CLIMATE AND WATER CHALLENGES OF LIVESTOCK PRODUCTION

Water pollution and Greenhouse Gas (GHG) emissions from livestock production are gaining increasing political attention. Nutrient loads from dairy production represents a persistent problem in the Baltic Sea region. GHG emissions from livestock production make a considerable contribution to global warming, and this has led to a heated debate on the need to reduce livestock production. Seen from a policy perspective, measures to effectively reduce water pollution due do livestock production related nutrient loading exists. In contrast, the possibilities to reduce livestock related GHG emissions are currently limited – the only real option being to reduce the number of productive animals. Livestock production is, indeed, facing great challenges.

LIVESTOCK PRODUCTION – AN INTENSE PRODUCTION SYSTEM

Livestock farming is a very intense production activity requiring heavy investments. Modern dairy farms provide a good example: they are efficient production plants with intensively bred cows and specialized milking robots and processing systems. Choosing the diet is at the heart of milk production. From the life cycle perspective, the key products of dairy farms are milk, meat and milk-based products such as cheese. Milk is produced using grass, and concentrates made out of cereal crops, rape seed and soy, as feed. Large crop land areas are needed to produce the required feed for livestock. Manure management and pasturing constitute essential aspects of dairy farming. Manure, which may be perceived as a side product of milk production, represents significant value as fertilizer for crop production.

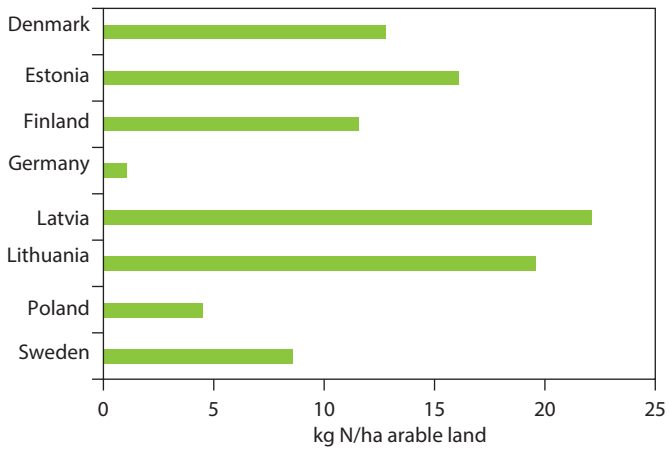

Figure 1. Country-wise nitrogen loads (kg/ha) from agriculture to the Baltic Sea.
Data source: HELCOM PLC-6 and Eurostat

NUTRIENT LOADS TO WATER: A KNOWN, BUT PERSISTENT PROBLEM

While manure is a valuable fertilizer, it is also the source of special challenges to dairy and livestock production. Due to regional concentration of dairy and livestock farming, excess manure and resulting nutrient loads represents a huge problem for water protection in many parts of the Baltic Sea. A related problem is the accumulation of phosphorus in soils, which arise due to the fact that manure, compared to the nutrient demand of crops, contains too much phosphorus relative to nitrogen. As farmers typically determine the amount of manure to be applied with reference to the optimal level of nitrogen fertilization, this means that excess phosphorous is applied. The types of manure storage facilities and spreading technologies, along with the amount of manure applied per hectare, are important determinants of the actual nutrient loading. Nitrogen loading varies considerably across countries (see Figure 1). Loads, as a result of manure and mineral fertilizer application, are the highest in Latvia, followed by Lithuania and Estonia; loads are also quite high in Denmark and Finland.

GREENHOUSE GAS (GHG) EMISSIONS: A NEW CHALLENGE WITH NO EASY SOLUTIONS

The main source of GHG emission from dairy farming is methane (CH_4), originating from animal enteric fermentation. Manure storage and spreading also give rise to methane emissions, but compared to the enteric fermentation they only play a minor role. Livestock production also gives rise to indirect GHG emissions which result from the large land areas that are used to produce fodder. Currently there are no efficient means to reduce methane emissions from enteric fermentation, and as methane is a very aggressive greenhouse gas, this represents a significant challenge. Agricultural methane emissions vary across the Baltic Sea countries, as shown in Figure 2, with Denmark and Poland having the smallest per unit emissions.

POLICY BRIEF NO. 2

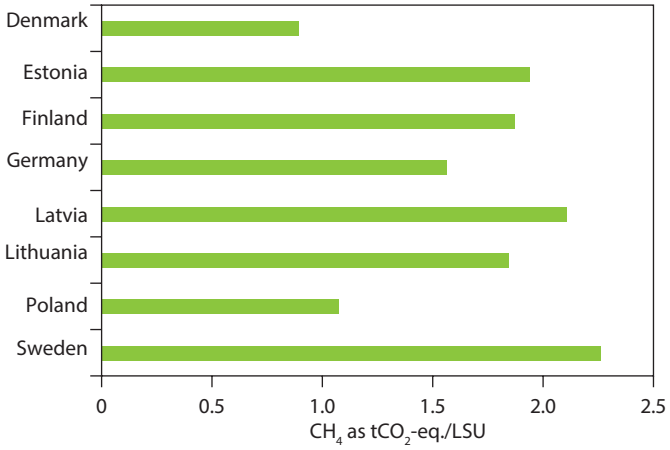

Figure 2. Country-wise per livestock unit (LSU) methane (CH_4) emissions as carbon dioxide equivalents (CO_2-eq.) from agriculture in the Baltic Sea region.

Source: Data calculated by the CAPRI model for the year 2030.

EFFICIENT MEASURES FOR WATER PROTECTION

There is significant potential for livestock farms to reduce their nutrient loading beyond the current level. The measures, which may be applied, include preventing leakages from manure storage facilities, ensuring sufficient storage capacity to enable adjusted timing of manure application, investing in improved manure spreading technologies (injectors), and reducing the level of fertilization (especially phosphorus.)

A promising technological solution for dairy farms and other livestock farming is separation of nutrients from manure. Nutrient separation facilitate agronomically efficient use of both nitrogen and phosphorus on a larger scale, depending on the crop specific needs for the different nutrients. Promoting the adoption of separation technologies requires stronger regulation than the one currently in place. Examples from USA and Ireland show how tightening regulation has led to innovative solutions for poultry manure with nutrient trading and transport both in nearby areas and in longer distances. Implementation of nutrient separation technologies in relation to dairy manure is technically more challenging than in relation to poultry manure, but a number of solutions has been developed and ideally these should be used at a larger scale. Tighter regulation could be used to speed up the implementation of new separation technologies.

EFFICIENT MEASURES FOR GHG EMISSIONS

Adjustments of livestock diets, or implementation of new manure spreading and storage technologies, may serve to reduce GHG emissions from dairy and livestock farms, but the resulting impact on GHG emissions will only be marginal. Other means for farms to reduce their carbon footprint, however, are to produce biogas from manure and grass, and to increase the share of grasses, legumes and perennials in the cultivation. In order for the former to be relevant at a larger scale, it is a prerequisite that the market opportunities for selling biogas are in place.

In the short-run, a quick but harsh GHG abatement measure is to reduce the number of animals. In the longer run, however, finding new ways of reducing methane emissions from enteric fermentation are needed. This can either be through the development of new emissions reducing livestock-diet ingredients, or the development of technologies for capturing methane emissions from barns.

RECOMMENDATIONS

1. Societies should promote biogas production based on manure and grasses, to replace fossil fuels, thereby considerably reducing the climate impacts of livestock production. Investments in large biogas facilities would improve productivity and investment support could be used to facilitate this development.
2. Nutrient separation technologies represent significant potential as a means to reduce excess nutrient loading caused by the uneven regional distribution of livestock production. Nutrient separation facilitates transport of nutrients from livestock farms to crop production farms, and reduce the need to use climate-unfriendly mineral fertilizers. It also decreases risks of phosphorus accumulation on soils. Nutrient separation and transport can be promoted by tighter regulation. If combined with biogas production, both climate and water quality benefits can be obtained simultaneously.
3. A shift to manure spreading using injection technology provides considerable water quality benefits compared to broadcast spreading, and injection technologies should be mandatory on farms not relying on nutrient separation.
4. Measures with synergistic effects in terms of water and climate targets should be promoted.
5. The above mentioned aspects should be included in the upcoming CAP financial program for 2021-2030 and in national programs.

CONTACT DETAILS AND ACKNOWLEDGEMENTS

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This policy brief disseminate results from the **BONUS Go4Baltic** project (2015-2018). The aim of the project is to

- provide policy relevant advice and recommendations for reductions of the eutrophication in the Baltic Sea in coherence with climate and agricultural policies
- examine national and international environmental and agricultural policies across the Baltic countries, to analyze and propose cost-effective solutions
- point at coherence and conflicts between the policies.

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