

# Global Dairy Farmers and climate change

Impressions from the 2010 Global Dairy Farmers congress in Europe

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## 1. Introduction

It is a dynamic time for dairy worldwide: high prices for dairy commodities in 2007 followed by low prices and the end of 2008 and early 2009. In 2010 prices were better but a lot of farmers still had to recover from the impact of the dairy crisis of early 2009 and the financial crisis that also had a big impact on the dairy sector.

Global Dairy Farmers is a worldwide network of leading dairy farmers who meet each other on a regular base and discuss the developments in dairy in general and more specific what this means for their strategy. The network is supported by a number of business partners to make it possible to organize a congress and to do research that can be used as input for the discussions in the network. In 2010 Global Dairy Farmers held their congress in Europe. The tour started in Western Europe. In the first leg farms were visited in the Netherlands, Germany and Poland. In the second leg the group travelled to Romania and Hungary.

Global Dairy Farmers has asked a group of researchers to look at the topic climate change for this congress. For this purpose GHG emissions have been calculated for a number of GDF members. These calculations and the mitigation strategies of the farmers have been input for the discussion at the congress. This report is a result of this process, it covers research that has been done in advance and it also shows the results of the discussion in the network on climate change. This report also gives a summary of the traditional GDF regional discussion on major trends and challenges and the strategic choices the farmers are making.

We would like to thank Global Dairy Farmers and his business partners for the good and pleasant cooperation. Special thanks for Theun Vellinga, Jon Hillier, Gillian Hayman, Catherine Phelps and Karen Christie for helping us with the climate change study.

## 2. Climate change

### 2.1 *The dairy industry and climate change*

Climate change is one of the important aspects within sustainability. Sustainability, also in the dairy industry, comes more and more in the picture. In 2002 Nestlé, Unilever and Danone started the Sustainable Agriculture Initiative (SAI) Platform. Today this initiative has 25 members with estimated sales of US\$ 300 billion among which the founders, CocaCola, Fonterra, FrieslandCampina, Kraft foods, McDonalds, Pepsico and Novus. The members actively share the same view on sustainable agriculture seen as a "productive, competitive and efficient way to produce agricultural products, while at the same time protecting and improving the natural environment and social/economic conditions of local communities". Some more information about the SAI can be found in Appendix 1.

The International Dairy Federation (IDF), representing over 50 different member nations producing 86 per cent of the world's milk, has organized a consultation and review process concerning greenhouse gases (GHGs) because, in their words, "most industries are now being challenged to quantify and reduce their carbon footprints, or emissions of GHGs to the atmosphere; businesses in agriculture and food production are no exception. Both food processors and farming organisations within the international dairy industry have recognised the need to calculate their impact on the environment in terms of GHGs".

Some important research on GHGs has been done by the Food and Agriculture Organization (FAO) of the United Nations. The FAO-report 'Livestock's long shadow' (2006) reports that total livestock contributes 18% to total worldwide GHG-emissions. Per country the contribution of livestock varies: for the USA and Western Europe this figure is below 10%, for New Zealand it's above 40%. According to the FAO-dairy report on greenhouse gases (FAO, 2010) the contribution of dairy to GHG-emissions is 4% (so less than a quarter of total livestock). The average emission per kg of milk is about 2.4 kg CO<sub>2</sub>-equivalents with higher values for less developed countries with

low milk production per cow and low digestibility of feed as figure 2.1 shows. More background information on this issue can be found in appendix 2 containing the presentation that was used at the GDF meeting. The farming systems of GDF-members, all in more developed countries with higher milk production per cow and better digestibility figures for feed, will result in values around 1.5 kg CO<sub>2</sub>-eq or lower.

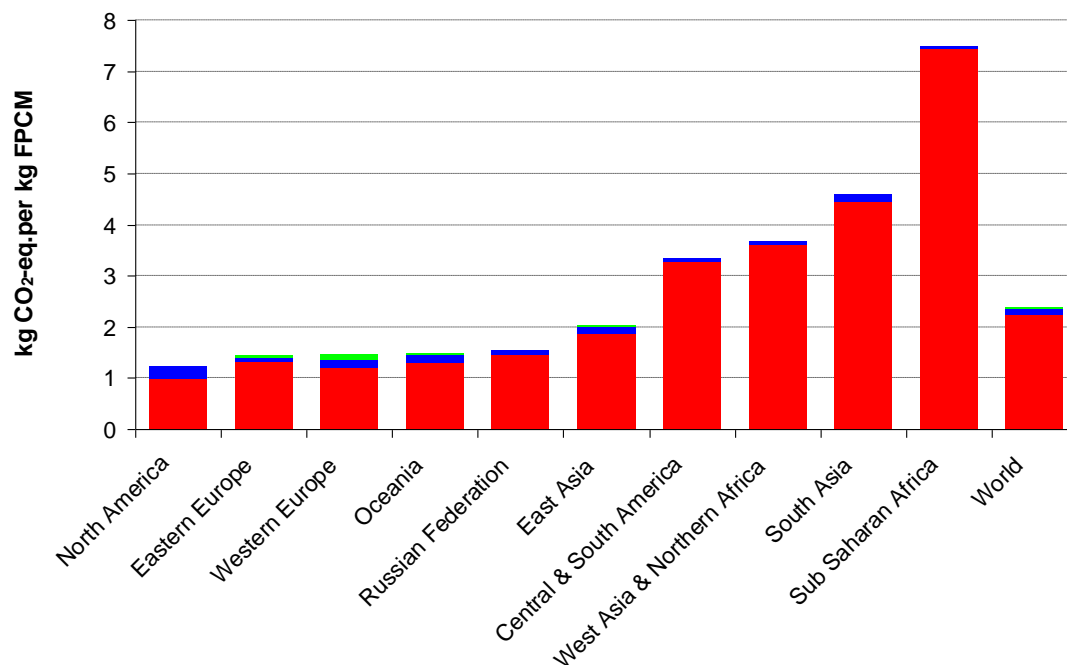


Figure 2.1 kg CO<sub>2</sub>-eq. per kg Fat and Protein Corrected Milk (FPCM)  
Source: FAO (2010)

## 2.2 Calculations for GDF dairy farms

Many tools to calculate the GHG-emissions mainly use the IPCC-guidelines. The Intergovernmental Panel on Climate Change (IPCC) has set guidelines to calculate GHG-emissions from the different sources by means of a Life Cycle Analysis (LCA) approach. If few data are available calculations are made at the Tier1-level as has been done in parts of the FAO-report of 2006. Most tools use the Tier2-level which also has been used in the FAO-dairy study of 2010. For instance the Tier2-level takes into account the milk production per cow and differences in digestibility between feed stuffs and regions whereas the Tier1-level doesn't distinguish in milk production per cow and little in digestibility.

Some tools are supported by the dairy industry like the Cool Farm Tool (still in development). Others come from research like the DGAS-calculator from the University of Tasmania and Dairy Australia. For this report we use a spreadsheet from the FAO, a base for the calculations in the FAO-dairy study, for all available GDF-farms and also the DGAS-calculator for the available Australian GDF-farms in the case of tree planting.

The system boundaries for calculations of GHG-emissions are normally set following the 'cradle to farm gate'-approach. This means:

- Pre-farm- and on-farm-emissions are taken into account. Pre-farm-emissions are, for instance, emissions from fertilizer production and production of off-farm concentrates and roughage.
- Emissions from buildings and equipment (b&e), infrastructure and services (i&s) are not incorporated. The same holds for carbon stocks of land use & land use change except for soy.

- Also emissions from the processing and distribution of milk and milk products after the milk has left the farm are not part of the 'cradle to farm gate'-approach.

We have calculated GHG-emissions in kg CO<sub>2</sub>-eq per kg of milk for 7 GDF-farms, 3 from Australia, 1 from the USA, 1 from Scotland and 2 from the Netherlands. Both the current situation (2009/2010) and (except the Scotland case) a mitigation strategy have been examined. Table 2.1 shows the results.

Table 2.1 GHG-emissions in kg CO<sub>2</sub>-eq per kg milk for dairy farms of some GDF-members in 2009 without and with a mitigation strategy

Farm	CO <sub>2</sub> -eq/kg milk 2009	Mitigation strategy	CO <sub>2</sub> -eq/kg milk with mit. Strat.
1 Australia	1.15	Add oil and tannins to the diet	1.07
2 Australia	1.38	Add oil and tannins to the diet, use nitrification inhibitors, increase milk production/cow/year with 250 kg, less heifers and less bulls	1.16
3 Australia	1.43	Add oil and tannins to the diet, use nitrification inhibitors, reduce energy usage (kW) with 15%	1.24
4 USA	0.89	Decrease young stock with 1.7 per 10 cows	0.85
5 Scotland	0.96	Not available	
6 the Netherlands	1.02	Replace 1 kg DM grass silage/cow/day by 1 kg DM maize silage	1.01
7 the Netherlands	1.14	Increase milk production/cow/year with 840 kg = 10% less dairy cattle	1.12

Source: own calculations with FAO-tool

Figure 2.2 shows the results in a graph for the year 2009 (the values in the second column of table 2.1) as well as the shares of N<sub>2</sub>O (nitrous oxide: 1 kg N<sub>2</sub>O is about 300 CO<sub>2</sub>-eq), CH<sub>4</sub> (methane: 1 kg CH<sub>4</sub> is about 20 CO<sub>2</sub>-eq) and CO<sub>2</sub> (1 kg CO<sub>2</sub> is 1 CO<sub>2</sub>-eq) in total GHG-emission. Main conclusions from table 2.1 and figure 2.2 are:

- The Australian farms with milk productions around 5500-6000 kg/cow/year have higher GHG-emissions per kg milk than the other farms with 7500-10000 kg milk/cow/year.
- The share of methane (CH<sub>4</sub>) in total GHG-emission for the European farms is lower due to supposed higher digestibility of the feed ration in Western Europe.
- The Australian farms, however, achieve more reduction with their mitigation strategies in which the use of oil and tannins in the cow's diet is an important factor.
- A combination or package of measures is necessary to obtain substantial reductions in GHG-emissions. Both the packages of farms 2 and 3 and the stacking of the measures of farms 4, 5 and 7 give reductions of more than 5% whereas separate measures often remain below 2-3% reduction.
- The developers of the DGAS-tool have incorporated CO<sub>2</sub>-sequestration by trees into their model. In their calculations one hectare with trees fixes 5,000 to 40,000 kg CO<sub>2</sub>-eq per year (depending on age, yearly rainfall and type of tree). The farms 1, 2 and 3 already have some area with trees and expand those areas in their mitigation strategies. Because land is often scarce and important for feed production we have excluded the land with trees (and their CO<sub>2</sub>-sequestration) from the calculations.

The Dutch farm 7 uses a digester. Table 2.1 and figure 2.2 show values for this farm including the digester. Without digester the values would be about 10% higher. It must be noted that only reductions by the digester in methane and nitrous oxide emissions from manure are included. The reduction in CO<sub>2</sub>-emission because of the generated

electricity and heat, which saves fossil energy, from only manure is about 0.12 CO<sub>2</sub>-eq/kg milk for farm 7 (around 10%). Because the digester not only uses manure but also other products like energy maize the total reduction in GHG-emissions from the digester can be different. The 'cradle to gate'-calculation for this whole system hasn't been made yet nor are studies available which do GHG-emissions calculations for such a system in an integral way.

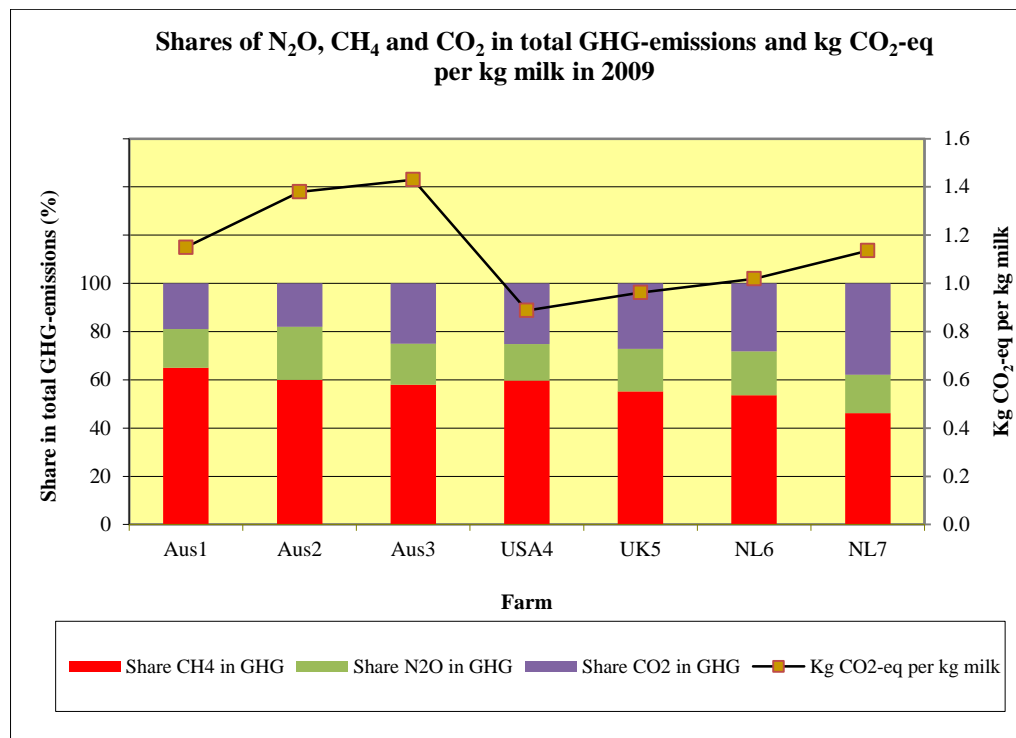


Figure 2.2 GHGs in kg CO<sub>2</sub>-eq per kg milk for dairy farms of some GDF-members in 2009 and the shares of N<sub>2</sub>O (1 kg N<sub>2</sub>O, CH<sub>4</sub> and CO<sub>2</sub> in total GHG-emission

Entrepreneurs are willing to implement (packages of) measures to reduce GHG-emissions when there is a benefit for their farming business. Sometimes other factors, like shade and shelter for the cows by trees in the Australian summer, also play a role in the entrepreneurial decisions. One entrepreneur suggests that planting trees on lower quality land combined with more focus on the remaining land can avoid suppression of overall production.

### 2.3 Concluding remarks

- As the FAO-studies show there are big differences in GHG-emissions per kg milk between dairy farming systems. Intensive farming systems with higher productions per cow and good feed quality achieve lower emission rates;
- The main issue in feed quality concerning GHG-emissions is digestibility;
- Mitigation measures on the farm often refer to efficiency: try to produce more milk with the same or even less inputs;
- Some additives in the cow's diet like oils and tannins look attractive in reduction of GHG-emissions from cattle;
- (planting of) trees can be used for CO<sub>2</sub>-sequestration but land for trees is often in competition with land for feed production;
- Packages of measures, geared well to one another, can lead to much higher reductions in GHG-emissions than single measures. That makes integration of reduction in GHG-emissions into the whole farm strategy more necessary.

### 3. Global Dairy Outlook

#### 3.1 Program GDF discussion

One day of the GDF congress is focussing on GDF as a discussion group. During this congress the following subjects were addressed:

- Dairy Outlook: looking at developments in milk price and margins
- Farmer strategies of two members
- Climate change (see chapter 2)
- New housing systems (loose housing)
- Regional discussions on trends and challenges.

This report will give a summary of the presentation on dairy outlook and the regional discussion.

#### 3.2 Dairy Outlook

During the previous congresses of GDF (Moscow, 2007 and Beijing, 2009) the participants discussed trends and challenges per region as input for a dairy outlook. In 2007 milk prices were rising as figure 3.1 shows for California and margins were pretty positive. California is the state with the highest share in the milk production of the United States and with many big dairy farms, using a footloose system.

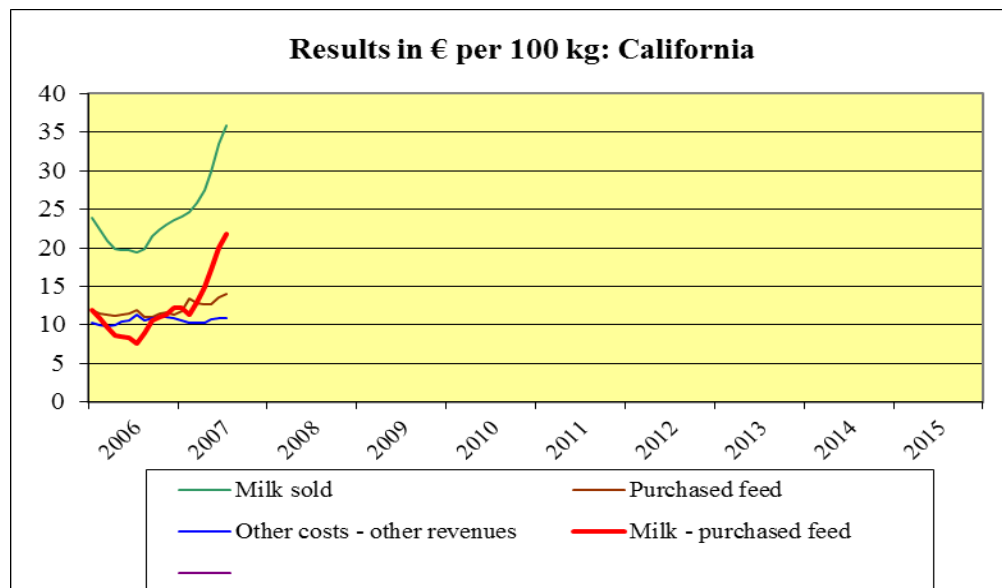


Figure 3.1 Milk price, costs of purchased feed, milk - purchased feed and other costs - other revenues in € per 100 kg milk in California for the years 2006-2007

Source: USDA

Table 3.1 gives the summary of the GDF analysis of the environment in 2007. Labour and societal preconditions became more important and growth was the main strategy.

	Oceania	USA	Eastern Europe	Western Europe
<b>Production and sales</b>	Limited increase in output	Stable	Increase	Slight increase
<b>Societal preconditions</b>	Reduction of greenhouse gases	Increasing influence. End of BST and hormone use	Very limited	Very important
<b>Local aspects</b>	Water Labour	Water	Availability of animals. Management level	Good infrastructure Good climate
<b>Economy</b>	Increasing cost price	Cost of biofuels, feed increasing	Milk prices and cost increasing	Stable prices
<b>Strategy</b>	Increases in scale	Increases in scale Collaboration	Increases in scale	Growth in farms. Added value from chain

Table 3.1 GDF analysis of the environment in 2007

In 2009, when the GDF congress in Beijing was held, the situation was quite different. The milk prices were very low. In California the milk price didn't even cover the costs of purchased feed as figure 3.2 shows.

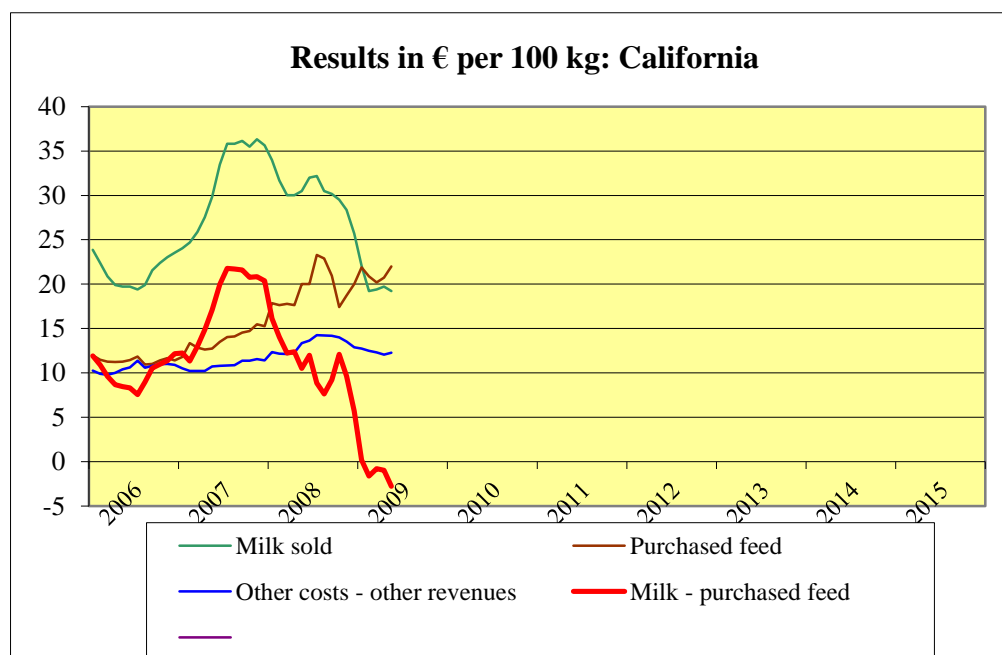


Figure 3.2 Milk price, costs of purchased feed, milk – purchased feed and other costs – other revenues in € per 100 kg milk in California for the years 2006-2009  
Source: USDA

Table 3.2 gives the summary of the GDF analysis of the environment in 2009. The emphasis was much more on cost control and labour and societal preconditions were less in the picture. Growth was still an important strategy but more attention was given to integration, both horizontal and

vertical. Resilience was one of the new themes which brought pasture based systems more in favour than in 2007 because of their relative independence of feed costs.

Current developments	Oceania	China	North America	South America	Europe
Economy/ market	Milk price low, but costs more under control.	Effect melamine Strong support government	Crisis situation: price milk low,/feed high. Difficult to get loans	Brazil: milk and feed price reasonable	Government support will remain (indirect)
Societal preconditions	Water Green House Gasses	Milk quality (very basic)	At the moment no issue	Hardly an issue, environmental demands could arise	Strong: environment, landscape, animal welfare
Labour	Availability no problem, longer term better image needed to attract young people	Availability no problem, quality of management major issue	At the moment no issue	Available, quality is sometimes a problem	
Future strategies		Strong integration, large processors combined with large dairy farms or more gradual development of family owned farms.	First surviving! On farm level: - control on feed prod. - own processing Chain level: Discussion price + prod. control	Gradual growth in size. Chain integration will be stronger.	Further scale increase of Differentiation of types of farms and milk. Stronger horizontal and vertical integration.
Innovations	High capacity robotic milker (Aus) Innovations related to improving grassland efficiency +reduction of GHG-emissions	IT, in line testing of milk quality e.g. antibiotics test.	Needed in financing models.	New financing models (loans to buy land)	

Table 3.2 GDF analysis of the environment in 2009

During the GDF congress in September 2010 spirits were moderately optimistic. Milk prices were much better than in 2009 but not at the high level of 2007. Figure 3.3 supports this mood: at the end of 2010 prices were slightly better than in September. Price projections of FAPRI (OECD and FAO outlooks show corresponding developments and levels) for the next 5 years expect milk and feed prices at the same level as today (first part of 2011).

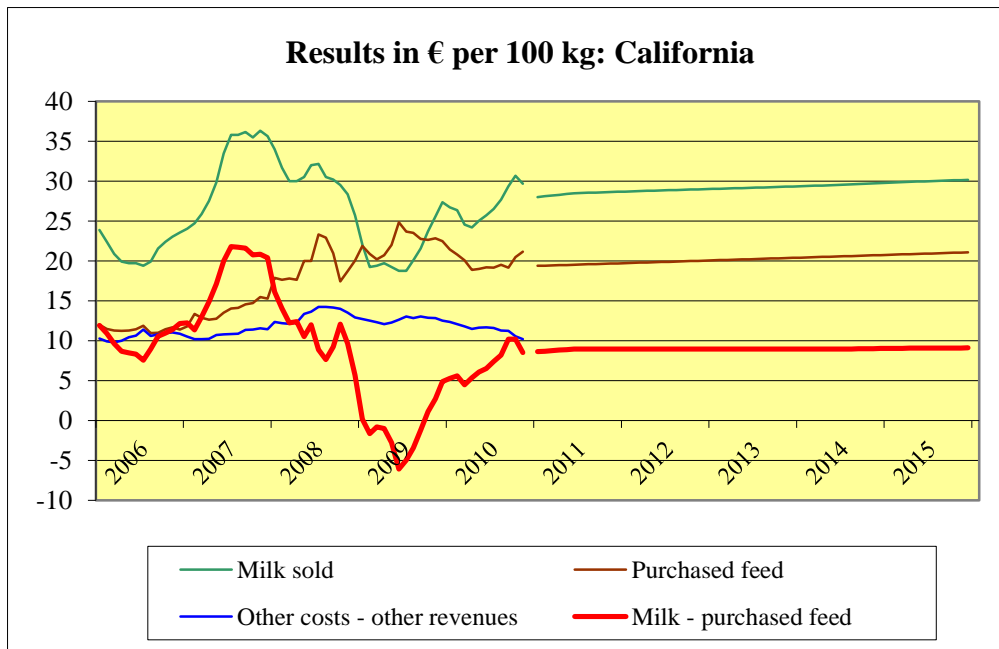


Figure 3.3 Milk price, costs of purchased feed, milk – purchased feed and other costs – other revenues in € per 100 kg milk in California for the years 2006-2010  
Sources: USDA, FAPRI

It is important to notice that those outlooks can't predict price volatilities like we have seen in the last five years. Some buffers (and the costs for those buffers) must be incorporated in farm strategies and predictive cost calculations to cope with price volatilities. Also remarkable is the development in the costs for purchased feed over time: these costs are considerably higher than about five years ago and because of competition with food, fuel and fibre these costs more tend to increase somewhat further than to decrease.

Keeping a finger on the pulse is therefore becoming more and more important. A list of 11 Key Performance Indicators (KPIs), formulated by Rabobank, can be helpful in the farm management:

- *Costs for feed and crops per 100 kg milk*
- *Costs for feed and crops in % of milk price*
- *Life milk production in kg milk per cow*
- *Milk production in kg per hour/annual milk production in kg per FTE*
- *Debts per 100 kg milk*
- Milk price per 100 kg milk
- Labour (paid + private withdrawals) per 100 kg milk
- Capital costs (interest, rent and lease) per 100 kg milk
- Tax income per 100 kg milk
- Capacity to set aside per 100 kg milk (farm income + depreciation – private withdrawals)
- Structure of total cost price milk

GDF members have mentioned the first five of these KPIs as very useful in their farm management.

### 3.3. Regional trends and challenges

Also in Romania the traditional regional discussion on main trends and challenges was held during the Global Dairy Farmers conference. In this chapter a short summary is given of the main discussion points per region. In is important to note that this summary reflects the opinion of the farmers and business partners present at the congress.

## China

### *Current*

### *developments*

The milk quality remains a big issue. The melamine scandal is still not resolved. This will probably be a large problem for dairy in China. Parents don't want to buy Chinese milk powder for their children. They want the best for their child, so they buy European powder. The estimation is that the milk quality is better on the large scale farms. The laws (e.g. permits) are often unclear and the interpretations of the rules differ from town to town. This makes investments risky.

Some foreign investors (e.g. Fonterra) are building large scale dairy farms, in order to assure a high quality milk supply for the processing industry. Another complicating factor for dairy farms is the difficulty to secure the (production of) feed needed for the cows. There is no private ownership of land, most plots or fields are small and it is difficult to organize an efficient feed production. This is also the reason why China is interested in the feed industry (it is difficult to grow your own crops so there is a market for concentrates and imported feed). China is actually importing feed from USA and Australia.

Labor is cheap in China, but management qualities are quite poor.

### *Market*

A high milk price is possible, if you produce high quality of milk. However this is only 1% of the market. The feeding costs are difficult to predict, because of the reasons mentioned before. China is securing land abroad (e.g. in Africa). The exact goal for this is not very clear, it could be to secure raw materials, but also to secure food and feed production.

There is a lot of pressure on China to increase the value of their currency. This could influence possibilities of import and export very much.

### *Strategies*

The main strategy seems to be to invest in large scale dairy farms (500+). Dairy processors are making these investments in order to secure their milk supply. So this is a development towards strongly integrated chains. Some processors seem to choose for investing in the development of family farms. The goal is to gradually scale up these farms up to 150 cows. The Chinese GDF member was impressed by the European family farms, with their high quality of management.

## Western

## Europe

### *Current*

### *developments*

Major changes ahead, the quota system will end and farmers are preparing for this. Some farmers still have their doubts if the quota system will end, because some countries are protecting their own farmers (e.g. France). The expansion of the EU causes a rise of the EU budget and also causes political discussion about the budget for the agricultural policy. Some discussions are going on about reallocating the budget (e.g. from west to east).

The availability of labor is a problem in certain regions. Especially the quality of the available labor could be a major issue in the near future. Young people are not interested very much in working on dairy farms. It is important to create a career perspective for these young people.

The change of the climate seems an advantage for the western European farmers (compared with Eastern Europe)

### *Market*

The expectation is that there will be a differentiation in products but also in different milk streams (different origins of milk). In some countries strong regional markets will remain. The expectation is that the milk price will be volatile, but in general will be quite good. The main challenge is to cope with fact that the costs have increased in the past 4 decades because of inflation and the milk price has not increased at the same level.

### *Strategy*

Increasing scale will be the dominant farm strategy in Western Europe. Technology will be important to achieve this increase in size in combination with a level of management and a (labor) efficient production.

## Eastern Europe

### *Current developments*

Laws and rules are changing nearly daily, rules on animal welfare are increasing but the enforcement of the rules is not always very strict. There are differences between EU and Russia. In Poland, Romania and Hungary sometimes EU regulation is implemented very strict. Sometimes there seems to be a way around these rules. It takes sometimes a lot of time to get permissions for new investments. An example from Romania was that during this process new houses were built within a circle of 500 meter of the building site. Because of this only a permission for 500 cows was given instead of 1000.

Pollution of water is an discussion point but till now no strict rules, or the rules are not enforced. Greenhouse gasses or climate change is no issue. Concerning animal welfare EU rules are in place, but actually only enforced if there is an immediate cause to audit the farm.

There is a lack of suitable workers. The mentality of the workers is very variable. Several negative examples were mentioned. But also positive experience are reported, e.g. for Romanian workers. In some regions guards are necessary to guard the farmers possessions, especially with foreign owners. The number of cows per labor unit is increasing in Poland and Hungary, due to higher labor prices. This is not happening in Romania, due to culture and lower labor costs.

### *Economy and market:*

Volatile milk prices are expected in Eastern Europe. Within the fluctuations because of the world market there will also be big difference in prices depending on milk quality. Good quality milk gives significant higher prices in the East part of the EU (but till now not in Russia). SMC standards in the EU part will lower annually after 2015 with 100.000 cells (750.000 - >400.000). In contrary with Western Europe the demand for milk is price sensitive, so will be less with high milk prices. Hungary is exporting milk to Romania and Russia. Strong improvement of land production in Poland and Hungary is possible and will be achieved because of high prices for crops and grains: currently there are differences between 2-9 tons wheat /ha. Romania is following. In general costs are increasing because of higher land prices and labor costs. New investments in new buildings are expensive, partly caused by strict legislation (e.g. snow). For the non Euro countries strong inflation of the local economy causes severe currency problems. There are nearly no possibilities for loans in Romania. Therefore investments have to be done from the cash flow. Inflation and currency forces farmers to invest immediately their surplus from the cash flow.

### *Innovations and strategies:*

More and more western technology will be used, but with less ICT (resilient technology). Especially around cities there will be a strong demand for milk. Especially high quality milk (EU standard) is asked by western dairy processors. Some chain partners are investing in setting up complete chains for milk by co-investing in groups of bigger farms (500-1000 cows) and processing milk themselves.

## Australia

### *Current developments.*

Water is still the main (environmental) issue in Australia. The drought is causing competition between different users: (1) urban areas, (2) wetlands, (3) farms and (4) recreation. The farms use about 80% of the water. There is also a competition within agriculture between the different sectors, which sector uses the water most efficient? With a green party in the government the question is: Who will get what? There is no real pressure on other environmental issues, like on use of fertilizer.

The main issue with animal welfare is about bobby calves. Most bull calves are slaughtered at a young age. A public debate is held on this issue, initiated by Animals Australia. In other sectors like the pork industry there are also discussions on animal welfare. Interesting is that the super markets want free range pork meat from the own country as a standard for fresh meat. But they also import processed meat originated from traditional systems.

Labor is still difficult but somewhat easier than a couple of years ago. The mining industry was very competitive, but because of the financial crisis this industry has collapsed more or less and more skilled workers are now available for dairy. On large dairy farms Filipino workers are hired, they are reliable workers and often highly skilled (veterinarians). They prefer to work and live in groups and are therefore more suited for the big dairy farms.

#### *Economy/market*

The milk price will follow the world market with its volatilities. Australia is used to these fluctuations. The current problem is however that the grain prices sky-rocketed (doubled), partly offset by above average rainfall. Other rising costs are costs for interest and energy.

In the chain Danone is entering as a new entry. In the retail Aldi en Costco (low cost strategy supermarkets) are challenging the other retailers. More processors are entering the dairy sector and there is an increased interest from Chinese people in Australian (and New Zealand) dairy industry (farm and processor level).

#### *Future strategies and innovations*

More farmers supply to smaller processors to create less independence from the big processor and chains. Robotic milking is making an entrance in the industry.

Current innovations that are implemented are sexed semen and cross breeding.

The traditional summary of the discussion can be found in table 3.3

	North America	Oceania	China	Western Europe	Eastern Europe
<b>Market</b>	Volatile. Will chains remain in business? Banks avoiding risks after financial crisis.	Milk price reasonable, increasing costs (feed). NZ is intensifying farm system to more input. Foreign take overs in NZ dairy chain.	Milk quality is still a major issue. Good price for high quality milk.	Volatile (is new for this region). Decoupling EU support. Support direct to by regional funds. End of milk quota.	Increase in regulation. Volatile prices. Big differences (EU\ non EU). Good price for high quality.
<b>Regulation\ society</b>	Differences between regions. NGO' s sometimes big influence. On certain theme' s.		Milk quality (basic), regulation often unclear. Differences in interpretation.	Big influence	Increasing influence. Enforcement of rules not (yet) very strict.
<b>Environment</b>	In urban areas: smell, dust, manure	Water, carbon footprint issue in NZ, not yet in Aus. .	Availability of feed related to ownership\ availability of land.	Strict demands (water, carbon footprint)	
<b>Animal welfare</b>	Increasing influence, Lot of negative publicity with hidden camera videos.	Increasing interest (killing of young calves)		NL: grazing discussion. EU discussion on animal welfare standards.	
<b>Labor</b>	Availability has improved, quality is sometimes problem	Available, often foreign labor (Fillipines) Competition with other sectors e.g. mining industry	A lot of cheap labor available. Quality of management is a problem.	Career-perspective in dairy?	Quality moderate, mentality variable
<b>Strategies:</b>	Take care of buffer (savings or land), chain integration, increase in scale will continue	Development in chain: big chain v.s. development of group of suppliers working with several small processors	Strong chain integration. Fonterra is establishing big dairy farms. Processing will follow. Development towards family farm?	Increase in scale. Automation. More genomics.	Concentration of chains. Connection with region is lost (e.g. Poland). Milk production will travel to the east and\ or will be concentrated around the cities.

Table 3.3 GDF analysis of the environment in 2010

## Literature

Food and Agriculture Organization of the United Nations, *Livestock's long shadow, environmental issues and options*, FAO, Rome, 2006

Food and Agriculture Organization of the United Nations, *Greenhouse Gas Emissions from the Dairy Sector, A Life Cycle Assessment*, FAO, Rome, 2010

## Appendix 1

*SAI-Platform: information from the website [www.saiplatform.org](http://www.saiplatform.org)*

The Sustainable Agriculture Initiative (SAI) Platform is the main food industry initiative supporting the development of sustainable agriculture worldwide.

Food industries are the biggest purchasers of agricultural raw materials. In order to rely on a constant, increasing and safe supply of agricultural raw materials, these must be grown in a sustainable manner. In 2002 Nestlé, Unilever and Danone created the Sustainable Agriculture Initiative (SAI) Platform, a non-profit organization to facilitate sharing, at precompetitive level, of knowledge and initiatives to support the development and implementation of sustainable agriculture practices involving the different stakeholders of the food chain.

The SAI Platform today counts [25 members](#), with estimated sales of US\$ 300 billion, which actively share the same view on sustainable agriculture seen as a "productive, competitive and efficient way to produce agricultural products, while at the same time protecting and improving the natural environment and social/economic conditions of local communities".

Among the latest services and deliverables produced, the SAI Platform published Principles and Practices for the Sustainable production of Arable and vegetable Crops, Coffee, Dairy and Fruit; a Benchmark Study of Agriculture Standards and a Short Guide to Sustainable Agriculture. The Platform also organized two conferences in Brussels and one in Washington on sustainable agriculture. It carried out seminars on water management, on certification schemes, and on organic vs. sustainable agriculture. It commissioned studies on green house gas measurement in dairy production, on carbon and water footprint of fruit production, on cost and benefits of sustainable green coffee production.

### Unique Characteristics:

1. SAI Platform is the **only global food industry initiative for sustainable agriculture**.
2. It **seeks involvement from all food chain stakeholders** willing to play an active role in the development, recognition and implementation of sustainable practices for mainstream agriculture.
3. The initiative **gathers and develops knowledge on sustainable agriculture**, which it then shares with all interested parties to reach common understanding of the concept and of its long-term implications.
4. It has **an inclusive approach, taking into account any valuable initiatives and concepts**, for instance elements from both integrated and organic farming, as far as they contribute to sustainable agriculture.
5. It aims at developing sustainable agriculture for the mainstream agricultural produce through a **continuous improvement process** that allows for an easier and more flexible adoption by farmers, worldwide.

**Appendix 2: Presentation with background information on carbon footprint.**

## Carbon footprint

Alfons Beldman ([alfons.beldman@wur.nl](mailto:alfons.beldman@wur.nl))  
 In cooperation with Theun Vellinga and Co Daatselaar (both Wageningen-UR), Dairy Australia and SA-platform

## Carbon footprint

- Content
  - General background and some developments since 2009 (GDF China)
  - Climate change related to dairy (FAO-report 2010)
  - GHG emissions of GDF – farms and mitigation strategies

## Carbon footprint: climate change?

- Climate change or climate gate?  
 (concentrations green house gases ppm, ppb, and global warming potential)

	Pre industrial	Current	GWP
CO2	277	382	1
CH4	600	1728	23
N2O	280	318	296

## Carbon footprint: climate change?

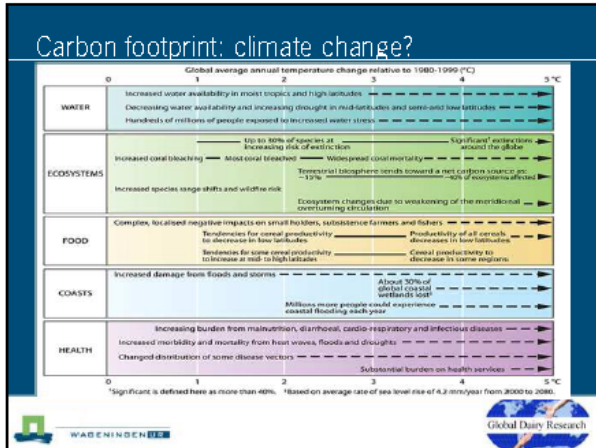
- Climate change or climate gate?

## Carbon footprint: climate change?

- Climate change or climate gate?

## Carbon footprint: climate change?

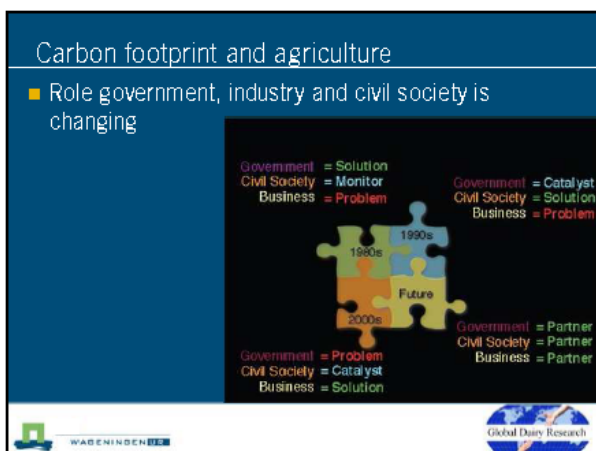
**Positive proof of global warming.**



- ### Carbon footprint: climate change?
- Climate policy is not just about emissions
    - Pressure on water supplies (quality and quantity)
    - Pressure on food availability
    - Pressure on energy
    - Pressure on diseases
    - Risks for disasters
    - Risks for ecosystem degradation
    - Mass migrations

- ### Carbon footprint: climate change?
- Should the focus be on mitigation or on adaptation?
    - The necessity of adaptation arises because of the failure to mitigate
    - So both strategies will have to be implemented within the context of other sustainability issues.

- ### Carbon footprint and agriculture
- Is climate change relevant for dairy farmers and the dairy industry?
    - Climate gate and failure of Copenhagen has supported the skeptics.
    - A new carbon economy is in development
    - Agriculture will be at the center of the adaptation economy.
    - Role of business, government and civil society is changing
- 



### Carbon footprint and agriculture

- Developments in food industry show climate change is high on the agenda.
- Example of changing roles: SAI-platform

**Active Members:** Nestlé, Unilever, Mondelez, CIO, Coca-Cola, Danone, etc.

**Affiliate Members:** CLM, etc.

## Carbon footprint and agriculture

- SAI platform working group dairy:
  - FrieslandCampina, Cayuga Marketing, Fonterra, General Mills, Groupe Danone, Kraft, McDonald's, Nestlé and Unilever
  - Working on two major issues:
    - Climate Change / Green House Gas emissions: development of cool farm tool
    - Indicators of Sustainable Dairy Production.



## Climate change and livestock

- FAO report livestock's long shadow (2006)
  - Big impact of livestock and especially dairy and beef on climate change
- 2010 update on livestock's report with focus on dairy.



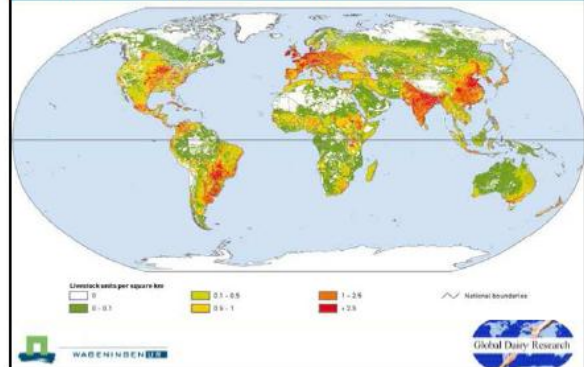
## Climate change and livestock

- Livestock related GHG emissions:
  - extensive systems main contributor

	Livestock related emission (10 <sup>6</sup> ton CO <sub>2</sub> e eq)	Percentage of total emission	Main contribution
CO <sub>2</sub>	2.70	9	Deforestation
CH <sub>4</sub>	2.20	35-40	Enteric fermentation
N <sub>2</sub> O	2.20	65	Manure



## Climate change and livestock



## Climate change and livestock

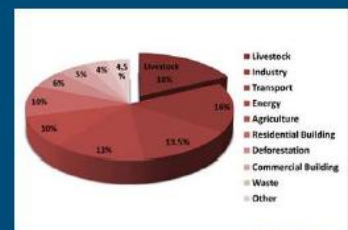
- Sources for emissions of GHG related to livestock
  - Fossil fuel (fertilizer, on farm, transport)
  - Methane (from manure/fermentation)
  - Land use change
  - Land degradation
  - N<sub>2</sub>O from manure

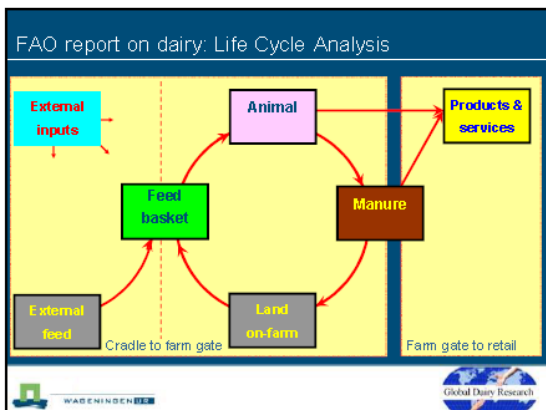


## Climate change and livestock

- Livestock major contributor to GHG emissions

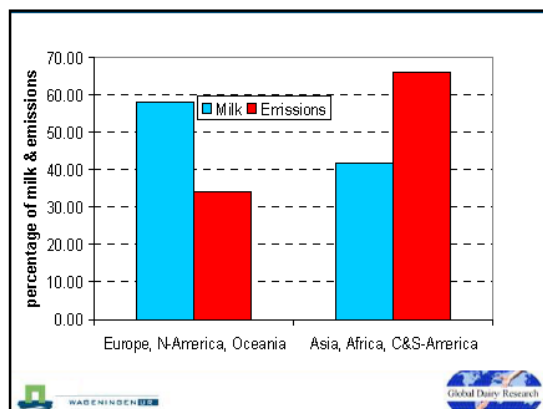
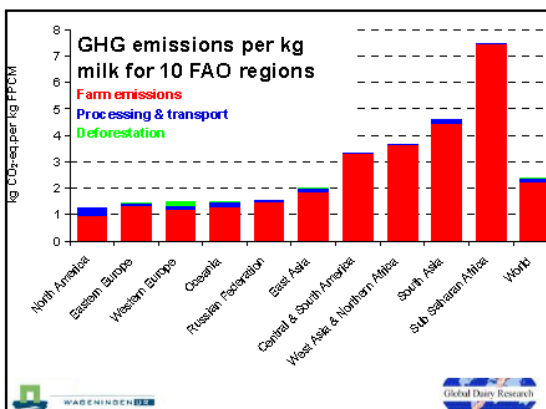
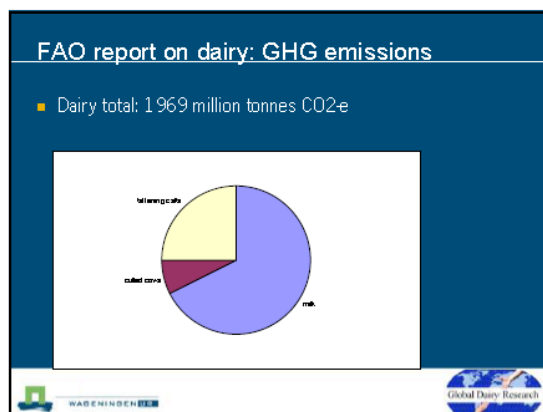
- 2010 FAO report on dairy
- LCA





- ### FAO report on dairy: system borders
- Cradle to retail
  - Not incorporated:
    - buildings and equipment (b&e);
    - infrastructure and services (i&s);
    - Carbon stocks of land use & land use change except for soy.

- ### FAO report on dairy: GHG sources
- Producing grass and feed
    - Production of fertilizer
    - Application of manure and fertilizer
    - Direct use of energy
    - Processing crops in e.g. concentrates
    - Land use change: deforestation → soy bean
  - Enteric fermentation
  - Manure storage
  - Farm gate to retail
    - Transport milk and animals
    - Processing raw milk
    - Production of packaging
    - Refrigeration
    - Transport to retail



### FAO report dairy: contribution of the dairy sector to global GHG anthropogenic emissions

	Mton	%
■ Milk, including processing	1 328	2.7
■ Meat from culled cattle	151	0.3
■ Meat from surplus young stock	490	1.0
■ Total	1969	4.0

■ Average emission milk: 2.4 kg CO<sub>2</sub>-eq/kg milk

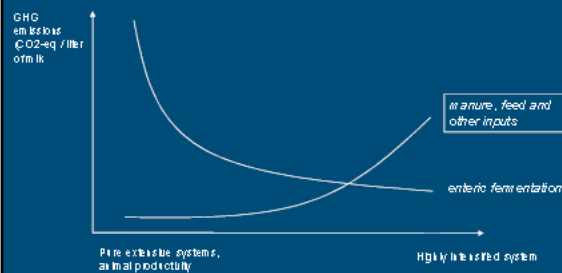


### FAO report dairy: effects of intensity on emissions of milk and meat

Country	Milk yield (kg/yr)	Digestibility of feed (%)	Dairy herd		Beef herd
			Emissions related to milk (kg CO <sub>2</sub> e/kg)	Emissions to meat (kg CO <sub>2</sub> e/kg)	Emissions to meat (kg CO <sub>2</sub> e/kg)
The Netherlands	7,400	75	1.43	9.68	36.9
India	1,000	49	5.34	30.44	103.22
India – urban dairy	2,500	55	2.36	14.46	n.a.
Brazil	1,200	60	4.48	24.28	86.54



### FAO report dairy: working hypothesis – milk production



### FAO report dairy: compared performances of dairy and beef herds

Country	Emissions to proteins (kg CO <sub>2</sub> e/kg protein)		Biological efficiency (kg of protein per /kg live weight)	
	Dairy herd	Beef herd	Dairy herd	Beef herd
The Netherlands	46	176	0.32	0.04
India	160	543	0.07	0.02
Brazil	128	455	0.06	0.02



### FAO report dairy: lower replacement rate as a mitigation option?

		RR= 33% (3 lactations)	RR= 12.5% (3 lactations)
Meat, carcass weights	t/year	280,428	206,081
Milk	t/year	10,585,000	10,585,000
Emission per kg animal protein	kg CO <sub>2</sub> e/kg protein	45.70	42.25
Emission per kg milk	kg CO <sub>2</sub> e/kg milk	1.55	1.44
Emission per kg meat	kg CO <sub>2</sub> e/kg meat	8.68	8.02



### FAO report on dairy: lower replacement rate as a mitigation option?

		RR= 33% (3 lactations)	RR= 12.5% (3 lactations)	RR= 12.5% (3 lactations) + Beef production
Meat, carcass weights	t/year	280,428	206,081	280,428
Milk	t/year	10,585,000	10,585,000	10,585,000
Emission per kg animal protein	kg CO <sub>2</sub> e/kg protein	45.70	42.25	47.52
Emission per kg milk	kg CO <sub>2</sub> e/kg milk	1.55	1.44	1.44
Emission per kg meat	kg CO <sub>2</sub> e/kg meat	8.68	8.02	15.66



## FAO-report: conclusions

- Milk & the related meat contributes 4 % to anthropogenic GHG emissions
- Protein from meat and milk is more efficient than from meat alone
  - emissions from young fattened stock are similar
  - most difference come from cows and replacement females
- Emissions from milk and beef production need to be addressed in an integrated approach
- Feed digestibility and milk yield are key factors influencing emission level
- System improvement needs systems analysis, no allocation



# End

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