REDUCING THE EMISSIONS INTENSITY OF LIVESTOCK PRODUCTION:

CASE STUDIES OF SUCCESS

GLOBAL RESEARCH ALLIANCE
ON AGRICULTURAL GREENHOUSE GASES

NETHERLANDS

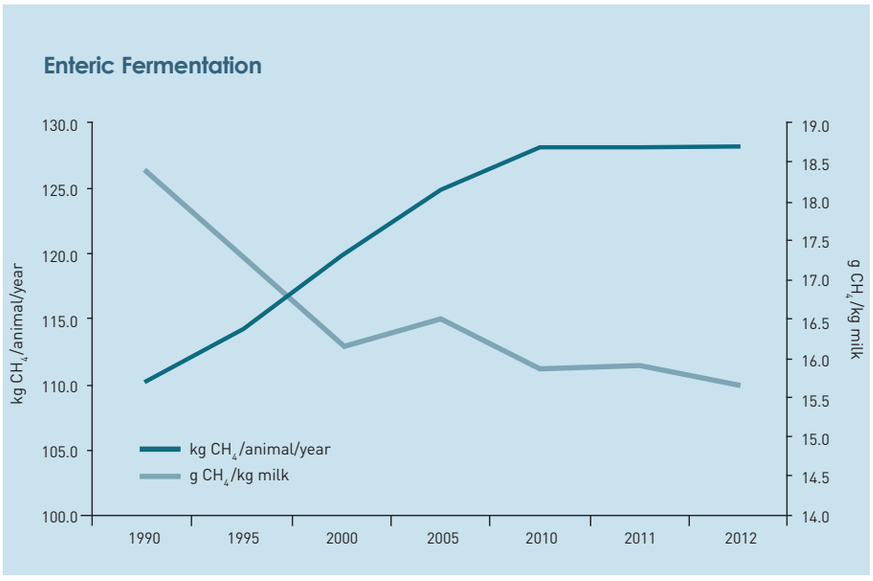
Scale: National
System: Mixed
Sector: Dairy

Reducing the emissions intensity of dairy production on Dutch farms

Increased milk production per individual cow resulted in lower emissions from enteric fermentation per kg of milk produced. Keeping dairy cattle more indoors and less at pastures resulted in increased CH4 emissions from manure management. The combination of these two activities resulted in lower CH4 emissions per kg of milk produced.

Background

Agriculture contributes around 10% to the national economy in the Netherlands, while the milk production accounts for 1.2% of the national economy. Milk is produced at 20,000 farms, of which 95% are specialised dairy farms, keeping an average of 85 dairy cows. In the northern half of the country grass is the dominant feed for dairy cattle, whilst in the southern half of the country a mixture of grass and maize silage is used. Farms produce on average 14,000 kg milk per hectare of land.



Key actions & their effects on productivity, income & food security

Total milk production in the Netherlands is determined by European Union (EU) policy on milk quotas, which has remained unchanged for the most part between 1990 and 2012. During that same period the milk production per cow increased from 6000 to 8200 kg per animal per year. This increase was a result from breeding programmes for milk yield, as well as an increase in individual feed intake. In order to comply with the milk quota, numbers of mature dairy cattle had to decrease to counteract the effect of increased milk production per animal.

Another development during the same period was the increased average time dairy cattle were kept indoors. For efficiency reasons more farmers kept their dairy cattle during the whole year indoors. This increased the amount of liquid manure in the stables and decreased the amount of manure on pastures.

Effect of actions on emissions intensity of livestock production

The number of dairy cattle has steadily reduced from 1990-2012 while milk production per animal increased (see table). Although emissions factors for enteric fermentation increased due to increased production per animal, the amount of CH_4 emissions per unit of milk produced decreased (from 18.4 to 15.6 g CH_4/kg milk). As the total milk production remained stable, total CH_4 emissions from enteric fermentation decreased from 7.6 Mt CO_2 eq to 6.6 Mt (-13%) between 1990 and 2012. Intensification of production led to a decrease in CH_4 emissions from enteric fermentation.

The CH_4 emission factor for the manure management of mature dairy cattle increased between 1990 and 2012. The increased milk production per animal was a result of higher feed intake per animal, which resulted in increased manure production per animal and an increase in the volatile solids content of cattle manure.

Besides the increased manure production per animal there was another shift in manure management. The proportion of the two dairy manure management systems (liquid manure in the stable and manure production on pasture land) changed between 1990 and 2012. The share of the amount of liquid stable manure increased, while simultaneously the amount of manure produced on pasture land during grazing decreased. With animal housing manure showing a 17-fold higher EF for CH_4, the new practice of keeping the herd indoors during the whole year increased methane emissions per animal. CH_4 emissions from manure management increased per animal. As this was not counteracted by the increased milk production per animal the emission from manure management per kg milk increased from 4.7 gr to 5.3 g per kg of milk produced.

The combined effect of enteric fermentation and manure management resulted in a decrease in CH_4 emission per kg of milk produced from 23.0 to 20.9 g.

National Inventory Report 2014								
	Units	**1990**	**1995**	**2000**	**2005**	**2010**	**2011**	**2012**
Mature dairy cattle	number (1000s)	1878	1708	1504	1433	1479	1470	1484
Milk production	kg milk/animal/year	6003	6596	7416	7568	8075	8063	8192
Total milk production	kt/year	11274	11266	11154	10845	11943	11853	12157
Feed intake	MJ/animal/day	279.6	292.1	306.7	321.2	333.2	333.8	334.9
Methane from Enteric fermentation	kg CH_4/animal/year	110.3	114.3	119.9	124.9	128.1	128.3	128.2
Methane from Enteric fermentation	g CH_4/kg milk	18.4	17.3	16.2	16.5	15.9	15.9	15.6
Total manure production	t/animal/year	23.0	23.0	25.0	26.0	26.0	26.0	26.0
Liquid manure production	t/animal/year	16.0	16.0	18.0	20.5	23.5	23.5	23.5
Manure production on pasture	t/animal/year	7.0	7.0	7.0	5.5	2.5	2.5	2.5
Methane from manure management	kg CH_4/animal/year	28.0	30.8	33.6	38.0	43.1	43.1	43.1
Methane from manure management	g CH_4/kg milk	4.7	4.7	4.5	5.0	5.3	5.3	5.3
total CH_4 emission	g CH_4/kg milk	23.0	22.0	20.7	21.5	21.2	21.3	20.9

Co-benefits and trade-offs

It is difficult to relate benefits and trade-offs to a single activity in dairy farming in the Netherlands during the mentioned period. The increased milk production per animal coincided with increased specialism at individual farms. Dairy farms grew in size became more specialised and changed housing systems.

Farmers increasingly kept the animals indoors as a measure of efficiency. To some extent this has led to a reaction from the public and consumers. People consider dairy cattle on pasture as an important aspect of the Dutch rural landscape, and many question the welfare situation of dairy cows that are kept indoors year round. This has led to measures stimulating farmers to put more dairy cattle on pasture which could influence future production systems.

Implications for adaptation

Climate change in the Netherlands is expected to result in higher average temperatures and more erratic rainfall with fewer but heavier rainstorms. Since high productive animals cope less well with increasing temperatures, this could imply a potential trade-off between productivity and adaptation to climate change. However, keeping dairy cattle indoors year round can make farms more resilient to the effects of climate change, as temperatures inside stables are easier controlled, and feeding of the animals is less dependent on daily growth of grass and on pasture condition.

Challenges to implementation and adoption

In April 2015 the EU quota system ended. As farmers anticipated an increased demand for Dutch milk and dairy products, they started to increase their herd size, and overall milk production is expected to increase. This may result in in increased CH_4 emissions from dairy farms. The challenge will be to come with measures and activities that increase total farm production without increasing CH_4 emissions.

Although the EU milk quota will end, farmers are still faced with limits to increase production. The total farm production is limited by the land available in relation to the manure production at farm level.

Further information

Wageningen UR

www.wageningenur.nl/en.htm

National Inventory Report

bit.ly/1GAMvPm

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