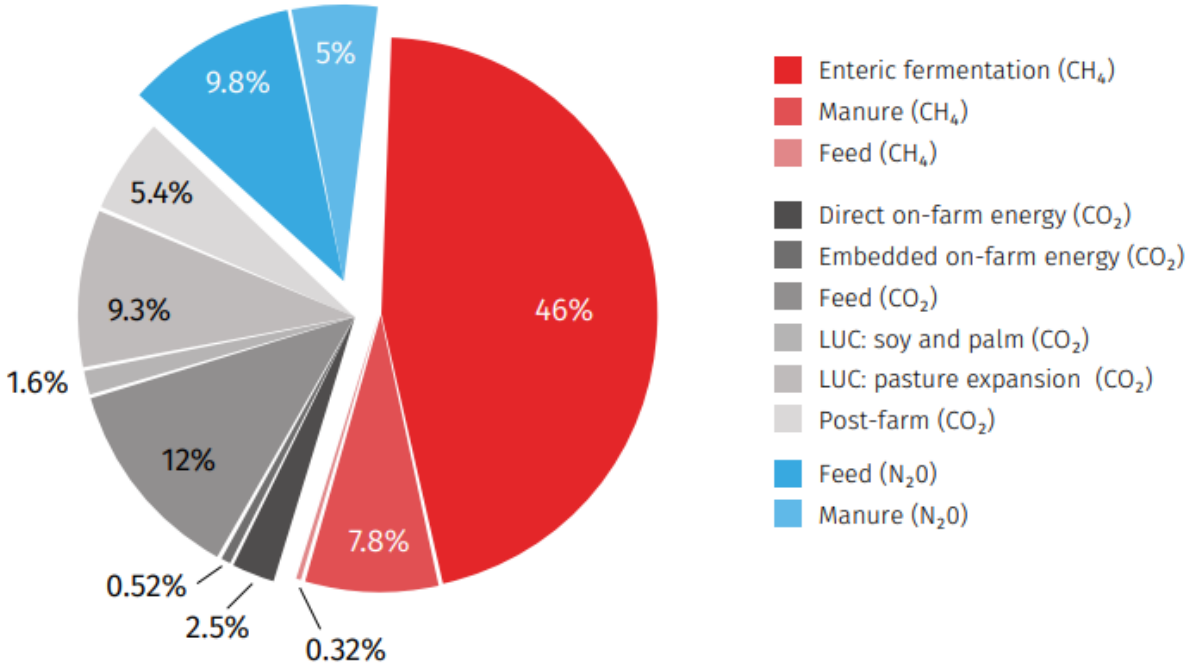
# GHG emissions assessment




**38 % of emissions are associated with upstream and downstream processes (feed production and processing)**

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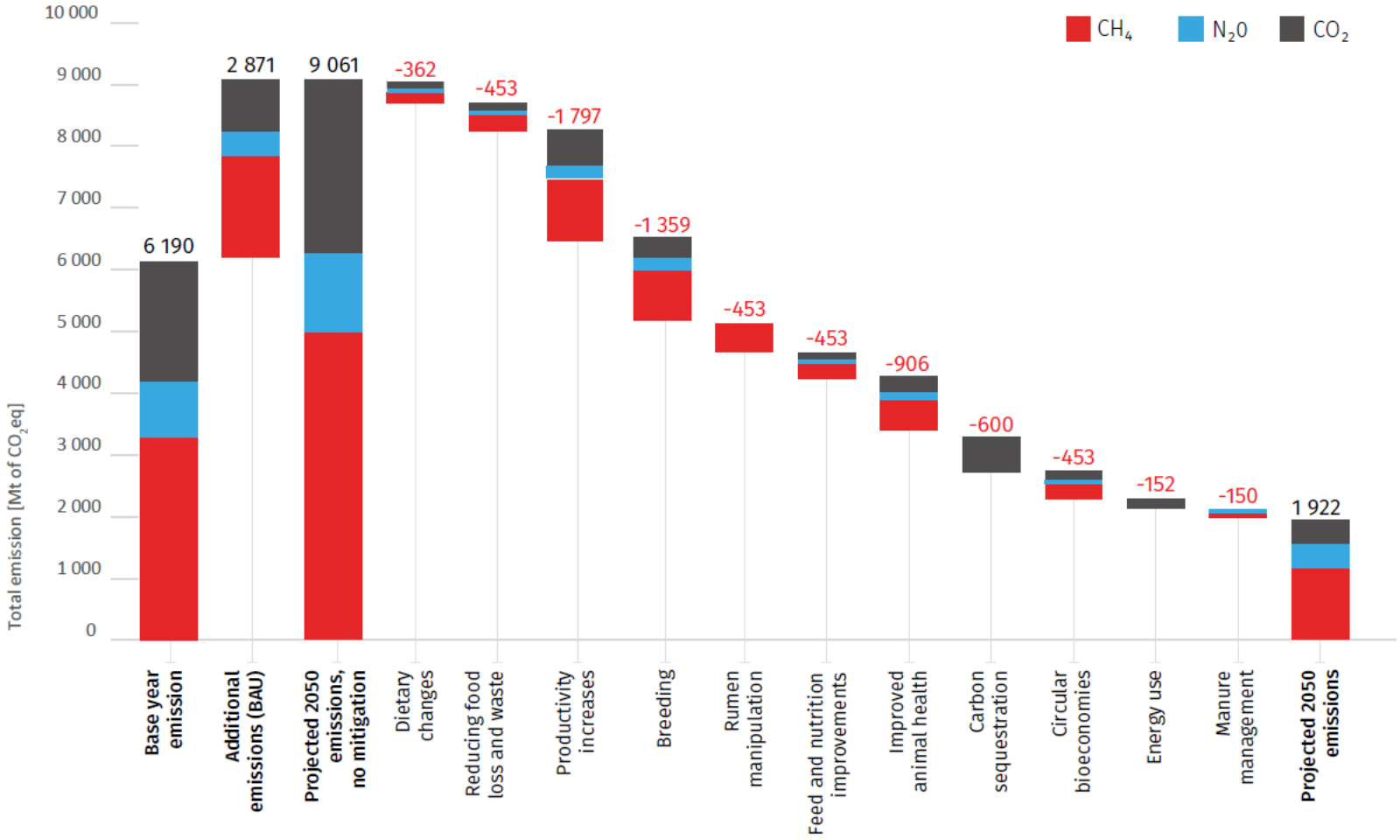
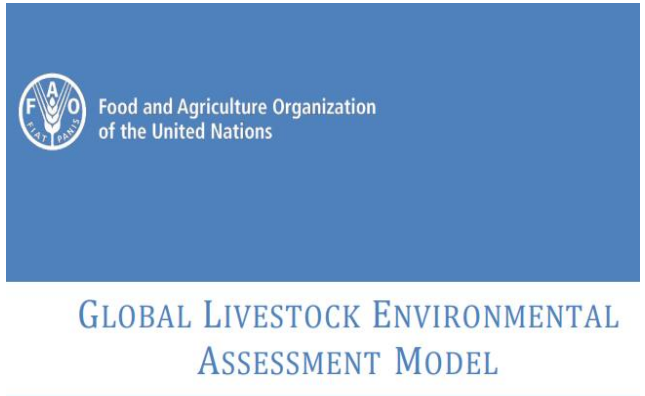
# Pathways to lower emission livestock

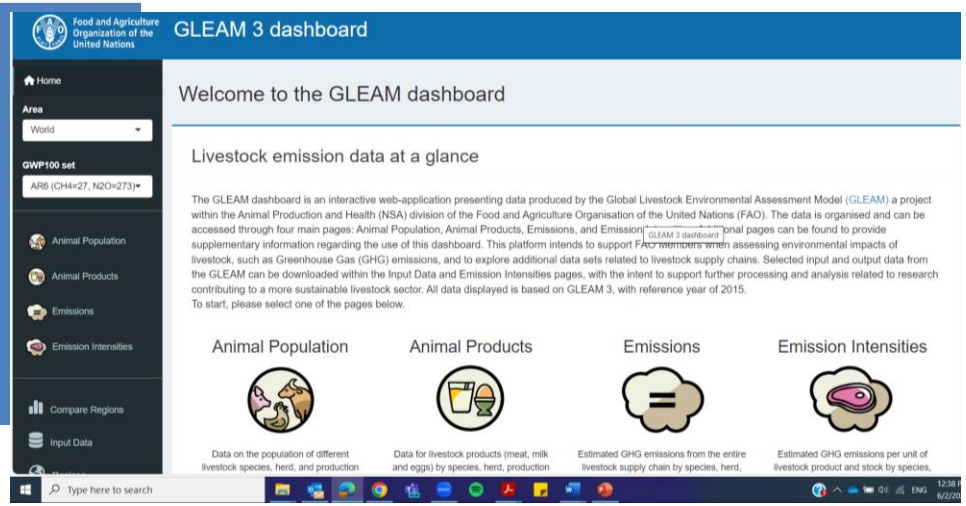


# Resources

## GLEAM

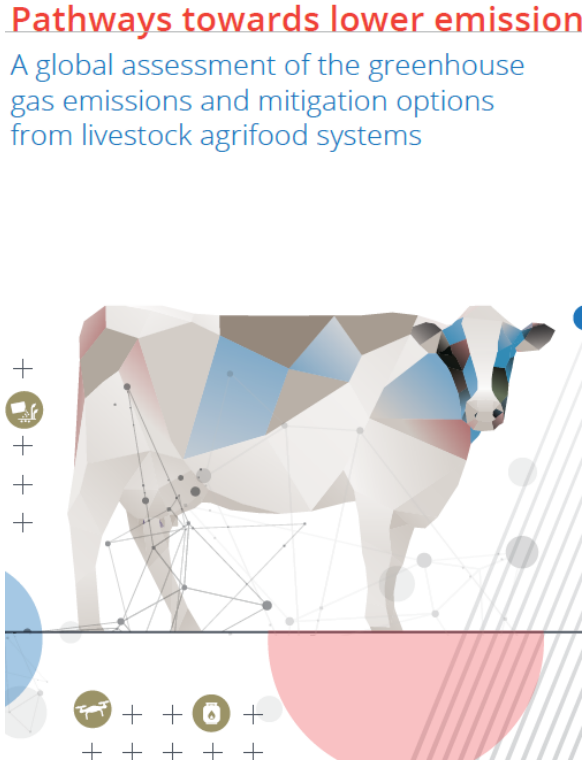
(Global Livestock Environmental Assessment Model (fao.org))




## Pathways towards lower emissions

Pathways towards lower emissions (fao.org)



# Many thanks

# for connecting and networking

Erda Celer – FAO Türkiye
Erda.Celer@fao.org

LinkedIn