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Danish dairy farmers have top performance with regards to ammonia emissions

Using data on milk production and associated ammonia emissions, The Danish Agriculture and Food Council has compared the efficiency of milk production for the EU member states for the period 1990-2012. The analysis concludes that Denmark has a leading position on reducing ammonia emissions. Thus, Denmark has the lowest ammonia emissions per produced kg milk compared to other large milk producing member states in the EU.

Highlights:

- Since 2004, Denmark has had the lowest ammonia emissions per kg milk produced among the 10 largest milk producers in the EU.
- According to the latest figures, Denmark has ammonia emissions of 2.9 grams of NH_3 per kg milk, while Italy, France, Poland and Germany have emissions of 5 grams of NH_3 per kg milk or more. The emissions in the Netherlands and Belgium are between 3 and 4 grams of NH_3 per kg milk.
- The Netherlands, Poland and Belgium have achieved the largest reductions in ammonia emissions per kg milk from 1990 to 2012 - 73 pct., 67 pct. and 52 pct. respectively. However the ammonia emissions in these three member states were relatively high at the outset.
- Denmark has reduced its ammonia emissions per kg milk by 47 percent in the period 1990-2012, while reductions in the UK, Ireland and France are less than 25 percent.

Introduction

Denmark is one of the 10 largest milk producing member states in the EU. In 2012, these member states supplied approximately 85 percent of the total EU milk production. The four largest producers - Germany, France, UK and the Netherlands - produced 79 billion kg milk, equivalent to 56 percent of the total production.

In 2012, Denmark was the 9th largest milk producer with an annual production of 4.9 billion kg, followed by Belgium with an annual production of 3.1 billion kg. In 2013, Denmark's milk production amounted to 5.0 billion kg.

The latest internationally comparable data on ammonia emissions for the EU member states are from 2012. Therefore, 2012-data are used for comparison in this analysis.

The source for the emission data used is the European Environmental Agency (EEA). The available data on ammonia emissions from dairy cattle include emissions from housing, manure storage and land application of manure. Internationally comparable data on emissions from dairy grazing cattle are not available, and could therefore not be included in this analysis.

Figures for Portugal and Spain do not include delivery

It should be noted, that - according to the National Centre for the Environment and Energy (DCE) - the available emission figures for dairy cattle in Portugal and Spain does not include emissions from land application of manure. Instead, these emissions are attributed to crop production. Therefore, although these two member states appear to have relatively low emissions of NH₃ per kg milk, their emission data are not directly comparable to the emission data from the other member states.

Denmark is in the lead

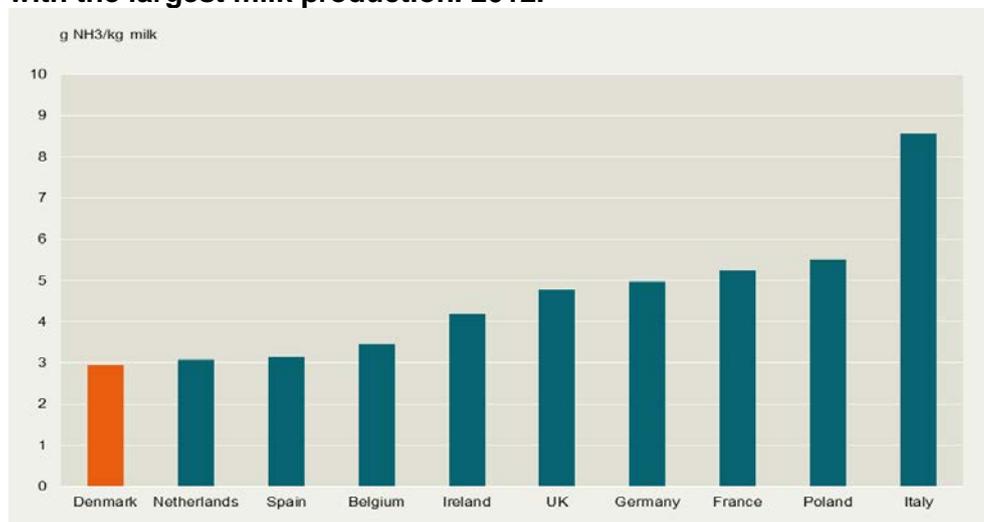
Denmark has the lowest emissions of NH₃ per kg milk

Comparison of the annual production of milk with the associated ammonia emissions for the 10 largest milk producing member states shows, that Denmark has the lowest emissions of NH₃ per kg milk (unit emissions).

Marginal changes in emissions from 2011-2012

From 2011-2012, ammonia emissions per kg milk increased in Ireland, the UK and Italy, while it decreased in Germany, Poland, the Netherlands (and Spain). In Denmark, France and Belgium emissions per kg milk remained unchanged. In general, there were only minor changes in the ammonia emissions in the period.

Ammonia emissions per kg milk for the 10 EU member states with the largest milk production. 2012.



Note: The figure shows the 10 largest milk producing member states, accounting for approximately 85 pct. of EU milk production. Emissions from grazing cattle are not included.

* Exclusive emissions from application of cattle manure.

Source: Agriculture and Food on the basis of Eurostat, [apro_mk_pobta] and the European Environment Agency - National emission (LRTAP Convention) database.

As illustrated in the figure above, Denmark emits 2.9 grams NH₃ per kg milk, while the other nine largest producers all emit more than 3 grams of NH₃ per kg milk. Thus, France, Poland and Italy emit more than 5 grams of NH₃ per kg milk, while Germany, Ireland and the UK emit 4-5 grams. The Netherlands and Belgium emit between 3 and 4 grams of NH₃ per kg milk.

Inclusion of emissions from grazing dairy cows is not likely to change the overall result

As mentioned, emissions from grazing animals are not included in the figures. The share of grazing dairy cattle is low in Denmark, compared to the other EU member states. Therefore, an inclusion of emissions from grazing animals is not likely to change the position of Denmark as the lowest emitter. On the contrary, an inclusion would most likely increase the emissions of a number of member states with higher shares of grazing animals.

Changes in emissions from 1990 to 2012

During the last 20 years, the largest milk producing EU member states, all reduced emissions of NH₃ per kg milk. Thus, from 1990 to 2012 ammonia emissions per kg milk dropped by 10-70 percent.

The Netherlands had the largest reduction: 73 pct.

The Netherlands is the country that reduced ammonia emissions per kg milk the most in the period 1990-2012. Emissions per kg milk were reduced by around 8 grams, equivalent to approximately 73 pct. This, however, should be seen in light of the fact that at the outset the Netherlands had relatively high emissions of 11.2 grams per kg milk - that is, almost twice the level of emissions in Denmark at the same time. The same applies to Poland, which was also at a higher level than Denmark in 1990.

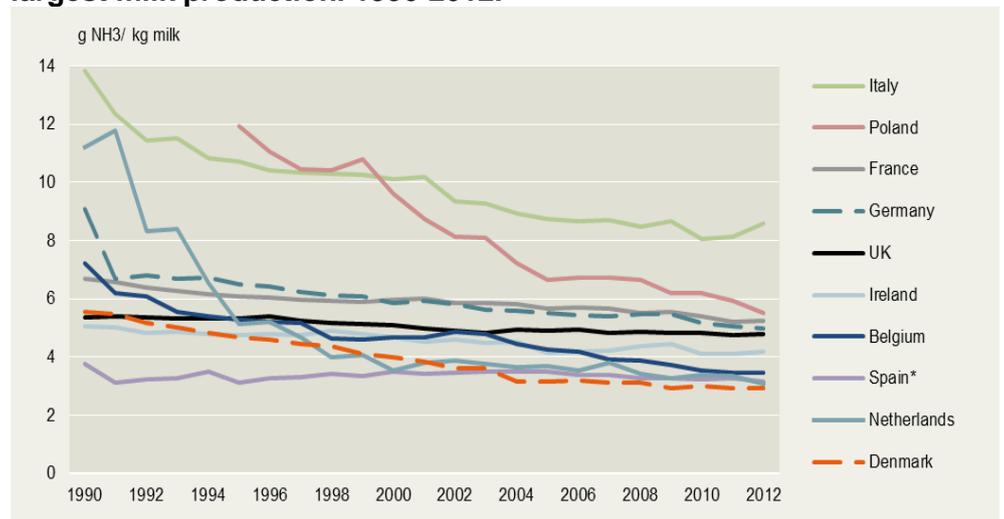
Danish reduction at 47 pct.

In the same period, Denmark reduced its emissions by 2.6 grams or just over 47 per cent. This is equivalent to the fourth largest reduction among the 10 largest milk producing member states in the EU. The reduction in Poland was 67 pct., and in Belgium 52 pct., equivalent to the third largest emission reduction.

Reductions in UK, Spain, Ireland and France are among the lowest. For these member states, reductions were less than 25 pct.

Since 2004, Denmark has had the lowest ammonia emission per kg milk among the 10 member states. See the figure below.

Ammonia emissions per kg milk for the 10 EU member states with the largest milk production. 1990-2012.



Note: The figure shows the 10 largest milk producing member states, accounting for approximately 85 pct. of EU milk production. Emissions from grazing cattle are not included.

* Exclusive emissions from application of cattle manure.

Source: Agriculture and Food on the basis of Eurostat, [apro_mk_pobta] and the European Environment Agency - National emission (LRTAP Convention) database.

The Netherlands, Poland and Belgium had large reduction potentials

The Netherlands, Poland and Belgium – the three member states that reduced unit ammonia emissions the most - all had larger emissions at the outset, compared to Denmark. Therefore, they had a relatively larger reduction potential.

Milk production and reduction of NH₃ per kg milk. 1990-2012.

Land	NH ₃ per kg milk 1990 (gram)	NH ₃ per kg milk 2012 (gram)	Reduction 1990-2012 (pct.)	Milk production 2012 (mia. kg)
The Netherlands	11.2	3.1	72.6	11.7
Belgium	7.2	3.4	52.3	3.1
Denmark	5.5	2.9	46.8	4.9
Germany	9.1	5.0	45.3	29.7
Italy	13.8	8.6	38.1	10.5
Poland	**11.9	5.5	***66.6	9.9
France	6.7	5.2	21.8	24.3
Ireland	5.1	4.2	17.5	5.4
Spain*	3.8	3.2	16.5	6.1
UK	5.4	4.8	10.6	13.6

Note: The table shows the 10 largest milk producing member states, which account for over 85 pct. of the EU milk production. Emissions from grazing animals are not included.

* Exclusive emissions from application of cattle manure.

** Year 1995

*** The reduction in the period 1995-2012.

Source: Agriculture and Food on the basis of Eurostat, [apro_mk_pobta] and the European Environment Agency - National emission (LRTAP Convention) database.

Improved breeding, feeding and manure management has reduced emissions

The Danish reductions are mainly due to improved breeding, feeding and manure management. Higher genetic level and better feeding has led to higher milk yield per cow. While the production of milk has remained fairly constant in recent years, the number of dairy cows has been reduced. This has contributed to a significant reduction of unit ammonia emissions.

Improvements of manure management have reduced ammonia emissions significantly in Denmark. The improvements include among other, natural crusts and covering of slurry tanks, as well as other methods such as band spreading and slurry injection instead of broad spreading.

Emissions for EU-28

When all the EU member states are taken into consideration, Denmark still obtain a favorable position with respect to emissions of ammonia related to milk production.

Denmark has a leading position

Among the 28 EU member states, Denmark has the third lowest unit emissions. The two member states with lower emissions are Portugal and Lithuania.

Differences in registration practices

However, as mentioned above, the emission figures for Portugal do not include emissions from land application of manure. This most likely means that Portugal has higher emissions than Denmark.

Lithuania apparently has the second lowest unit emissions. This is somewhat surprising, since Lithuania in previous reporting had much larger unit emissions in milk production. In the present reporting, ammonia emissions only comprised one third of the previous reporting, where Lithuania only achieved a 24th place among the 28 EU member states. Therefore, it should be taken into consideration, that there might be an error in the present reporting from Lithuania.



Ammonia emissions per kg milk. 2012. All EU member states.



Note: Emissions from grazing cattle are not included in the calculation. Bulgaria and Romania each emit more than 15 g NH₃ per kg milk and is not included in the figure. * Emissions in 2008. ** Excluding emissions from application of cattle manure.

Source: Agriculture and Food on the basis of Eurostat, [apro_mk_pobta] and the European Environment Agency - National emission (LRTAP Convention) database.

Member states with unit emissions above 6 grams

The highest unit emissions are observed in Hungary, Slovakia, Italy, Slovenia and Croatia (as well as Bulgaria and Rumania) with emission above 6 grams NH₃ per kg milk. Of these member states, Italy is the largest milk producer (no. 5 of the EU member states) with a market share of 7.5 pct.

Member states with unit emissions between 4 and 6 grams

There are 14 member states that emit between 4 and 6 grams NH₃ per kg milk. Among these are several of the largest milk producers in the EU, including France, Germany, UK and Poland.

Data and sources

Eurostat Data on production are from Eurostat: <http://ec.europa.eu/eurostat>. Data on milk production is extracted from the time series [apro_mk_pobta], comprising "Cow's milk collection" on an annual basis.

EEA Emission data are obtained from the European Environment Agency: <http://acm.eionet.europa.eu/databases>
Data on e.g. ammonia emissions are reported by each member state according to common guidelines from the "Convention on Long-range Transboundary Air Pollution" (CLRTAP). The applied ammonia emission includes emissions from housing, manure storage and land application of manure. Portugal and Spain does not include emissions from spreading of manure in their dataset.

Since there are no publicly available data on emissions from grazing cattle, such emissions are not included in the present analysis.

DCE Dialogue on statistics, including the data on emissions for Spain and Portugal: Mette Hjorth Mikkelsen, Danish Centre for Environment and Energy (DCE). February 2015.



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