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RUMINANTS AND METHANE 1:4

European cattle and sheep production

GHG EMISSIONS FROM RUMINANTS

In recent years, greenhouse gas (GHG) emissions from ruminants have gained increased attention. Anthropogenic emissions of enteric methane (CH4) are estimated to be responsible for about 18% of global GHG emissions (Gerber et al, 2013). The most important GHG are methane (CH4) and nitro oxide (N2O). Enteric emissions of CH4 from domesticated ruminants, arising primarily from the fermentation of feed in the rumen, are considered to be one of the three largest sources of methane on a global scale. The emission of methane by cattle and sheep is a major pathway for carbon loss that results in reduced productivity (Johnson and Johnson, 1995). If the energy could be rechannelled into weight gain or milk production, it would increase production efficiency while reducing methane emission to the atmosphere. At pasture, the


Norwegian red dairy cows on pasture. Photo: L. Aanensen

challenge in managing pastoral ecosystems is to reach an equilibrium between pasture growth and animal intake. When proper grazing management practices are adopted, animal productivity increase while CH4 emissions per kg of animal product decreases (DeRamus et al, 2003). In Norway, GHG emission from agriculture are estimated to account for 4.5 % (SSB, 2018) of the total national emissions. Of this percentage, ruminant production is calculated to be responsible for about 60% (Harstad and Volden, 2009).

DAIRY

The EU dairy sector is the second biggest agricultural sector representing more than 12% of the total agricultural output (EPRS, 2017a). The production system dominates both in volume (163 million-litre milk per year) and value. The specialized dairy farms are concentrated mainly in the north-western part of EU with the largest (by economic size) found in the UK, Germany, Slovakia and Denmark. In 2015, about 23.4 million dairy cows were found in EU with 4.2 million being in Germany making up 18% followed by France (15%) and United Kingdom (10%). The most common breed is the Holstein-Freisian. The EU dairy sector is facing a number of challenges and the production must become more resilient and sustainable (EPRS, 2017a). From an economic point of view, it is necessary to decrease production costs and at the same time, increase efficiency of natural resources such as water and feed. Resilient dairy farming includes good animal welfare with healthy animals (EIP-AGRI, 2018).

There are around 215 000 dairy cows in Norway (March 2019), after a slight decrease (-1.62%) from 2018. Trøndelag is the county with most dairy cows (approx. 47 000) representing more than 20% of all the dairy cows in Norway. The legislation of animal welfare in Norway states that dairy cows must be allowed access to pasture at least eight weeks during summer. According to species-specific needs for grazing, regulations suggest that there should be grass available for grazing in these pastures. However, use of barren enclosure with gravel or concrete surface is allowed as an alternative (Mattilsynet, 2010).

Most of the enteric methane measurement from ruminants have been done on dairy cows. Feeding (e.g. Hammond et al, 2011), genetics (e.g. Breider et al, 2019) and additives (e.g. Martinez-Fernandez et al, 2018) are the main research areas. This is related both to indoor feeding and grazing in several countries e.g. United Kingdom, New Zealand, and Denmark (Hammond et al, 2014; Szalanski et al, 2019; Wall et al, 2019).

SHEEP

The European sheep production represents only a small proportion of the total EU livestock output and the sector does not ensure self-sufficiency. That is why the EU is among the world's main importers of sheep and goats, mainly from New Zealand and Australia. As sheep production is among the less remunerative agricultural activities, larger investments or recruitment of younger generations of farmers is difficult. The sheep sector can however deliver both food, wool and public values such as landscape and biodiversity conservation which are demanded. Sheep are well adapted to utilize less favoured areas not suitable for intensive farming. EU holds about 86 million head of sheep reared on 14% of the EU farms. Among the highest density of sheep in Europe are found in Sardinia in Italy (EPRS, 2017b) and in Norway (FAOSTAT, 2012). Meat is the main product but also milk, cheese and wool products

Norwegian White Sheep on island pasture. Photo: V.Lind

Hereford cattle. Photo: H. Sund

bring in significant revenue. Meat accounts for only about 2% of the total EU meat marked (700 000 t) and milk less than 2%. Dairy sheep dominate Southern Europe with 92% of the sheep milk produced in Greece, Spain, France, Romania and Italy. On the contrary, sheep meat production is dominating in Northern Europe (UK, Ireland but also Spain and France). Number of sheep in Norway is approximately 1 million winterfed ewes. During the summer and grazing season, about 2.5 million sheep (ewes with lambs) are released on rangeland pastures for four months in average.

There has been much less focus on the GHG emissions from the sheep industry compared with the dairy industry. Some studies have been done in Brail, New Zealand and China (Hammond et al, 2013; Savian et al, 2014; Savian et al, 2018; Shou-kun et al, 2016) focusing mainly on grazing animals. Under Norwegian conditions, focus should be on spring and autumn grazing in smaller paddocks where the farmer has the option to change management thus affect methane emissions. For sheep grazing natural pastures, the picture is more complex and thus should, according to our view, be dealt with at a later stage.

SUCKLER COW

Within the EU, the beef sector is one of the most important agricultural productions. In 2014, the EU bovine livestock herd reached approximately 88 million animals. Two thirds of the EU beef come from dairy herds, but structural changes in the dairy sector affect the beef sector to a large degree. In Norway, the number of suckler cows are relatively stable at around 92 000 heads. More than 50% of the animals are in Trøndelag, Oppland, Rogaland and Hedmark counties.

To reliably estimate the enteric methane contribution from beef cattle to the total global emissions requires extensive CH_4 emission data from beef cattle experiencing different management conditions worldwide (van Lingen et al, 2019). Such measurements conclude that predicting beef cattle CH_4 production using energy conversion factors, as applied by the Intergovernmental Panel on Climate Change (IPPC), indicated that adequate forage content-based and region-specific energy conversion factors improve prediction accuracy and are preferred in national or global inventories. No such data are available under Norwegian conditions and thus any predictions of CH_4 emissions from beef cattle are based on models and data inputs from other countries.

NEED FOR RESEARCH IN NORWAY

Worldwide, there are work both in vitro, in vivo and by modelling for estimating enteric methane emissions from ruminant. So far very little research in vivo has been performed in Norway and we have very few data to use when estimating the national emission factors. Thus, most of the data, publications and policies regarding GHG emission from ruminant production used in Norway are based on modelling. Key data for these models comes from other models or in vivo measurements from other countries with different climate, feed and production structures. The question is how reliable the Norwegian emission factors for ruminants are?

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