Greenhouse gas emission profiles of European livestock sectors

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Overview

There are increasing concerns about the ecological footprint of global animal production. We assessed regional variations in dairy, beef, pork, poultry and egg production, and related greenhouse gas (GHG) emissions in the EU-27. The MITERRA-Europe model was used to calculate annual nutrient flows and GHG emissions from agriculture in the EU-27. The sources of GHG emissions included were enteric fermentation, manure management, direct and indirect N_2O soil emissions, cultivation of organic soils, liming, fossil fuel use and fertilizer production.

The dairy sector has the highest GHG emission in the EU-27, directly followed by the beef sector. Enteric fermentation is the main source of GHG emissions (36%) followed by N_2O soil emissions (28%). On a per kg product basis, beef has by far the highest GHG emission, followed by pork, eggs, poultry and milk. Among EU countries a large variation in GHG emissions per unit product exists, which offers perspective to improve efficiencies and lower environmental impacts of animal production.

Methods/Approach

Analyses were made with the MITERRA-Europe model (Velthof et al., 2009), which calculates annual nutrient flows and GHG emissions from agriculture in the EU-27. Main input data were derived from CAPRI (crop areas, livestock distribution, feed inputs), GAINS (animal numbers, excretion factors, NH_3 emission factors), FAO statistics (crop yields, fertilizer consumption, animal production) and IPCC (CH_4, N_2O, CO_2 emission factors). First, we quantified the area of agricultural land needed for animal feed production. Next, we assessed GHG emissions from different sources related to livestock production. Then, based on these data, average GHG emissions per livestock sector and animal product were determined. The sources of GHG emissions included were enteric fermentation, manure management, direct and indirect N_2O soil emissions, cultivation of organic soils, liming, fossil fuel use and fertilizer production.

Results

Livestock farming has a significant impact on global warming with about 10% of the total GHG emissions in the EU-27. This share would be even larger if emissions from land use change as a result of soybean cultivation in Latin America and those associated with transport, processing and packing were included. The dairy sector has the highest GHG emission with an annual emission of 195 Tg CO_2-eq in the EU-27, followed by the beef sector with 192 Tg CO_2-eq (Fig. 1). Enteric fermentation was the main source of GHG emissions in the European livestock sector (36%) followed by N_2O soil emissions (28%). On a per kg product basis, beef had by far the highest GHG emission with 22.6 kg

CO_2-eq/kg, milk had an emission of 1.3 kg CO_2-eq/kg, pork 3.5 kg CO_2-eq/kg, poultry 1.6 kg CO_2-eq/kg, and eggs 1.7 kg CO_2-eq/kg (Table 1). However, among EU countries large variations in GHG emissions per unit product exist, which can be explained by differences in animal production systems, feed types and nutrient use efficiencies. There are, however, substantial uncertainties in the base data and applied methodology such as assumptions surrounding allocation of feeds to livestock species. Results of our study provide insight into differences in GHG sources and emissions among animal production sectors for the various regions of Europe.

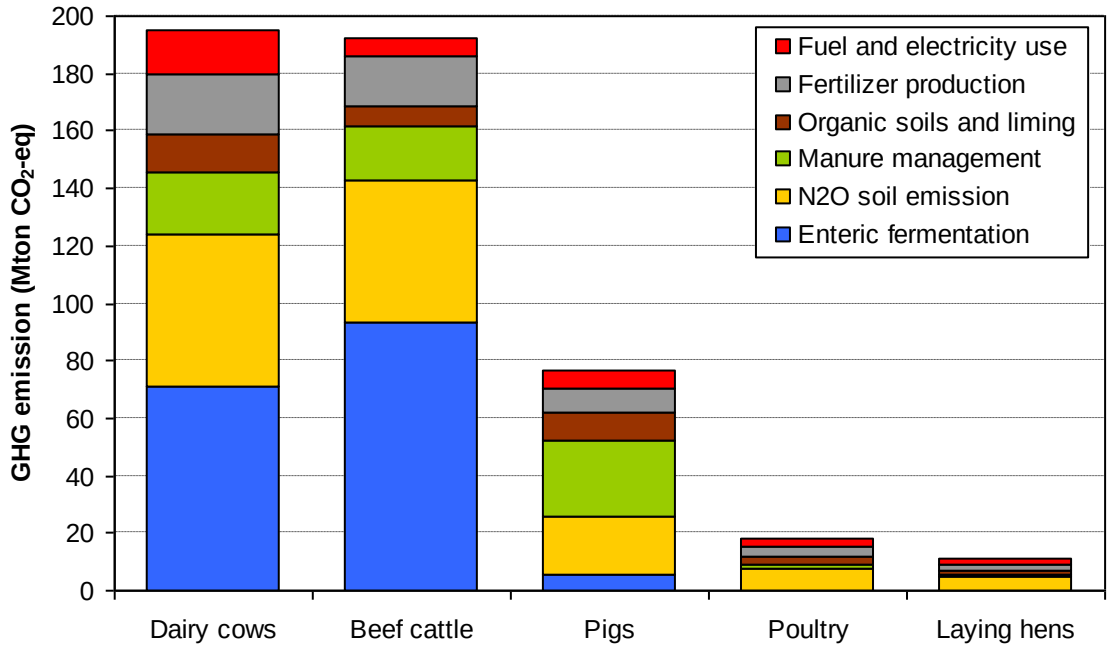

Fig. 1. Total greenhouse gas emissions from the various emission sources associated with livestock production in the EU-27

Table 1. Feed conversion ratio (mass of dry weight feed consumed per mass of product produced), surface area for feed and forage, and GHG emission per kg product for the EU-27.

Product	Feed conversion ratio kg feed/kg product	Surface area for feed and forage m^2/kg product	GHG emission kg CO_2-eq/kg product
Cows' milk	1.2	2.4	1.3
Beef	19.8	37.3	22.6
Pork	4.1	11.7	3.5
Poultry	3.3	9.2	1.6
Eggs	2.8	9.0	1.7

References

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