

Trends and challenges in world dairy farming

Impressions from the 2009 Global Dairy
Farmers congress in China



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Trends and challenges in world dairy farming

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Farmers congress in China

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During the congress of Global Dairy Farmers in China in 2009 the main trends and challenges were discussed with farmers and representatives from the dairy industry. Globalisation, change from agricultural to rural policy and sustainability issues like global warming will influence dairy. Farmers are looking for innovations in farming systems, but also towards the chain to cope with these challenges.

Gedurende het congres van Global Dairy Farmers in China in 2009 werden de belangrijkste trends en uitdagingen besproken met melkveehouders en vertegenwoordigers van de industrie rond de melkveehouderij. Globalisering, de verandering van productondersteuning naar regionaal beleid en duurzaamheidsthema's als de klimaatveranderingen zullen van grote invloed zijn op de ontwikkelingen in de melkveehouderij. De ondernemers zijn op zoek naar innovaties in bedrijfssystemen, maar kijken ook nadrukkelijk naar de mogelijkheden in de keten om deze uitdagingen het hoofd te kunnen bieden.

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Preface

It is a dynamic time for dairy worldwide: high prices for dairy commodities in 2007 were followed by low prices at the end of 2008 and early 2009. The fluctuations in prices are big, even for farmers in traditional world market exporting countries like New Zealand and Australia. Global Dairy Farmers is a worldwide network of leading dairy farmers that meet together on a regular basis and discuss the developments in dairy in general and, more specifically, what this means for their strategy. The network is supported by a number of business partners to make it possible to organise a congress and to do research that can be used as input for the discussions in the network. Global Dairy Farmers has asked a group of researchers (Global Dairy Research) to look at some major developments in and around dairy and to facilitate the discussion between members during the congress. This report is a result of this process. It covers the studies that have been done in advance and it also shows the results of the discussion within the network.

We would like to thank Global Dairy Farmers and its business partners for the fruitful and pleasant co-operation.

A handwritten signature in black ink, appearing to read 'R.B.M. Huirne', written in a cursive style.

Prof. Dr R.B.M. Huirne
Managing Director LEI

Summary

Global Dairy Farmers asked a group of researchers to prepare some studies for the congress and facilitate discussion with the network during the congress. This report is a result of these studies and the discussion during the 2009 Global Dairy Farmers Congress in China.

Developments in the major dairy regions

In most regions the number of dairy farms is decreasing by 4 to 4.5% per year (Europe, US, Australia); in New Zealand the decrease is somewhat slower. At the same time, the total production in dairy continues to increase. This means that farm size in general as well productivity is increasing.

The major trends and driving forces that influence the current developments in dairy are:

1. *Globalisation*

Prices of dairy commodities were high in 2007 but dropped at the end of 2008. The general expectation is that demand will increase more than production so prices will be higher in the future, but bigger fluctuations in price are also expected;

2. *Increase in scale*

The increase in scale seems to be an autonomous process, the current situation, however, has taught us that not all farming systems are resilient in the face of current circumstances;

3. *Change from agricultural policy towards rural policy*

In several regions of the world policymakers are moving away from direct support of agricultural production and towards support of regions through more general investments in these regions. For example, by developing new services and products that can also be provided by farmers;

4. *Sustainability issues*

An important issue is the climate change/energy discussion. In general, livestock is seen as one of the main contributors to global warming. Dairy is very important in this field because of the production of methane;

5. *Regional trends/driving forces*

In western regions there is pressure on the consumption of animal-based food products due to discussion about environmental issues or animal welfare, for example. In other regions consumption of dairy will increase be-

cause the economy is growing and income of especially poor people will increase.

The following table shows the main points from the regional discussions.

Table 1	Main points regional discussions				
	North America	South America	Oceania	China	Europe
Current developments					
Economy/market	Crisis situation Low milk price, high costs for feed Difficult to get loans	Brazil: milk and feed price reasonable	Milk price low, but costs more under control	Effect melamine Strong support government	Government support will remain (indirect)
Societal pre-conditions	At the moment no issue	Hardly an issue, environmental demands could arise	Water Green House Gasses	Milk quality (very basic)	Strong: environment, landscape, animal welfare
Labour	At the moment no issue	Available, quality is sometimes a problem	Availability no problem, longer term better image needed to attract young people	Availability no problem, quality of management major issue	
Future strategies	First surviving! On farm level: - control on feed production - own processing Chain level: discussion of production + price control	Gradual growth in size Chain integration will be stronger		Strong integration, large processors combined with large dairy farms or more gradual development of family owned farms	Further increase of scale. Differentiation of types of farms and milk. Stronger horizontal and vertical integration
Innovations	Needed in financing models	New financing models (loans to buy land)	High capacity robotic milker (Aus) Innovations related to improving grassland efficiency and reduction of GHG emissions	IT, in line testing of milk quality e.g. antibiotics test	

The extremely high milk prices of 2007/2008 caused fall-out in the demand of milk by consumers. Milk was too expensive for poor consumers. Production and consumption of alternative products like soy milk and analog cheese increased in this period. This caused lower milk prices. The feed prices however did not fall.

This greatly affects highly specialised footloose¹ farms. More than 50% of the costs of these farms are feeding costs. These feeding costs are rising. This in relation with low milk prices causes severe liquidity problems.

Pasture based farms with low external input are a resilient farming system. The New Zealand and Australian farming systems are less influenced in their operational costs by developments that influence input price. These farming systems are, however, more directly affected by environmental issues such as the availability and quality of water and climate change.

Economy/market

One of the chain strategies in Chinese dairy is focusing on a total integration of the chain. The choice for the type of chain depends not only on the strategy of the chain (low cost/bulk or added values) but also on the history and the political situation of the region where the chain is operating. In China a totally integrated chain seems more appropriate. It is therefore very interesting that Nestlé is in China with a strategy that focuses more on empowering the farmers to become entrepreneurs.

National or regional dairy policy

In Australia, New Zealand and South America there is strong resistance against USA and EU policy in supporting the dairy industry by intervening in the market, e.g. through buying and stocking milk powder. In the short term the interventions in the US and the EU support the prices of the world market, because no extra products are dumped on this market. In the longer term these stocks could affect the recovery of the market. GDF members asked if European farmers especially are aware of the consequences of this policy for their colleagues overseas. In all honesty the answer was 'Probably not'.

In the past the connection of the dairy industry with the general economy was relatively clear. If the economy was growing in poor areas, the market for dairy products would rise quite rapidly. In wealthier regions dairy prices would

¹ 'Footloose' means that the farm does not grow feed for the cows itself. Most of all the feed is bought in.

more or less follow feed prices. This is changing because price of feeds are now also influenced by biofuels. So feed prices can go up, without the milk price following.

Societal preconditions

Because of the current crisis there is less pressure on the societal preconditions. But with a recovering economy the pressure will return, although perhaps in a different way. Sustainability issues will be important for the future in dairy. The three main issues are: water (availability and quality), climate change (energy use, production of greenhouse gasses) and phosphorous.

Future strategies and innovations

It is clear that dairy faces several challenges, especially in the short term. The prospects for the market in the longer term are still quite good.

In general, development of resilient farming systems and strategies are required. The strategy has to be able to cope with fluctuations in costs and milk prices. Looking at the current systems, the low input pasture based systems seem to be the best option. This does not mean that other farming systems will disappear, but they will have to adapt. The footloose farming systems will have to look for alternatives to control the risks, either by forming contracts with arable farmers or growing crops themselves. This can also be done by other financial models (different types of contracts for feed or milk) or by participating in the chain to spread risk. The development and implementation of these innovations, however, will require time and funds, so they will not be available very soon.

If we take a closer look at the actual farm or farming systems the following challenges should be mentioned:

- Mitigation strategies for GHG emissions;
- Manure and manure handling (e.g. digesters) will be important for efficient use of nutrients, but also for reducing GHG emissions;
- Efficient use of water (different crops, monitoring systems, et cetera);
- New housing systems that are cheap and offer a good climate and good conditions for animal welfare (free stall, cross ventilation);
- Good Key Performance Indicators (KPIs) in order to support management of the farm.

The biggest challenge is to incorporate the different demands in an integrated system. Is it possible to come up with a farm and chain strategy that incorporates these demands and challenges and is capable of creating value out of this. One of the proposed solutions of the current situation in US dairy was to

enter the dairy chain. In fact, this choice to enter the chain is part of a survival strategy or at best a business development strategy (you cannot get a return on investment on farm level so that is the main reason to invest in the chain). To actually create value it is important that this development is market driven. Unfortunately, no blueprints are available for this.

Samenvatting

Op verzoek van Global Dairy Farmers (GDF) heeft een groep onderzoekers een aantal studies voorbereid voor het congres van het internationale netwerk. Deze studies dienden als input voor de discussie van het netwerk. Deze rapportage is een weergave van de resultaten van studies en van de discussies gedurende het congres.

Ontwikkelingen in de belangrijkste zuivelregio's:

1. *Globalisering*
De prijs van met name de zuivelbulkproducten waren hoog in 2007, maar zakten weer snel in 2008. De algemene verwachting is dat de vraag meer zal toenemen dan de productie, zodat de prijzen weer zullen stijgen. Er worden echter ook meer fluctuaties in de prijzen verwacht;
2. *Schaalvergroting*
De schaalvergroting lijkt een autonoom proces te zijn. Niet alle huidige bedrijfssystemen blijken echter even robuust te zijn, sommige systemen bleken erg kwetsbaar;
3. *Verandering van agrarisch beleid naar regionaal of ruraal beleid*
In diverse regio's in de wereld verschuift het beleid van ondersteuning van agrarische productie naar het ondersteunen van de regionale economie. Hierbij treedt ook een verschuiving op naar het investeren in regio's door de overheid in plaats van het subsidiëren van productie;
4. *Duurzaamheidsvraagstukken met name rond energie en klimaatverandering*
De veehouderij is een van de belangrijkste bronnen van broeikasgassen. Melkveehouderij is in dit kader specifiek van belang vanwege de methaanproductie;
5. *Regionale trends en drijvende krachten*
In de westerse landen ontstaat steeds meer druk op de consumptie van dierlijk voedsel door discussies over milieu-impact en dierenwelzijn. In andere regio's is de verwachting dat de consumptie van dierlijke eiwitten in het algemeen en ook van zuivel zal stijgen door een toenemende welvaart.

Per regio is gediscussieerd over de gevolgen van de genoemde ontwikkelingen, de volgende tabel is een samenvatting van deze discussie.

Tabel 1					
Belangrijkste conclusies uit regionale discussies					
Huidige ontwikkelingen	Noord Amerika	Zuid Amerika	Oceanië	China	Europa
Economie\markt	Crisis situatie, lage melkprijs, hoge voerkosten. Financiering lastig.	Brazilië: prijzen relatief stabiele	Melkprijs lag, maar kosten relatief goed onder controle	Effect melamine nog groot. Sterke ondersteuning zuivel door overhead.	Ondersteuning overhead blijft overeind, van directe naar indirecte steun.)
Maatschappelijke eisen	Vanwege conomische crisis niet aan de orde	Vrijwel niet aan de orde. Milieu-eisen komen in beeld	Water Broeikasgassen	Melk kwaliteit (basale eisen)	Hoge eisen: milieu, dierenwelzijn, voedselveiligheid.
Arbeid	Op dit moment is arbeidsvoorziening geen probleem	Beschikbaar geen probleem, kwaliteit wel.	Beschikbaarheid nu geen probleem. Op lange termijn is een beter imago nodig om jonge mensen aan te trekken.	Beschikbaarheid geen probleem. Kwaliteit van management is belangrijk vraagstuk.	
Toekomstige strategieën	Eerst overleven! Op bedrijfsniveau: - grip krijgen op voerproductie. - zelf verwerken Op keten niveau: Discussie over productie en prijs controle	Geleidelijke groei in omvang. Sterkere ketenintegratie. .		Sterke ketenintegratie. Grote verwerkers in combinatie met grote melkveebedrijven. Daarnaast ook meer geleidelijke ontwikkeling van familiebedrijven.	Doorgaande schaalvergroting. Differentiatie naar verschillende typen bedrijven en melk. Sterkere horizontale en verticale samenwerking.
Innovaties	Gewenst in financieringsmodellen	Nieuwe financieringsmodellen (b.v. lenen voor grondaankoop)	Melkrobot met hoge capaciteit (Aus). Innovaties gerelateerd aan grasland efficiency and reductie broeikasgasemissies.	IT, in line testen van melkkwaliteit b.v. antibiotica: voor toepassing op grote schaal.	

De extreem hoge melkprijzen in 2007/2008 veroorzaakten vraaguitval. De zuivelproducten werden te duur voor de arme consument. Daarnaast nam de productie en consumptie van alternatieve producten, zoals sojamelk en analoge kaas toe in deze periode. Dit resulteerde uiteindelijk in lagere melkprijzen. De voerprijzen daalden echter niet. Deze ontwikkelingen hebben met name veel effect gehad op de grondloze melkveebedrijven. Op deze bedrijven vormen de voerkosten meer dan 50% van de totale kosten. Hoge voerkosten in combinatie met lage melkprijzen zorgden voor grote liquiditeitsproblemen op deze bedrijven.

De graslandbedrijven uit Nieuw-Zeeland en Australië bleken robuust. Deze bedrijven worden aan de kostenkant minder beïnvloed door prijsfluctuaties. Aan de andere kant zijn de milieuvraagstukken waar deze bedrijven mee worden geconfronteerd wel indringend te noemen. Het gaat hierbij met name om water (beschikbaarheid en kwaliteit) en om broeikasgassen.

Economie/markt

Een van de Chinese ketenstrategieën is sterk gericht op (achterwaartse) ketenintegratie. De keuze voor dit type keten hangt ook samen met de politieke situatie en geschiedenis van dit land. Interessant is dat Nestlé in China op een andere ketenstrategie inzet, namelijk op de ontwikkeling van gezinsbedrijven.

Nationaal of regionaal (zuivel)beleid

In Australië, Nieuw-Zeeland en Zuid-Amerika is veel weerstand tegen het beleid in de VS en de EU die de eigen zuivel ondersteund door in te grijpen in de markt, bijvoorbeeld door het aankopen en opslaan van melkpoeder om de prijs te ondersteunen. De redenering is dat op termijn deze ingrepen schadelijk zijn voor de markt. De GDF-leden uit de genoemde landen vroegen zich met name af of de Europese en Amerikaanse melkveehouders zich bewust zijn van het effect van deze ingrepen voor hun overzeese collega's. Het antwoord was in alle eerblijvendheid: 'Waarschijnlijk niet'.

In het verleden was de relatie van de zuivelindustrie met de algemene economie vrij duidelijk. Als de economie in arme landen groeit, dan neemt de vraag naar zuivelproducten vrij snel toe. In rijkere landen volgen de prijs van de zuivelproducten over het algemeen de voedselprijzen en daarmee ook de daaraan gekoppelde voerprijzen. Nu is dat niet meer zo duidelijk, omdat de prijzen van voedsel/voer mede bepaald worden door de vraag naar biobrandstoffen.

Maatschappelijke randvoorwaarden

Vanwege de huidige (economische) crisis is er minder druk op de maatschappelijke randvoorwaarden. De verwachting is dat met het herstel van de economie ook deze druk weer zal toenemen. Duurzaamheidseisen zijn van groot belang voor de toekomst van de melkveehouderij. Concreet gaat het met name om drie punten: water (beschikbaarheid en kwaliteit), klimaatverandering (energieverbruik, broeikasgasemissies) en fosfor.

Toekomstige strategieën en innovaties

Het is duidelijk dat de melkveehouderij wereldwijd nog een aantal uitdagingen voor zich heeft. Dit geldt vooral voor de korte termijn, op de langere termijn zijn in ieder geval de marktvooruitzichten vrij gunstig.

In het algemeen is er behoefte aan de ontwikkeling van robuuste bedrijfssystemen en strategieën. De strategieën moeten in staat zijn om schommelingen in kosten en opbrengsten op te vangen. Als we naar de huidige systemen kijken dan lijkt vooral het low input graslandbedrijf zoals dat in Oceanië voorkomt hieraan te voldoen. Dit wil niet zeggen dat andere bedrijfssystemen zullen verdwijnen, ze zullen zich echter wel aan moeten passen. De grondloze bedrijven moeten alternatieven zoeken om hun risico's onder controle te kunnen houden. Dit kan, bijvoorbeeld door zelf voer te gaan te telen of contracten met akkerbouwers aan te gaan. Ook andere vormen van ketenparticipatie of risicoverzekeringen zijn mogelijk. De ontwikkeling van deze strategieën kost echter ook tijd en geld en beide zijn momenteel niet ruim voorradig op deze bedrijven.

Kijken we wat meer in detail naar het primaire bedrijf dan zijn de volgende vraagstukken met name aan de orde:

- Strategieën om emissie van broeikasgassen te reduceren;
- Mest en mestbehandeling. De benutting van nutriënten moet omhoog, daarnaast moet de productie van broeikasgassen omlaag. Vergisters kunnen op beide punten een belangrijke bijdrage leveren;
- Efficiënt gebruik van water (andere gewassen, monitoringssystemen, enzovoort);
- Nieuwe huisvestingssystemen, die goedkoop zijn, een goed klimaat garanderen en goed zijn vanuit oogpunt van dierenwelzijn;
- Goede Key Performance Indicators (KPI's) of prestatie-indicatoren om het management van het bedrijf goed te kunnen monitoren en ondersteunen.

De grootste uitdaging ligt echter in de combinatie van alle genoemde eisen in een integraal bedrijfssysteem. De vraag is of het mogelijk is om een bedrijfs- en ketenstrategie te ontwikkelen waarin aan alle genoemde eisen wordt voldaan

en die ook in staat is om die eisen om te zetten in een meerwaarde. Eén van de suggesties vanuit de Amerikaanse melkveehouders was om zelf de keten in te stappen. Deze stap wordt echter vooral ingegeven vanuit een overlevingsstrategie of is hooguit bedoeld om voor het primaire bedrijf de mogelijkheid te creëren om zich verder te ontwikkelen (een bedrijfsontwikkelstrategie). Om echt waarde te kunnen creëren is het van belang dat er een echte marktvraag is of wordt ontwikkeld.

1 Introduction

During the 2009 GDF conference in China an internal workshop for the GDF participants was organised in Beijing. In this workshop the main developments in dairy were discussed. The workshop consisted of the following parts:

1. Reviewing the analysis of the 2007 GDF conference in Moscow;
2. Presentation of the current picture of dairy worldwide;
3. Presentation of major trends and turns;
4. Discussion per dairy region: analysis, driving forces and (need for) innovations.



Participants GDF conference 2009

2 GDF analysis 2007 in review

During the GDF conference in Moscow the members discussed the dairy situation at the time. The situation then was very different from the current situation in dairy. Milk prices were high and some experts predicted that this was the start of a fundamental change in the worldwide dairy market due to the expected increase in demand and the difficulties to increase production in the short term.

The discussion in 2007 resulted in the following Table 2.1.

Table 2.1	GDF analysis in 2007 of factors in development of dairy regions			
	Oceania	USA	Eastern Europe	Western Europe
Production and sales	Limited increase in production	Stable	Increase	Slight increase
Societal preconditions	Reduction of greenhouse gasses	Increasing influence	Very limited	Very important
Local aspects	Water, labour	Water	Availability of animals, management level	Good infrastructure, good climate
Economy	Increasing cost price	Increasing feed costs (feed food fuel)	Milk price and cost price increase	Stable
Strategy	Increase in scale and off-farm investment	Increase in scale, collaboration	Increase in scale	Increase in scale, added value

The major issue that was not foreseen in 2007 was of course the much lower milk prices. The general idea in 2007 was that cost-price would probably increase because of the higher feeding costs caused by stimulation of biofuels. In other regions the cost price was expected to increase because of stricter societal preconditions. But this would be compensated by a higher milk price. In most regions cost price actually did increase because of the mentioned reasons, but the milk price rapidly declined. Because of the lower milk price and, even more, the general economic crisis there is no pressure on societal pre-

conditions at the moment in the USA. In other regions there is also less pressure on societal preconditions directly from consumers, due to the economic crisis. On the other hand, governments do invest considerable amounts of money in the green economy to support the economy. In a way this also offers opportunities for the dairy sector, but so far the dairy industry does not seem to be able to profit from this development.

3 The current picture (2009) in important dairy regions

3.1 Introduction

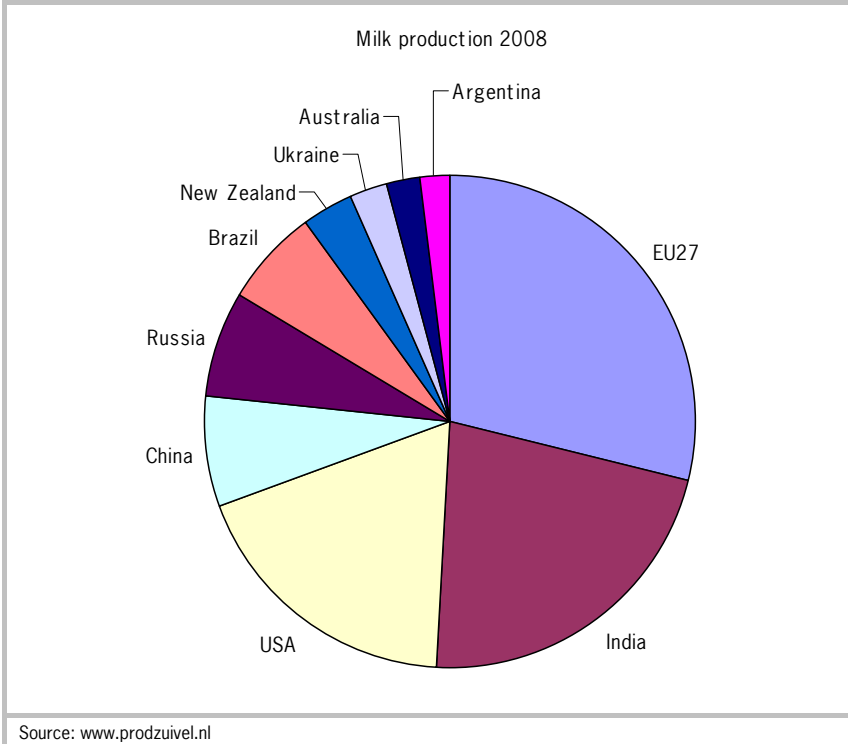
In this chapter the current picture is sketched of the important dairy regions in the world: North America (USA), South America (Brazil, Argentina), Oceania (Australia and New Zealand), China, Western Europe and Eastern Europe. Most of the data that is used in this chapter is taken from www.produivel.nl. Table 3.1 shows the main milk production regions or countries in the world.

	Milk prod. 2008 (* million tonnes)	2008 comp. to 2007 (2007=100)	2007 comp. to 2006 (2006=100)
EU27	134	101	100
India	102	106	104
USA	86	102	102
China	34	95	110
Russia	32	101	103
Brazil	30	108	106
New Zealand	16	108	103
Ukraine	12	96	92
Australia	10	102	91
Argentina	10	105	92

Source: www.produivel.nl

The same numbers are also presented in a graph (Figure 3.1). Around 30% of world milk production is produced by other countries that are neither part of the table nor of the graph. India is by far the single biggest milk producing country. The milk is partly produced by buffalo. India and Brazil have shown a considerable growth in milk production in the last two years. New Zealand also still shows a growth in total production.

Figure 3.1 **Relative milk production in important dairy regions**



The development of the world market prices does not depend solely on the biggest producers. Table 3.2 shows the major players on the world market. The EU is the biggest exporter; New Zealand and Australia are in second and third place. The USA exported a lot in 2008, especially compared to earlier years.

Table 3.2		Export of cheese, butter, milk powder and condensed milk in 2008 (*1,000 tonnes)		
2008	Cheese	Butter	Milk powder + condens	2008 comp. to 2007
EU27	551	119	885	0
New Zealand	241	320	833	--
Australia	157	29	285	--
USA	131	80	452	+++
Ukraine	77	5	80	+
Argentina	35	14	114	-
Russia	24	2	35	+
Brazil	7	4	124	+
India	2	10	42	+
China	0	4	72	-
<i>Total</i>	<i>1,226</i>	<i>587</i>	<i>2,921</i>	

Source: www.produivel.nl

This chapter will continue with a description of the developments of the dairy sector in the mentioned regions. For each region the prevailing farming system will be described. This is done within the framework of the Global Dairy Farmers network, so this does not necessarily mean that this is the average farming system, but it is the system that is most relevant for the GDF network. For example, the footloose¹ system has been chosen from the USA because this is the system that focuses on low cost production and aims to be competitive on the world market. For each farming system the main characteristics are given according to the following key factors:

- System;
- Market;
- Economy;
- Societal preconditions and other (local) aspects.

Where relevant some points of attention or, in extreme cases, risks are given for these factors.

¹ 'Footloose' means that the farm does not grow feed for the cows itself. Most of the feed is bought in.

3.2 USA

Farm structure and milk production

The number of dairy farms in 2008 was about 67,000. In 2000 the number of dairy farms was about 105,000, resulting in a decline of 4.6% per year. The average milk yield per cow is just over 9,000kg. The number of cows per farm has increased from 86 (2000) to 134 (2008). This is an increase of over 7% per year. The total milk production in the USA in 2008 was about 86m tonnes. There is a great diversity of farm types and systems. Traditionally the medium-scale farms with approximately 80 cows can be found in the north and north-eastern part of the USA (e.g. Wisconsin) and the large-scale dairy farms (feed-lots) in California. Large-scale dairy farms have been developed in new areas such as in Texas in recent years.

Dairy production, trade and consumption

The top 5 of the dairy industry consists of Dean Foods (annual turnover €8bn), Dairy Farmers of America (8bn), Kraft Foods (5bn), Land O'Lakes (2.8bn) and Schreiber Foods (2.5bn). Most of the milk is used to produce cheese (about 50%) or fresh dairy products (30%). The consumption of dairy products has been quite stable in recent years; about 2kg of butter, 16kg of cheese and 83kg of fresh milk per capita (Table 3.3).

	Production	Export	Import
Milk supply	86,179		
Cheese	4,462	131	170
Butter	748	80	7
Non-fat milk powder	854	391	4
Whole milk powder	22	41	20
Condensed milk	259	20	18
Fresh	27,390		

Source: www.produivel.nl



Large scale dairy farm in USA

Farming system

As we saw in the general country description, the USA farms show a rapid increase in scale. In recent years many large-scale dairy farms have been established or rapidly increased in scale (set up in large units and adding units of about 500 cows). Table 3.4 shows the important characteristics of this type of farm.

Table 3.4		Large-scale dairy farms in the USA (>1,000 cows, 'foot loose')	
System	Large-scale dairy farm, with purchased feed. Works with paid labour. High production per animal. High level of management		
	characteristics	points of attention/risks	
Market	<ul style="list-style-type: none"> - Fragmented buyers - Mainly in commodities - Around self-sufficiency 	<ul style="list-style-type: none"> - Often low added value - Resilience seems limited 	
Economy	<ul style="list-style-type: none"> - Feed costs >50% costs - Other costs low by scale - Few stable assets 	<ul style="list-style-type: none"> - Competition biofuels - Availability good people - Low securities 	
Societal pre-conditions and other aspects	<ul style="list-style-type: none"> - More concern from society - In some cases water is a problem 	<ul style="list-style-type: none"> - Claims from society 	

While this type of farm can have the advantage of economies of scale, it is also vulnerable due to dependency on purchased feed, quite small margins and low solvability. An important difference with many smaller scale farms is that virtually all costs have to be paid (paid labour, interest on loans).

3.3 South America (Brazil and Argentina)

Farm structure and milk production

Brazil has about 16m cows with an average milk production per cow of less than 2,000kg. There are no clear statistics about the number of dairy farms. A lot of cows are kept in small numbers in private households. Milk is often not cooled and sold directly to consumers. In recent years there has been an increase in the number of bigger and more professional dairy farms. These farms can meet international quality standards so Brazil is in principle also capable of meeting the quality standards required for the world market. The total milk production in 2008 was nearly 30m tonnes.

Argentina has about 11,000 dairy farms, a figure that decreases about 4.5% per year. The average farm has nearly 200 cows, and this number is increasing. The average milk production per cow is 45,000kg.

Dairy production, trade and consumption

Nestlé is the most important milk processor in Brazil followed by several other companies such as Itambé, Garoto, Parmalat, Danone, DPA and Batavia. A lot of milk is processed as milk powder, while cheese (21% of the milk) is less important. Consumption of dairy products is still quite low (0.4kg of butter, 3kg of cheese and 54kg fresh products) but is gradually growing.

Argentina has two major players in the dairy industry: Mastellona Hermanos and Sancor. Saputo is the third processor. About 50% of the milk is used for cheese production. Consumption of dairy products in Argentina is somewhat higher than in Brazil (0.7kg of butter, 11kg of cheese, 55kg of fresh products). The Brazilian milk production has been growing steadily in the last years and Brazil seems to be ready to export to the world market (Table 3.5).

Table 3.5		Milk supply, dairy production, import and export in Brazil and Argentina (*1,000 tonnes, 2008)				
	Brazil			Argentina		
	production	export	import	production	export	import
Production	29,758			9,541		
Cheese	630	7	5	491	35	3
Butter	84	4	1	51	14	0
Non-fat milk powder	133	0	7	25	14	0
Whole milk powder	580	83	23	200	100	0
Condensed milk	?	40	0	7	0	1
Fresh	10,674			1,725		

Source: www.prodzuivel.nl

Farming system

Brazil has many different farming systems, including small-scale farms. For the GDF network the farms that are capable of production that meets the quality standards of the world market are the most relevant (Table 3.6). So the farming system shown here is not an average farm, but rather the most relevant for the world market (possibly in the future).

Table 3.6		Larger-scale farms in South America (>200 cows)	
System	Larger scale with both home grown and purchased feed. Farmer is both manager and worker		
	characteristics		points of attention/risks
Market	<ul style="list-style-type: none"> - Fragmented buyers - Barely self supporting 		<ul style="list-style-type: none"> - Milk prices reasonable - Low added value - Exchange rates
Economy	<ul style="list-style-type: none"> - Cheap labour - Feeding costs moderate - Other costs low 		<ul style="list-style-type: none"> - Competition of other crops
Societal pre-conditions and other aspects	<ul style="list-style-type: none"> - Rather low, e.g. BST not an issue - Unknown, unloved?? 		

These dairy farms have good prospects, especially with better organised chains. The milk price is still reasonably good because the price is not so much

influenced by the world market. For Brazil, import from other South American countries is a possible threat.

It is important to realise what a large variety of dairy farm types and scales exist in South America. Brazil has a strong development at the moment of relatively small dairy farms (50-70 cows) in grassland regions. This development is supported by the government. These farms now produce about 20% of the national milk production.

In Argentina, large-scale dairy farms comparable to the US model have been established in the last 5 years.



Dairy farm Brazil

3.4 Oceania (New Zealand and Australia)

Farm structure and milk production

New Zealand had approximately 11,000 dairy farmers in 2008. The number of farms has declined by about 2.5% per year since 2000. The average number of cows is about 375, compared to 250 cows per farm in 2000. This translates into an annual increase of more than 6%. The milk production per cow is just below 4,000kg.

The number dairy farmers in Australia is declining by about 4.5% per year. The current number of farmers is approximately 8,500. The average number of cows per farm is just over 200. The average milk production per cow is close to 6,000kg.



Dairy farm Australia

Dairy production, trade and consumption

Fonterra is by far the biggest processor of milk in New Zealand. With an annual turnover of about €10bn it is much larger than Westland Milk (0.26bn) and Tatua Milk Co-operative (0.1bn). New Zealand milk is mostly processed for export (Table 3.7). Only 2% of the milk produced is used as fresh milk. Twenty-one percent is turned into cheese (and then mostly exported). Dairy consumption in New Zealand is high for butter (6kg per capita), but not so high for cheese (6kg) and fresh milk (86kg).

Fonterra is also an important dairy processor in Australia (turnover €1.7bn). Other dairy processors are: Murray Goulburn (1.6bn), National Foods (0.9bn) and Dairy Farmers Group (0.8bn). Australia exports less than New Zealand; about 24% of the milk is used for fresh dairy products. Australian dairy consumption is 4kg of butter per capita, 12kg of cheese and 96kg of milk.

	New Zealand			Australia		
	production	export	import	production	export	import
Production	16,326			9,630		
Cheese	345	241	5	343	158	68
Butter	405	320	1	92	29	17
Non-fat milk powder	310	236	1	203	126	4
Whole milk powder	710	596	1	136	141	8
Condensed milk	?	0	4	?	18	2
Fresh	331			2,295		

Source: www.prodzuivel.nl



Large scale dairy farming combined with grazing

Farming system

New Zealand has a pasture based system, based on low input and own feed production. Inputs of fertiliser and concentrates are low. Seasonal calving is used to produce as much milk as possible with fresh grass. In Australia the same type of system is used in Victoria, but due to a different climate it is more difficult to implement this system here (Table 3.8).

Table 3.8 Large-scale pasture-based system, Oceania		
System	Pasture based. Milk production based on own feed production, seasonal production. Farmer is both manager and worker	
	characteristics	points of attention/risks
Market	<ul style="list-style-type: none">- Few buyers (NZ)- Mainly in commodities- Heavily dependant on export	<ul style="list-style-type: none">- Low milk prices- Distance to market- Exchange rates
Economy	<ul style="list-style-type: none">- Low feeding costs- Other costs low, excluding labour	<ul style="list-style-type: none">- Competition other cattle- Optimum reached?
Societal pre-conditions and other aspects	<ul style="list-style-type: none">- Rising concern for environment (GHG)- Water (AU, NZ-Canterbury)	<ul style="list-style-type: none">- Taxes and/or quota on GHG proposed

This system has the lowest cost price of milk worldwide and, in that way, sets a minimum level for the price of milk. Revenue of milk follows costs of milk. Exchange rates cause vulnerability, however, and competition with South America (Argentina, Chili) is increasing because of increased dairy production in these countries with a similar level of costs.

3.5 China

Farm structure and milk production

China has very different farm types and systems. A separate study has been made about Chinese dairy for GDF.

A lot of milk is produced by cows on so-called 'backyard farms'. Each farmer had between 1 and 8 cows. These farmers live together in a dairy village. Many of these dairy villages have a central milking parlour where the cows of the village are milked. Since the melamine scandal, programmes are in place to improve the quality of milk production in these villages. The estimation is that

about 15% of the milk is produced on backyard farms and about 80% in dairy villages with a central milking parlour. About 5% of the milk is produced on large-scale modern dairy farms. China has an estimated 16m cows with an average production of 2,000kg.

Dairy production, trade and consumption

Mengniu Dairy and Yili (Inner Mongolia) are the two major milk processors (a turnover each of €2bn). Sanlu was in third position in 2007 but did not survive the melamine scandal. A large part of the milk is processed for fresh dairy products (46%). The other important product is milk powder. Cheese production is very low (Table 3.9).

Dairy consumption is very low compared to western countries: 0.1kg of butter, 0.2kg of cheese and 9kg of fresh milk per capita.



Head office Mengniu Dairy

Table 3.9 Milk supply, dairy production, import and export in China (* 1,000 tonnes, 2008)			
	Production	Export	Import
Production	33,500		
Cheese	18	0	14
Butter	30	5	8
Non-fat milk powder	60	1	55
Whole milk powder	1,200	62	46
Condensed milk	150	8	0
Fresh	15,300		

Source: www.produivel.nl

Farming system

Chinese dairy is in transition (Table 3.10). Because of the melamine scandal the old system of milk production in dairy villages with a middle man buying milk for the village and selling it to the processor is not allowed anymore. It is still uncertain what the main development for the future will be. Dairy villages are being modernised, new farm models are setting up in which the animals of a dairy village come together in one barn with one central management (dairy united model) and the dairy industry invests in housing and the milking parlour. Nestlé is supporting the gradual development of backyard farms into small to medium scale family farms. Part of the dairy industry is investing in large-scale dairy farms according to the American model. Milk quality and level of management are the key factors for the future of Chinese dairy. Growing enough feed of sufficient quality is another critical point for Chinese dairy.



Farm in dairy village

Table 3.10 Dairy villages in transition in China		
System	Many small-scale farms, some large-scale farms. Dairy village transitioning into different types of farms: dairy districts, family farms and large-scale farms. No ownership of land	
	characteristics	points of attention/risks
Market	<ul style="list-style-type: none"> - Fragmented buyers - Fresh products or milk powder - Many quality issues 	<ul style="list-style-type: none"> - Reasonable milk prices - Distance to market - Consumer confidence
Economy	<ul style="list-style-type: none"> - Feeding costs quite high - Other costs low - Failure costs 	<ul style="list-style-type: none"> - Competition other crops - Poor quality on many aspects
Societal pre-conditions and other aspects	<ul style="list-style-type: none"> - Much influence government - Attitude farmers different - Cultural differences 	<ul style="list-style-type: none"> - Management level - Entrepreneurship - Weakest will not survive

Quality in many aspects and trust (after the melamine scandal) are the hot items for all systems but especially for the smaller dairy farms. Total costs are quite low but higher than in Oceania. The Chinese government is stimulating milk production because of the increasing demand from consumers for animal protein and the wish not to depend on imports. Dairy is considered to be the most efficiently produced animal protein. A complicating factor is that the regions that are most suitable for the production of feed are not close to the area where the consumers live. So either feed or dairy products must be transported.

3.6 Europe

The description of Europe is a bit different from the other regions. It will start with a general picture of the EU27 and Russia, including dairy production, consumption and export (Table 3.11). After that production, farm structure and farm systems will be presented for Eastern and Western Europe separately.

Table 3.11 Milk supply, dairy production, import and export in Europe, EU27 and Russia (*1,000 tonnes, 2008)

	EU 27			Russia		
	production	export	import	production	export	import
Production	133,656			32,400		
Cheese	8,234	551	84	425	23	248
Butter	1,870	118	56	280	2	75
Non-fat milk powder	949	176	8	120	0	11
Whole milk powder	850	483	1	105	2	7
Condensed milk	1,156	225	8	217	33	0
Fresh	31,949			12,100		

Source: www.produivel.nl

The most important dairy industries in Western Europe are: Danone (turnover €11.5bn), FrieslandCampina (9.5bn), Lactalis (8.8bn), Arla Foods (6.6bn), Parmalat (3.6bn), Bongrain (3.6bn), Sodiaal (2.7bn), Nordmilch (2.5bn), Theo Müller (2.3bn), Groupe Bel (2.2bn). The average dairy consumption in Europe is just below 4kg of butter, 15.5kg of cheese and 76kg of fresh milk per capita.

The most important processors for Russia are: Wim-Bill-Dan (annual turnover €1.6bn) and Unimilk (1.1bn). The consumption per capita in Russia is 3kg of butter, 4.5kg of cheese and 88kg fresh milk.

3.6.1 Eastern Europe

Farm structure and milk production

Eastern Europe is defined as the EU members in the East (Finland, Poland, Estonia, Latvia, Lithuania, Slovakia, Czech Republic, Hungary, Romania, Austria, and Bulgaria) and Russia.

In total there are about 590,000 farmers in the Eastern EU countries. On average each farmer has 17 cows with an average milk production of just below 4,500kg per cow. It is important to realise that the differences within and between countries are very big. The average herd size of the Czech Republic is just over 160 cows, in Slovakia the average is almost 260 cows, while other countries have an average herd size of around 10. The Baltic countries (Estonia, Latvia and Lithuania) have small average herds, but in these countries big farms of 500 to more than 1,000 cows can also be found.

Russia has no reliable data available on the number of dairy farms and herd size. This is also a country with big differences. Around Moscow large dairy farms can be found that supply the big city with dairy products. The average milk yield per cow is estimated at about 3,200kg.

Table 3.12 **Milk supply and dairy production in Eastern Europe (EU members) and Russia (*1,000 tonnes, 2008)**

	Eastern Europe	Russia
Production	23,773	32,400
Cheese	1,427	425
Butter	330	280
Non-fat milk powder	174	120
Whole milk powder	78	105
Condensed milk	88	217
Fresh	4,668	12,100

Source: www.produivel.nl

Farming System



Housing for young calves in Russia

Table 3.13 Larger scale farms in Eastern Europe		
System	Still many small-scale farms. Some large-scale farms, made possible by investors	
	characteristics	points of attention/risks
Market	<ul style="list-style-type: none"> - Fragmented buyers - Limited added value - Quality issues 	<ul style="list-style-type: none"> - Low milk prices - Distance to market
Economy	<ul style="list-style-type: none"> - Low productivity - Costs low 	<ul style="list-style-type: none"> - Competition other crops - Poor quality on many aspects
Societal pre-conditions and other aspects	<ul style="list-style-type: none"> - Investors outside agriculture - Something out of a Western? 	<ul style="list-style-type: none"> - Management level - Entrepreneurship

In many aspects the situation in Eastern Europe (Table 3.13) looks similar to the situation in China. However, government influence and enforcement seems to be less, resulting in unclear organisation.

3.6.2 Western Europe

Farm structure and milk production

Western Europe consists of the following EU members: United Kingdom, the Netherlands, Germany, Denmark, Sweden, Belgium, Luxemburg, France, Spain, Portugal, Italy, Greece, Cyprus and Malta.

In Western Europe 346,000 dairy farmers have an average of 68 cows with a milk production of close to 7,000kg per cow. The differences between countries are small compared to Eastern Europe.

Farming system

The most common farming system is described in Table 3.14.



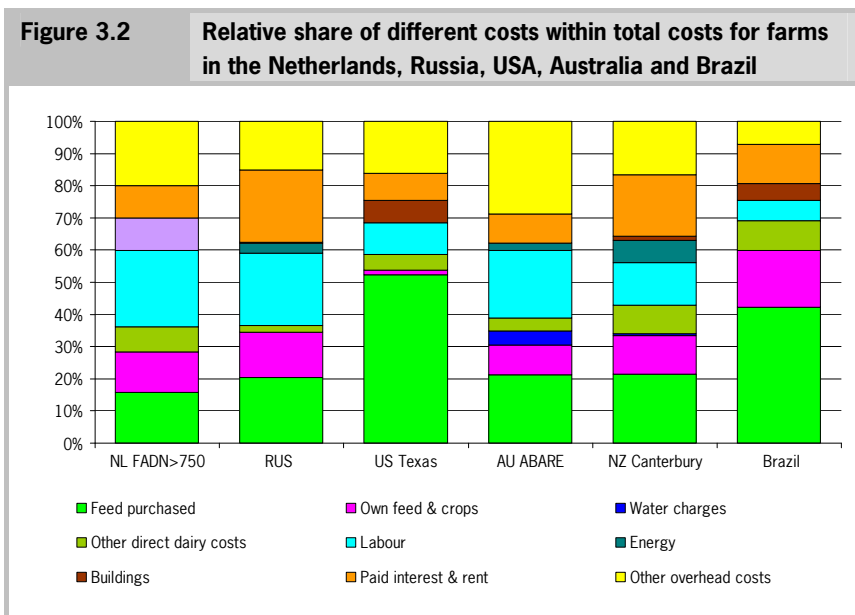
Dairy farm in the Netherlands

Table 3.14 Family farms in Western Europe		
System	Pasture based and/or summer feeding. Mainly family farms with high costs and lower expenses. Milk quota (will be abolished in 2015)	
	characteristics	points of attention/risks
Market	<ul style="list-style-type: none"> - Difference in buyers - Added value/good quality - Some countries export 	<ul style="list-style-type: none"> - Milk prices quite high, not very competitive
Economy	<ul style="list-style-type: none"> - Labour expensive - Feeding costs moderate, other times high (land in some countries) 	<ul style="list-style-type: none"> - Some competition biofuels - Capital intensive, need for loans
Societal pre-conditions and other aspects	<ul style="list-style-type: none"> - Much influence society: animal welfare, environment, landscape, GMO - Good infrastructure 	<ul style="list-style-type: none"> - Quite severe legislation - Involvement citizens

3.7 Comparing structure of cost price between regions

The next figure shows the relative share of different costs within the total costs for milk production. In absolute values the costs are the highest in Western Europe (NL FADN>750) and the lowest in New Zealand (NZ Canterbury). The other regions are somewhere in between with Australia and Brazil quite near to New Zealand.

Feed is the major cost in the USA, especially for the dairy farms with little or no home grown roughage. Labour and buildings are important costs for Western Europe and Australia has to cope with costs for water.



In Western Europe it seems that the cost price follows the price of milk. Because farmers were fairly certain of the milk price for the future they adapted the investments and costs to this milk price. So when the price of milk drops many dairy farmers run into big problems. The cost price of milk is among of the highest in the world. Milk quality and the infrastructure are good. The system of family farms tends to have a higher cost price of milk but is more resilient than systems with much paid labour and financing by investors.

4 Major trends, turns and key factors

The major trends and driving forces that influence the current developments in dairy are:

1. Globalisation: Boom, Bust and Beyond;
2. Increase in scale;
3. From agricultural policy to rural policy;
4. Sustainability issues, like climate change/energy discussion;
5. Regional trends/driving forces.

Possible turns and key factors for the future are:

1. New type of chain, creating value;
2. Influence of energy driven economy on dairy;
3. New farming systems, also on regional level;
4. Management (e.g. herd management, controlling costs);
5. Mitigation strategies GHG gasses.

4.1 Current trends and driving forces

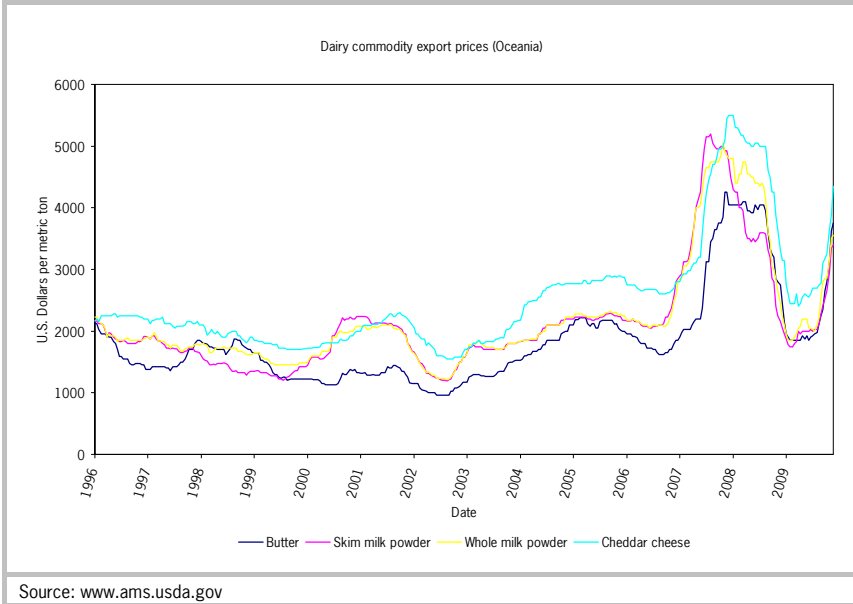
Boom, Bust and Beyond

This report will not focus too much on globalisation because this has been addressed in the paper of the Rabobank at the GDF conference (Sidwell, 2009). Some key elements from this presentation are shortly described in this paragraph.

It is obvious that the prices of dairy commodities crashed in 2008 after reaching a high level in 2007. This is clearly shown in Figure 4.1.

There are several causes for the crash. After the increase in dairy commodity prices at the end of 2007 the market was just starting to rebalance in mid-2008 when the global economy collapsed. The high prices at the end of 2007 and early 2008 impacted demand; in food services fewer dairy products were used (e.g. cheese on pizza) and the ingredient market switched to cheaper vegetable oils, et cetera. Because of the collapse of the global economy sales dropped in retail and credit shortages have further disrupted international trade. This has led to an estimated reduction in trade of 8% at the end of 2008 compared to 2007.

Figure 4.1 Dairy commodity export prices (f.o.b. Oceania)



The dairy farmers also reacted to these developments. First they increased their production, especially in the first quarter of 2008 - +3% compared to the final quarter of 2007. After that the supply growth slowed, but not quick enough. The EU and USA have started intervention, such as the domestic purchasing of dairy products. This has resulted in a world market floor because there is hardly any export subsidisation. Stocks have risen because of this intervention, but they are still much lower than in 2002-2005.

Will the demand grow in the near future? Cheaper dairy products resulting in improved competitiveness in the ingredient market, the end of inflation and no remaining stocks will of course help to improve demand. Remaining problems at the moment are difficulties with credit and the lack of economic growth. A further slowing down of supply growth is expected. In the long run the growth of the world population will stimulate demand, especially in the areas where the income of large parts of the population will rise above poverty level. At this level consumption of animal products, including dairy, usually increases rapidly. This is especially expected to happen in Asia.

A strong recovery ('V shaped') is possible if the general economic situation improves in the short term and the financial system functions in a normal way in combination with lower oil/commodity costs. In the long run a solid demand for

dairy is expected. It is also expected that input costs will be higher in the future. The export potential of lower cost suppliers is considered to be too limited (without increasing costs). And so for additional growth the market will have to turn to regions that require higher prices. Volatility will remain high. Supply and demand of dairy have always been considered inelastic, but now quite strong reactions are visible because of market shocks.

Increase of scale of dairy farms

The increase of scale of dairy farms seems to be an autonomous process. But in fact, at a closer look it is a combination of two processes: increase of scale in combination with specialisation. In recent decades there has not been a strong technological push to improve productivity. Capacity of milking parlours has improved, automatic feeding has been introduced and ICT to manage information. But this has not lead to a drastic increase in the number of cows that can be milked per person. For this reason the often mentioned economies of scale as a major driver for increase of scale could be discussed. This is especially the case for farms with more than 50 cows. For small-scale farms the situation is different, a lot of progress in efficiency of production and improvement of milk quality can be achieved by increase in scale.

The New Rural Paradigm: from agricultural policy to rural policy

According to an OECD report (*The New Rural Paradigm; Policies and Governance*, June 2006) that is based on a study in several countries worldwide, a transition is visible from an agricultural policy toward a rural policy. Rapid change in the international economy - globalisation, improved communications and reduced transportation costs, changing trade patterns for commodities, and the emergence of important non-farm activities in rural regions - confront rural regions with some obvious threats but also with significant opportunities. Against this background, policy makers increasingly recognise that traditional sectoral policies need to be upgraded and, in some cases, phased out and substituted for more appropriate instruments. Particular concerns are raised by the modest positive impact that agricultural subsidies have on general economic performance even in the most farming-dependent communities. Indeed, with farm families relying increasingly on off-farm employment, the economic success of rural communities will depend on the development of new economic engines. In this context, OECD governments are showing increasing interest in a more place-based approach to rural policy that emphasises investments rather than subsidies and that is able to integrate different sectoral policies and improve the coherence and effectiveness of public expenditure in rural areas. The

OECD report focuses on the reorientation of policy that has been observed through a series of reviews of territorial policy at the national level and a number of case studies of policy strategies in rural regions. The evidence suggests that the shift in policy towards a 'new rural paradigm' concerns both 1) changes in the policy focus and 2) adjustments to the governance structure, most notably:

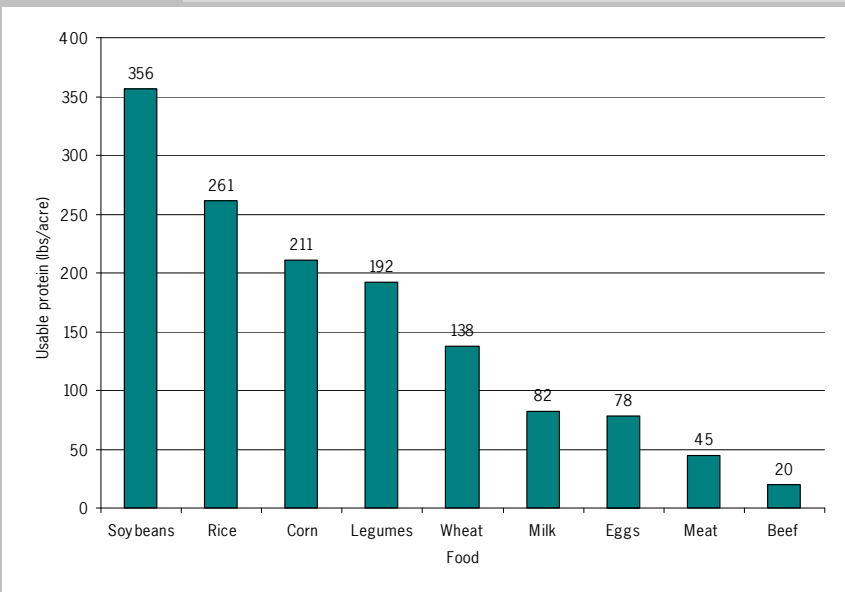
- a shift from an approach based on subsidising declining sectors to one based on strategic investments to develop the area's most productive activities; a focus on local specificities as a means of generating new competitive advantages, such as amenities (environmental or cultural) or local products (traditional or labelled);
- more attention for quasi public goods or 'framework conditions' which support enterprise indirectly;
- a shift from a sectoral to a territorial policy approach, including attempts to integrate the various sectoral policies at regional and local levels and to improve co-ordination of sectoral policies at the central government level
- decentralisation of policy administration and, within limits, policy design to those levels;
- increased use of partnerships between public, private and voluntary sectors in the development and implementation of local and regional policies.

This paradigm shift is a counterbalance to globalisation. In a purely globalised market the (commodity) price will be based on the region where the lowest cost price can be reached. Because of the shift towards rural policy other sources of income or other advantages are generated so that the place of dairy production will not only be decided by the cost of production.

Sustainability issues

The FAO report *Livestock's Long Shadow* (Steinfeld, 2006) clearly showed how big the impact of livestock (especially of dairy and beef) is on climate change. The topic of dairy emission of greenhouse gasses and mitigation was presented at the GDF conference in a separate paper. Al Gore's movie 'An inconvenient truth' has raised a lot of attention worldwide about the climate change issue. Several countries have developed policies to support the production of biofuels. This influences land prices and prices of feed for the cows. Because of this, extra attention is given to efficiency of protein production. According to the FAO, milk is the most efficient animal protein in terms of protein yield per acre. Of course soy beans and other protein producing plants are more efficient protein producers.

Figure 4.2 Land use efficiency - usable protein yields per acre from different foods



Source: USDA: FAO/WHO/UNICEF Protein Advisory Group.

Regional trends

Consumption of animal food products in Western Europe is under pressure. Animal food is discussed because of environmental impact, animal welfare and human health (e.g. obesity). This discussion is linked to the industrial production methods being used. Retail in some countries is paying closer attention to the way products are being produced. Retailer Tesco in the USA is an example of this development. It is developing programmes for more sustainable production by introducing food miles or food prints, for example.

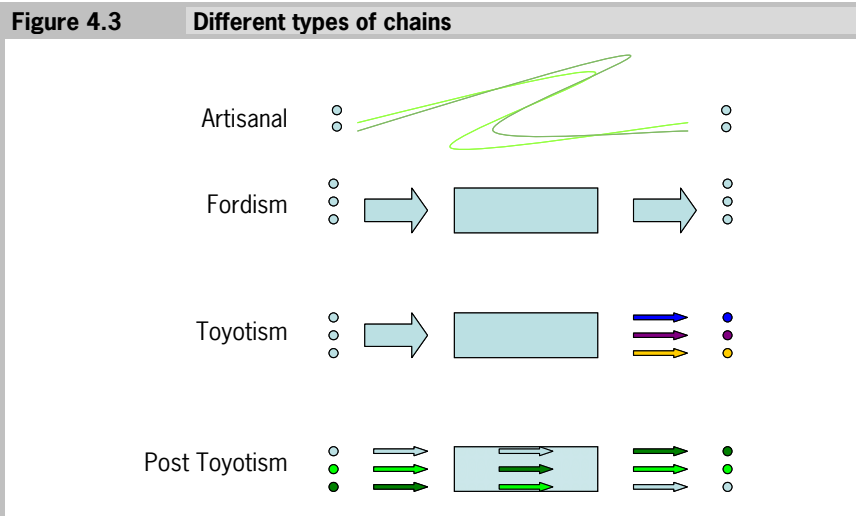
There is a growing interest in how food is being produced, partly as a result of publications such as that of Michael Pollan (Pollan, 2008), who has established rules for 'real food' and distinguishes real food from nutrients. This growing interest in the way food is produced is also visible in a growing interest in locally produced food and organisations like 'Slow Food'.

Developing countries are the major driver for the dairy commodity market. If incomes exceed the poverty level, consumption of dairy products and meat increases rapidly. This was one of the key factors in predicting a higher milk price for dairy commodities before the financial and economical crisis of 2008.

4.2 Possible Turns and Key Factors

New chain concepts

The dairy chain is very important for the dairy farmer. Chains in general can be described in different ways. The following types of chains have been distinguished, based on different types within the automobile industry (based upon Van der Schans in Kortstee (2008) and Beldman (2009)).



The artisan chain is based on craftsmanship and a direct relationship between producer and consumer. Each product is unique. In the dairy industry this type of chain consists of farmers that process their own milk in combination with direct sales. In the fordistic type of chain the focus is on efficient production; on bureaucratic control. There is usually a strong vertical integration and strict chain control. The chain is based on mass production and mass consumption. The word fordism is of course related to the Ford automobile industry in its early years. A famous quote from Henri Ford is that the customers could buy any colour car they wanted, as long as it was black. If you look at the dairy industry, chains that focus on production of commodities like milk powder often have fordistic characteristics.

A toyotistic (based on car manufacturer Toyota) chain is characterised by self-regulation, quality circles, outsourcing and mass individualisation. This chain tries to address individual wishes of clients, so that every customer thinks he is buying his own personal car, but in fact it is still a mass production system.

Again related to dairy this type of chain is seen where there is more focus on the consumer market. Standard white milk comes in at the front end. A big differentiation of consumer products comes out at the other end.

It seems very well possible that because of the mentioned trends (from agricultural policy toward rural policy, more interest in locally produced products) a new type of chain in dairy might evolve in the near future. In this type of chain different types of milk (produced in a different way or in a specific region) will enter the dairy chain and will be processed into large variety of end products. This type of chain can be characterised as Post Toyotism. Important is that the origin of the raw material is still visible in the end product and is also essential for the position in the market. At the moment some chains are experimenting with this type of product (e.g. FrieslandCampina with milk produced by grazing cows with a higher level of CLAs). The concept of A2 milk, which is based on the fact that it is produced with a different type of cow, also fits in this concept.

It is important to understand that each type of chain has its own characteristics. Each chain is organised in a different way and has its own culture. It is not so easy to switch from one type of chain to another. The experience of the pork industry when a more fordistic type of chain started an experiment with a different type of pig (based on a different production system) that was also sold in a different market illustrated these difficulties. After a few years the fordistic chain stopped the experiment. The farmers who worked with the new system found new chain partners and are still producing, for a relative small market. Another example is that a toyotistic dairy chain took over a small organic milk chain (so in fact became post toyotistic), but in essence the strategy of the chain did not change and the chain that was taken over was not further developed. This was partly because of the development in the market, with only a slowly increasing demand of organic dairy products, but also because the conventional dairy farmers considered the organic dairy farmers and their chain as their own competitor.

Of course not every chain exactly fits in this model. A very interesting example is the Victorian Organic Dairy Co-op (AU). This is a limited group of 16 organic dairy farmers. This co-op is aiming for the top segment of the market in order to achieve high milk prices. Normally it is very difficult for a relatively small co-operative to develop and produce a wide range of products. However, this wide range of products is a key factor if you want to produce for the top segment of the dairy market. In order to achieve this the co-op has decided not to invest in hardware to produce a wide range of products but to invest in partnerships. The coop works together with several small dairy processors that work in an artisan way and together they produce a wide range of products.

New farming system: regional farming

This system can be further developed if the trend toward regional policy and the trend among consumers of more interest in locally produced products continue. This could result in regional brands of dairy products or a brand based on the sustainability of the production system (in a post toyotistic chain). This development is most relevant for urban areas.

Management

One of the key factors for the future is a high level of management. This is a precondition for surviving the current bad situation and being successful in the long run. With the ongoing increase of scale of the dairy farms it becomes very important to monitor the performance of the farm and make adjustments in management in time. Related to the current scale of many farms the farmer can no longer rely on his own eyes and experience alone. It is therefore important to define some Key Performance Indicators (KPIs) that will be monitored continuously. A separate workshop on this topic was held during the GDF conference (see Appendix 2).

One of the conclusions of the GDF workshop was that financial KPIs are very important (return over feed/cow, concentrate costs/kg milk, total feed costs/kg milk), but these indicators heavily depend on non-financial KPIs. Milk production, for example, especially per cow per year, is a main KPI. Among the financial KPIs, the feed costs are considered to be the most important, followed by Investment KPIs. Although there is attention for operational or day by day KPIs, the focus within GDF is on tactical or strategic KPIs. This indicates a global management of the farm with attention for detail where considered necessary. KPIs for the People part of the triple-P (people, planet, profit) are lacking; currently these KPIs often lack a clear definition and good measures (see Appendix 2 for more information).

Sustainability, especially energy/GHG gasses and phosphorous

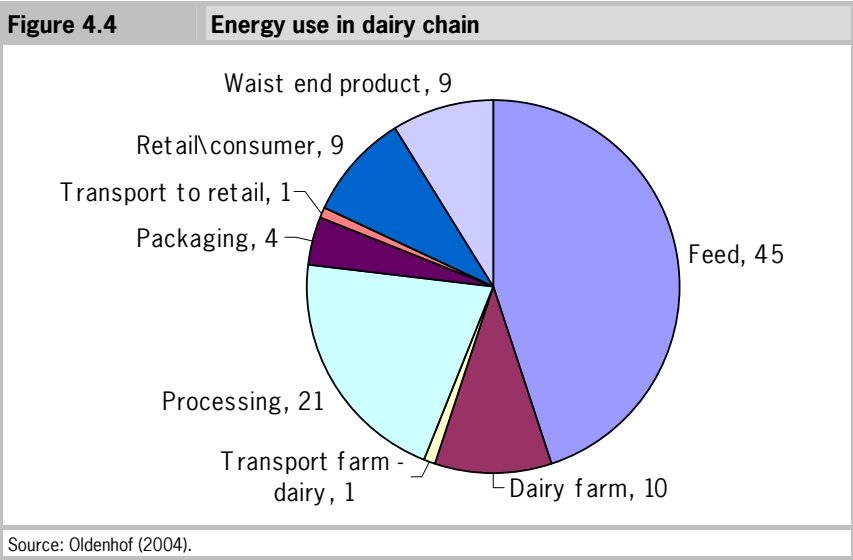
A second key factor is environmental sustainability. The energy issue has been mentioned before. A special workshop was dedicated to the Carbon Footprint during the GDF conference. Agriculture - especially live stock production - is a partial cause of climate change but climate change in turn affects agriculture. The main sources for emissions of GHG related to dairy on the farm level are fossil fuels (directly on farm and indirectly through use of fertiliser and concentrates), methane (from manure and fermentation) and N₂O (mainly from manure). Livestock in total is responsible for 19% of the global GHG emissions. In several

countries goals have been set for reduction of GHG emissions (e.g. in Europe: 20% reduction in 2020 and 20% use of renewable energy). In New Zealand 49% of GHG emission is from agriculture and so there is a lot of pressure for the dairy sector in this regard.

Emission of GHG gasses is calculated in Global Warming Potential units (kg CO₂ equivalents). Emissions of CO₂, methane and N₂O are incorporated in the GWP. There are big differences between different farming systems in GWP per kg of milk. A New Zealand farming system has levels of 0.86 GWP/kg of milk, while intensive high input farming systems in Western Europe have levels of 1.50. Large differences in GWP are also found within countries. In a Dutch study GWPs were calculated for nearly 120 dairy farms. The average GWP was 1.36kg of CO₂ eq/kg. About 55% is directly from the farm (use of fuel and energy, emission of methane) and 46% is indirect (mainly from concentrates and fertiliser). The standard deviation of GWP was 0.3kg of CO₂ eq/kg of milk. This means that differences between farms are quite big and there is room for improvement.

Possible mitigation strategies are mostly focusing on improved efficiency (lower replacement rates, frequent removal of slurry, improved application of slurry, et cetera) Anaerobic digestion can reduce GHG emission by 96% if all of the thermal energy can be used. Specific possible mitigation strategies for methane are mostly related to feeding strategies. Possibilities are use of additives (Garlic based allicin), use of more concentrates, use of more fat and the use of a vaccine to neutralise micro organisms.

It is important to realise that energy use is a chain issue. Especially in regions with farming systems that buy concentrates, the total use of energy is divided over different parts of the chain (e.g. feed company, dairy farm, processor). The following graph shows this for the Dutch dairy chain. About 45% of the total use of energy is related to feed (production). About 10% of the total energy is directly from the dairy farm. The rest is from processing, packaging, transport and retail (Figure 4.4)



The carbon footprint will be a major issue for dairy in the near future. It is difficult to predict what the actual impact will be, because this will depend on political decisions. Methods to assess GHG emission on the farm and operational level are in development. An integrated approach is necessary, because some strategies successfully reduce methane emission but in turn increase energy use. The presentation about climate change and carbon footprint can be found in Appendix 2; the references for this presentation are included in the presentation.

Other major sustainability issues for the future will be water and phosphorous. The world is running out of P-supplies. Fertilisation with P is important for a good feed production (grass and other crops).

Availability and quality of employees

Because of the increase of scale a lot of the future milk will be produced on large-scale farms that work with employees. In several regions there is a growing concern about the availability and quality of labour. This subject was also addressed in a separate workshop at the GDF conference.

4.3 Developments on regional levels based on discussion with GDF members

After a general presentation (with content from the preceding paragraphs) GDF members split up in regional groups to discuss the current situation in the region. The groups were asked to discuss:

1. The driving forces as mentioned before (economy, market, societal preconditions and quality and supply of labour);
2. Future strategies on farm or chain level;
3. Innovations (both necessary and those already in development).

Each regional group presented the main points to the entire group.

North America (representatives from USA)

The current situation (2009) is very bad. The milk price is low and feed prices are high; cattle prices have fallen 40%. The US dairy farmers had increased their production because of the expected increase in demand from China with the goal of producing for export. As we saw earlier, the USA became a serious player on the world market in 2008, exporting a total of about 10% of the production. The demand for milk from China collapsed because of the melamine scandal and the financial crises. The dairy crisis in the USA is deepened because of the lack of availability of credits. Banks are very reluctant to give money to dairy farmers because of the current low level of value of their assets.

The footlose systems are very sensitive to these developments. A low milk price influences all dairy farm systems, but it has of course the highest impact on highly specialised farms without any other sources of income. Because the farmers buy most of their feed and do not grow it themselves they are more vulnerable for price fluctuations. The equity level of this type of farm depends relatively much on the value of the livestock. So if you combine the drop in cattle prices with the reluctance of banks in general to take any risks regarding new credits because of the financial crisis it is very clear that the current situation is very difficult for dairy farmers at the moment.

In 2007 the North American farmers reported an increase in societal preconditions. At the moment this is vanished and the focus in the general public discussion is on the economy rather than animal welfare or environmental issues. The economic crisis also influences the availability of labour. People are happy to have a job at the moment. The US government is currently giving premiums to slaughter milking cows and is buying milk products to support the milk prices.

Future strategy on farm and chain level

The focus is now on surviving this period. Some farms are going bankrupt at the moment. There is a tendency to spread the risk more. Farmers are considering processing their milk themselves (sometimes with a group of farmers and especially on large farms). In 2007 there was already a tendency to connect the foot-loose system more with the feed production and this tendency has now strengthened. The problem is that investment must be done to implement these strategic changes and the credits for this are not available at the moment.

Farmers (and others) talk more about controlling production and prices. California works with a system of delivery rights, if you want to expand you have to pay so a market can be developed for the extra milk. The same system works in Florida. The farmers are rather reticent to discuss these topics because this is not part of the American way to be in business but the crisis forces this type of discussions. For the farmers more equity is necessary to develop more resilient farms.

Innovations are currently needed in the financial field. New financial models are needed for credits for dairy farms.

South America (representatives from Brazil)

Current picture

Milk prices are currently quite good compared to other countries. Brazil is mainly producing for the home market so far and is therefore less influenced by the world market. Most farms work mainly with their own roughage and with limited competition of other crops for ethanol. In some areas dairy has to compete with other crops such as oranges or coffee. Long term contracts are possible in these crops so they can offer a more secure future for the farmers. Land is a vital production factor because farms mainly feed their own roughage and concentrates. Land has to be financed with their own money (banks are not allowed to give loans for land). In the traditional agricultural areas land prices are rising, making it rather difficult to expand the farm. Milk is only paid based on volume, not on solids/contents. Brazil is not exporting at the moment.

Availability of labour is no problem, labour is cheap. The quality of labour is sometimes a problem. Some training is necessary. The farmers select 'hat workers' to work on the farm; those who learn fast can stay while the others leave soon. It is expected that labour will remain (relatively) cheap so there is no need to invest in automation. The Brazilian GDF members concluded: 'So in fact the circumstances for dairy are pretty good in Brazil at the moment.'

The government is stimulating dairy in the areas that are not suitable for arable crops, but rather for grassland. The focus of the governmental policy is on

stimulating family farms with 50-70 cows. So far there is not much interest in and outside Brazil to invest in dairy (unknown, unloved). Brazil is at the threshold of becoming an exporting country. This was already predicted 5-10 years ago because of the enormous production potential of this country for agriculture in general but also for dairy. It has taken more time to become an exporting country than was expected. This has been caused by lack of infrastructure and quality in the dairy industry. This will still be a critical factor for the near future in combination with political stability. Exporting country Australia sees Brazil as one of the main future competitors because of the production growth in recent years and the low cost, pasture based production that is being developed.

Argentina and Uruguay have a good climate for dairy production. Especially in Argentina foreign investors have set up big dairy farms and processing industry. Trading in dairy is also becoming more important (for example, Argentina imports from EU and exports to Brazil). Societal preconditions could become an issue (environment), but there is no discussion about animal welfare. BST is allowed. The political climate is very important for the future development of dairy in these countries. Investors are hesitant to invest because of political instability.

Future strategies on farm and chain level

Farm size will gradually grow. As mentioned before, land is the limiting factor. This can be solved partly by rearing young stock elsewhere. Integration in the chain is developing: dairy processors also offer feed and services like veterinary and financing.

Innovations (necessary and in development)

No clear developments in innovation at the moment. New bank financial models are required, and stricter rules within the dairy chain (to distinguish the real continuing professionals more easily).

Oceania (representatives from New Zealand and Australia)

Water is currently a very important issue. In Australia towns and the government are buying water for human consumption and for environmental purposes. This means that less water is available for agriculture. In New Zealand costs of water have gone up. A lot of effort was invested in increasing the efficiency of water use on dairy farms. Good progress has been made in this field. Australia is moving towards the use of GM crops, in New Zealand GM crops are not allowed and will not be allowed in the near future.

Climate change is considered to be a key issue for the future of both countries. In New Zealand this is mainly because of the fact that the dairy sector is the biggest producer of greenhouse gasses. The government therefore looks closely at the dairy sector for mitigation strategies. In Australia the dairy sector is more concerned with the direct effect of climate change. Recent periods of droughts alternate with periods of too much water. Some experts worry about the possibilities for dairy production in Australia in the future.

The availability of labour has improved in both countries. The improvement of labour availability in Australia was mainly caused by the collapse of the mine industry.

In Australia the competition between dairy processors has been strong and the number of processors has decreased. In New Zealand the development is in the opposite direction. The market share of Fonterra has dropped from 97 to 88% and new processors have entered the market. Fonterra has been affected by the Chinese Melamine crisis. Fonterra was a major (40%) shareholder of the Sanlu dairy company. This company went bankrupt because of the melamine crisis. Another setback for Fonterra was the voting down by the members of a new financing system. Fonterra took a remarkable step in supporting the farmers in the dairy crisis. Fonterra has made it possible to get extra credits for the farmers.

The world market is very important for both countries. The EU and US interventions are considered to be negative for the farmers in New Zealand and Australia.

Innovations (necessary and in development)

Australian researchers are working on a high capacity milking robot (up to 2000 cows). In New Zealand there are new developments in image management. A better image of dairy (also of individual farms) is needed to attract young people to the industry. A lot of research is done in the field of GHG mitigation strategies. For example on nitrate inhibitors and on ways to improve grassland production to reduce costs and lower emission of GHG (e.g. research on entophytes to create insect tolerance and on pasture growth regulators to compensate for not using GM grass). Nitrate inhibitors are used a lot; the drive for the farmers to use it is the increase in efficiency and lowering of costs. In New Zealand GHG is very important because the dairy industry is the most important contributor to the total national emission.

China (representatives from China, from the feed and dairy industry)

Current picture

At this moment there are many small farms. Because of the melamine crisis in 2008 the Chinese government wants to scale up the farms and milk processing. Different strategies are being implemented to scale up. One of the strategies is in a jump toward 1,000 or 10,000 cows per farm. This strategy is supported by the government and some major processors like Yili Group and the Mengniu Group. Nestlé has a different strategy. They work with small farms of consisting of around 5 cows by supporting them to grow gradually to 10 and later to 30 to 40 cows per farm. The growth is stimulated by paying a higher milk price for bigger farms, conditions to get a higher milk price are the use of a milk tank and good farm management. The total milk production in China dropped significantly last year because of the melamine crisis. The Dairy industry and the government think they can recover the trust of the consumers in the coming years.

In China the government has a big influence on the economy (guided economy) - and in fact a big influence on choices of people in general. It is a challenge to efficiently feed a large population. From an efficiency point of view it would be best to focus on the production of vegetarian food. But the government seems to want to meet the wish of the consumer to consume more animal products. The government, however, decides which animal products will be produced. Because dairy is the most efficient the choice has been made to invest in dairy. A second important aspect is that China wants to be independent from other countries and so wants to produce the dairy itself.

Future farm and chain strategy

First of all, the government plays an important role in the future development of farms and of the industry. For the short term the focus is on regaining the trust of consumers in the quality of milk. The government is focusing on producing for internal consumption because dairy is considered to be the most efficient animal protein. Part of the Chinese production will also be intended for export, giving the Chinese a trading position. For the mid term, however, China is expected to be a net importer of dairy. The government will stay in control of land and milk prices as long as possible.

The current strategies will remain in place in the coming years:

- The first is focusing on strong chain integration, starting with setting up a (large-scale) processing industry with the help of outside investors (e.g. Tetrapack). The processing industry will stimulate (by investing in housing and milking parlours) large-scale dairy farms. This scaling up can be done in

two ways, one way is to set up a completely new farm in one step. The other way is to do this more gradually, in which the small farmers join up in a bigger farm. The farmers will work at these farms and their cows will be leased. These farms will usually not be owned by farmers, but will be run by a manager. This strategy is implemented by the Yili group and the Mengui Group.

- The second strategy is focusing more on the development of current small farms in small steps to family farm scale (ca 80 cows). Nestlé is supporting this strategy.

A major question is what will happen with the backyard farms and the so called dairy villages. A lot of the governmental rules will affect these farms, the question is if they can adjust to these new rules and if the government will be able to implement and enforce these laws.

The dairy industry is expected to develop in two types of regions: in regions where feed production is possible (so the dairy products have to be transported) and in regions where the consumers live (so feed will have to be transported). Import of feed and cattle from Australia and feed from California will continue. China is also securing production of feed and food outside their own countries by making deals with African countries.

Important innovations for Chinese dairy are Information Technology and Antibiotic testing. Information Technology (IT) will help to increase management on the farm level. For example with line measurements in the milk flow, air tagging or camera systems. A quick Antibiotic test (AB) will have a big impact on the whole system of milk testing. A quick test should also be cheap because of the large number of farmers. At the moment all concentrates are sold in bags, experiments are starting with storing concentrates in silos on the farm.

One of the key factors for a successful development of Chinese dairy is to improve management. For the big footloose farms, supply of roughage and manure management are critical factors, the structure of the fields (many small plots) will make this difficult.

More detailed information about the visit of GDF members to China in June 2009 can be found on www.globaldairyfarmers.com/congress/reportGDFChina.

Eastern Europe

The expected increase in demand of dairy products has slowed down considerably in countries like Russia, Romania and Ukraine. This is mainly caused by the worldwide economic crisis which greatly affects Eastern Europe in general. Russia is also affected by lower prices for oil and gas.

The situation in Russian dairy has not changed very much since 2007 (GDF congress Moscow). At that time it was concluded that an impulse was needed to improve the quality of the dairy chain; for example improving the quality of management (feed production, herd management) at the dairy farm and improving milk quality and processing in the dairy chain. At the moment it is difficult to achieve these targets, due to lack of capital, management, fertilisers and crop protection drugs. Large farms are developed with governmental subsidies, which are rather successful after a start period of 5-10 years.

For the other Eastern European countries (within the EU), changes are following rapidly. Programmes to introduce milk quotas for the new EU members are still in place, while farmers also already have to prepare for the abolishing of the quota system. There are big differences between and within countries. A lot of dairy farmers in smaller countries without a strong dairy industry are quite pessimistic at the moment. Some still see possibilities to produce for a local market, but need a good economy for this because consumers cannot afford to pay extra for local products during a financial crisis. In other regions dairy farming is developing quite strongly (e.g. Slovakia).

An innovation in Eastern Europe is the creation of large integrated farms with crops and milk, managed by skilled management and financed by companies in and outside Europe. These companies are the dairy industry, oil companies and car industry (LADA).

Western Europe (representatives from Germany and the Netherlands)

The intended abolishment of the milk quota in combination with the fluctuation in milk prices in the last couple of years is revealing big difference between future visions of dairy farmers. Some farmers are looking forward to a period without quota, because it will give them more room to be entrepreneurial. They realise that periods with low prices are part of the deal and that they will have to cope with this. Another group of farmers is looking for ways to keep the old system in place, with a controlled amount of production and a milk price that is based on the cost price of production. These different visions lead to intense discussion within the dairy sector. So far the regular farmer unions are more in favour of the liberalisation model. The European Milk Board (EMB) is in favour of a system with control of milk production. EMB wants to restrict European milk production until demand and production are in balance. Consequences are that there is no longer export outside of Europe. One of the arguments to create such an internal market is that EU also sets extra rules for milk production, and because of this farmers can not compete on the world market. This would mean European

milk production needs to decline by 8-10%. On an international level the debate will then still continue because worldwide exporting countries will want Europe to open up its borders.

So far EU policy is still planning to end the quota system despite the pressure of the EMB and member countries like France and Germany. To soften the effects of the low prices somewhat the EU has chosen to implement a temporary intervention as an answer to the US interventions in the dairy market.

After the end of the quota system an increase of production is foreseen. There is not a clear answer as to how much. In the Netherlands expectations are between 10-30% (Dairy processor FrieslandCampina 10%, but farmer unions more). In the new member states of the EU an increase is not foreseen because they don't fully produce the quota at the moment. It is difficult to establish new dairy farms in these countries due to a lack of money, suitable labour workers and management.

In the summer of 2009 the Irish and British dairy farmers were pessimistic. There is an exodus of farmers because of the low milk prices, bankruptcy of dairy processors (Dairy Farmers of Britain) and more regulation. For example, Irish processor Glanbia payed out one of the lowest prices in the EU (source www.milkprices.nl). No increase in milk price is foreseen and a decrease of milk production is expected in these countries in 2009.

In Denmark farmers are running into financial problems due to high loans that were made possible by the financial system. Until 2007 farm growth was financed by the annual increase of land value, but land prices are no longer rising and the interest had to be paid from a cash flow that is under pressure.

In France farm scale has not grown in the past 10 years as it has in countries around France. As a consequence, the EU farm scale average is lower.

In Germany the dairy sector is suffering from an increase of maize and land prices due to the increase of digesters (bio gas) using energy maize. In former East Germany the milk production is not growing but most of the remaining farms have doubled their size in a relatively short time.

In general, European farmers expect that the influence of the government (and EU) will remain in place. Partly to translate demands from society into legislation and rules but also to support (dairy) farming by financing regional projects and research. Food safety is not an issue anymore in Western Europe. One of the challenges will be how to deal with the upcoming further requirements of society. These requirements will probably lead to an increase of costs but it is not expected that consumers are willing to pay more for the desired 'green' food. It is for farms their 'License to Exist'.

Future farm and chain strategy

The increase in scale of dairy farms will continue. The farmers expect to have more differentiation in types of farms as well as in milk produced. The farmers will be managed in a more professional way. There will be more horizontal integration (co-operation between farmers) and more vertical integration (feed companies will be more integrated in the chain). This will result in more added value products. An example is 'Hemme Milch' in Hannover (Germany) and Den Eelder (the Netherlands). Also Dutch FrieslandCampina is starting with differentiation as 'Weidemelk' (Pasture milk) and taken over the initiative 'DeichGold'. (This initiative comes from different regional farmers near the Waddenzee and focuses on a cheese from near the sea, with a special salty taste.) Dairy traders are working on answers regarding special high value milk powders (baby food and USA army requirements). For this it is necessary to integrate producers in the food chain by special requirements on the milk.

5 Discussion and conclusions

In the following table the main points from the regional discussions are summarised.

Table 5.1. Main points regional discussions					
	North America	South America	Oceania	China	Europe
Current developments					
Economy/market	Crisis situation Low milk price, high costs for feed Difficult to get loans	Brazil: milk and feed price reasonable	Milk price low, but costs more under control.	Effect melamine Strong support government	Government support will remain (indirect)
Societal pre-conditions	At the moment no issue	Hardly issue, environmental demands could arise	Water Green House Gasses	Milk quality (very basic)	Strong: environment, landscape, animal welfare
Labour	At the moment no issue	Available, quality is sometimes problem	Availability no problem, longer term better image needed to attract young people	Availability no problem, quality of management major issue	
Future strategies	First surviving: On farm level: - control on feed production - own processing Chain level: discussion on production + price control	Gradual growth in size. Chain integration will be stronger		Strong integration, large processors combined with large dairy farms or more gradual development of family owned farms	Further increase of scale. Differentiation of types of farms and types of milk. Stronger horizontal and vertical integration
Innovations	Needed in financing models	New financing models (loans to buy land)	High capacity robotic milker (Aus) innovations related to improving grassland efficiency and reduction of GHG emissions	IT, in line testing of milk quality e.g. antibiotics test	

Economy/market: Milk price crash

The extremely high milk prices of 2007/2008 caused fall out in demand of milk by consumers. Especially in Asia, Africa and China consumers could not pay the high prices anymore; this in relation with the other high prices of food in general. High milk prices also have a direct influence on the market for milk alternatives. Production and consumption of soy milk increased in this period as well as the use of so called analog cheese on pizza's and hamburgers. The financial and economic crisis is increasing the effects of the movements in the market.

... greatly effects highly specialised footloose farms

Low milk prices have an influence on all farms, but footloose farms are more vulnerable. More than 50% of the costs are feeding costs. Because of the development around biofuels in the USA and digesters in Germany feeding costs are rising. In USA 30% of all grain is converted to bio ethanol. This is putting pressure on the availability of land for feed production. In USA feed prices for dairy farmers increased by more than 40%. This in combination with low milk prices causes severe liquidity problems on footloose farms.

In the short term these farms are focusing on surviving the current crisis. In the longer term the farms are focusing on:

- own feed production or long term contracts with arable farmers;
- creation of higher margins by investing in processing or participating in the chain;
- new financial models (e.g. private investors).

Pasture based farm with low external input (resilient farming system)

The New Zealand and Australian farming systems with low external inputs like concentrates and fertiliser are less influenced in their operational costs by developments like biofuels or other developments that influence the price of feed (e.g. world grain market). These farming systems seem to be less affected by the developments in the world market, but will be more affected by environmental issues such as the availability and quality of water and climate change.

Currency influences

Farms in New Zealand and parts of Australia are strongly effected by currency rates. This is possibly the most influential factor in the dairy industry there. In 2008 this currency effect (a strong Euro) was a big advantage for USA exporters and a disadvantage for EU exporters.

Economy/market, role of farmers in the dairy chain

One of the chain strategies in Chinese dairy is focusing on a total integration of the chain. The dairy processor is investing in dairy farms, so that the person running the farm is not an entrepreneur but more a manager that produces milk that meets the standards required by the chain. This has led to an intense discussion between the GDF members. On one side the opinion was that to improve quality in the dairy chain, to work as efficiently as possible and to be in control of the chain, this total integration model would fit the best. Then entrepreneurs would not be needed on the farms, but managers that work according to the chain plan. Some chains (poultry and pigs) are organised in this way. On the other side the opinion was that the chain could also make use of the entrepreneurial qualities of dairy farmers to develop the farms and the industry and this way to co-create a strong and flexible chain.

The choice for the type of chain depends on the strategy of the chain (low cost/bulk or added values) but also on the political system and the historical development in the region where the chain is operating. In China a total integrated chain seems more appropriate. It is therefore very interesting that Nestlé in China has a strategy that is focusing more on empowering the farmers to become entrepreneurs together with the help of food suppliers such as Hendrix and Wellhope.

Economy/market, national or regional dairy policy

In Australia, New Zealand and South American countries there is a big resistance against the USA and EU policy of supporting the dairy industry by intervening in the market for example through buying and stocking milk powder. For the USA this is a new policy the USA has been a net exporter of milk since 2007. Europe did not have any stocks left in butter or milk powder but because of the change in policy that reintroduced a part of the old system the stocks are building up now. So far the EU emphasises that this is a temporary measure.

In the short term the interventions in the US and the EU support the prices of the world market because no extra products are dumped on the market. In the longer term these stocks could affect the recovery of the market. GDF members asked if especially the European farmers are aware of the consequences of this policy for their colleagues overseas. In all honesty the answer was 'Probably not'.

Economy/market, dairy more influenced by the total economy

In the past the connection of the dairy industry with the general economy was relatively clear. If the economy was growing in poor regions, the market for dairy products would rise quite rapidly. In wealthier regions the market would not so much grow in volume but more in turn over and added value by producing a growing variety of dairy products. And if due to a higher demand the prices of e.g. grains (for food and feed) would rise, then dairy price would also go up. This is changing because other processes are intervening now. Price of grains and other feeds are now also influenced by biofuels. As a result, feed prices can go up, without the milk price following.

The economy of dairy importing countries is affected by the prices for energy. Especially oil and natural gas producing countries are in general not strong in agriculture (Middle East, Russia). With high energy prices it is easier to spend money on the import of food. As soon as oil prices pass USD60 per barrel there is no more need to invest in agriculture because importing milk is easier. The question is, of course, how long this will continue in the face of a future lack of natural energy sources. China is especially aware of this danger. Necessity will grow in the Middle East as well due to the extremely high energy consumption of the national population. This means less oil can be exported.

Societal preconditions

Because of the current crisis there is less pressure on the societal preconditions. But with a recovering economy the pressure will return, though perhaps in a different way. It is interesting to see that the movement in China is to support the dairy production as the most efficient animal protein also complies with the wish of the Chinese to consume animal products. The opposite development is visible in Europe where pressure on animal production and consumption is increasing because of negative side effects like animal welfare and environmental issues.

Sustainability issues will be important for the future of dairy. The three main issues are:

- water: availability and quality;
- climate change (energy use, production of greenhouse gasses);
- phosphorous.

Future strategies and innovations

It is clear that dairy is facing several challenges, especially in the short term. The prospects for the market in the longer term are still quite good.

In general, development of resilient farming systems and strategies will be required. The strategy has to be able to cope with fluctuations in costs and milk prices. If you look at the current systems the low input pasture based systems seem to be the best options. This does not mean that other farming systems will disappear, but they will have to adapt. The footloose farming systems will have to look for alternatives to control the risks, whether by contracting with arable farmers or growing crops by themselves. This can also be done through other financial models (different types of contracts for feed or milk) or by participating in the chain to spread risk. The development and implementation of these innovations, however, will require time and funds, so they will not be available very soon.

If we take a closer look at the actual farm/farming systems, the following challenges can be mentioned:

- Mitigation strategies for GHG emissions. There are big differences in GHG emissions between types of farms. This opens up perspectives for mitigation strategies;
- Manure and manure handling (e.g. digesters) will be important for efficient use of nutrients, but also for reducing GHG emissions;
- Efficient use of water (different crops, monitoring systems, et cetera);
- New housing systems that are cheap and offer a good climate and (especially for Western Europe) good conditions for animal welfare (free stall, cross ventilation);
- Good KPI indicators in order to support farm management. A break through is expected in the field of in-line measurement of milk quality. This can rapidly improve the level of management and milk quality.

The biggest challenge is to incorporate the different demands in an integrated system. Is it possible to come up with a farm and chain strategy that incorporates these demands and challenges and is capable of creating value? One of the proposed solutions of the current situation in US dairy was to enter the dairy chain. In fact this choice to enter the chain is part of a survival strategy or at best a business development strategy (you cannot get a ROI on farm level, so that is the main reason to invest in the chain). To actually create value it is important that this development is market driven. Unfortunately, no blue prints are available for this.

References and websites

Beldman, A.C.G., J.W. van der Schans, C. Smit, C. Wierda, J. Poelarends, H. Kortstee and I. Enting, *Inspirerende kolomstrategieën; Lessen van buiten en binnen de agrarische sector* (In Dutch, summary in English). Rapport 2008-089. ISBN 978-90-8615-32-13. LEI Wageningen UR, Den Haag, 2009.

Kortstee, H.J.M., D.W. de Hoop, V. Immink, J.W. van der Schans, M. Fischer and M. Krol, *Case voor marktcreatie in het proces van professionalisering van producten in het veelzijdig platteland*. LEI Wageningen UR, Den Haag, maart 2008.

OECD (Organisation for Economic Co-operation and Development), *The New Rural Paradigm: Policies and Governance*. 101 pages. ISBN 9264023917, June 2006.

Oldenhof, S., *Uitgebreide Energiestudie Zuivelindustrie*. KWA Bedrijfsadviseurs bv, Amersfoort (in Dutch), 2004.

Pollan, M., *In defense of food*. Penguin, 2008.

Sidwell, B., *Boom, bust and beyond. The global dairy complex in review. The day after tomorrow*. Presentation during GDF congress. Beijing, June 2009.

Steinfeld, H, P. Gerber, T. Wassenaar, V. Castel, M. Rosales en C. de Haag, *Livestock's Long Shadow -Environmental Issues and Options*. FAO, Rome, December 2006.

Websites


- www.prodzuivel.nl
- www.globaldairyfarmers.com
- www.ams.usda.gov
- www.milkprices.nl

Appendix 1

Global warming

Carbon footprint

Alfons Beldman (alfons.beldman@wur.nl)



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Climate change and carbon footprint

livestock is long shadow

- Content
 - Climate change and agriculture #AO report
 - livestock's long shadow
 - Farm level
 - Mitigation strategies




Global Data Research

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Climate change and carbon footprint

- Climate change: agriculture victim or perpetrator?
 - Climate change will affect agriculture
 - Agriculture is also major cause




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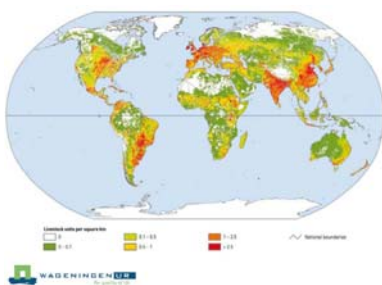
Climate change: some facts

- Climate change is caused by green house gasses (concentrations ppm, ppb, ppb and global warming potential)

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



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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
 - N2O from manure



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Climate change and livestock

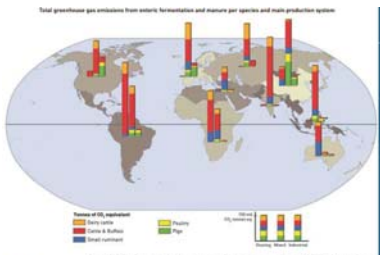
- Livestock major contributor to GHG emissions



Climate change and livestock

- Livestock related GHG emissions:
 - extensive systems main contributor

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



Climate change: policy (goals)

- Europe:
 - reduction GHG emissions by 20% in 2020
 - 20% utilization of renewable fuels by 2020
- New Zealand
 - 49% GHG emission from agriculture
 - 2013 methane and NO in Emission Trading Scheme: max 90% from 2005 level
 - Emissions have increased (increase livestock, deforestation)
- US no specific targets



Climate change: New Zealand farm level

- Cradle to farm gate: average NZ farm
 - 160 ha (of which 40 being used off farm land)
 - 315 cows
 - Total milk production: 1.2 mil kg



Climate change: New Zealand farm level

- Intensification strategies
 - Low input (no fertilizer, 2.3 cows/ha, no brought in feeds)
 - N fertilized (170 kg N/ha, 3 cows/ha)
 - N-fertilized + maize (5.2 cows/ha)



Climate change: New Zealand farm level

Countries and references	Systems	GWP (kg CO ₂ -eq.)	
		Expressed per	kg milk ha
NZ (this study)	Average NZ	0.856	8136
Sweden	Conventional	1.100	5714
	Organic	0.950	2742
Cederberg and Mattsson, 2000	Conventional	1.410	11,018
The Netherlands (Thomassen et al., 2008)	Organic	1.480	8362



Climate change: Europe farm level

- Cradle to farm gate: kg CO₂ eq/kg CO₂ eq/kg milk

Atlantic (75 cows, 27 t/ha, dairy, grazing)	1.33
Atlantic org. (42 cows, 11 t/ha, dairy, grazing)	1.45
Continental (60 cows, 2.5 t/ha, dairy)	1.33
Mediterranean (60 cows, 1.5 t/ha, no grazing)	1.70



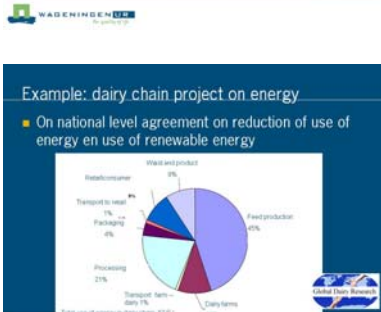
Table 3
Impacts of various mitigation strategies on greenhouse gas emissions from an 1800-cow dairy farm

Mitigation strategy	GHG emissions (t CO ₂ e/ha)
Baseline	10.00
Feed	9.50
Manure	9.00
Energy use	8.50
Climate change	8.00
Competition	7.50
Agro-ecology	7.00
Agro-ecology + feed	6.50
Agro-ecology + manure	6.00
Agro-ecology + energy	5.50
Agro-ecology + climate change	5.00
Agro-ecology + competition	4.50
Agro-ecology + agro-ecology	4.00
Agro-ecology + agro-ecology + feed	3.50
Agro-ecology + agro-ecology + manure	3.00
Agro-ecology + agro-ecology + energy	2.50
Agro-ecology + agro-ecology + climate change	2.00
Agro-ecology + agro-ecology + competition	1.50
Agro-ecology + agro-ecology + agro-ecology	1.00

- ### Climate change: Europe farm level
- Mitigation strategies and maximum effect
 - Lower replacement rate: -1.3%
 - Frequent removal of slurry: -7%
 - Use of trail hose and injection in manure application - 0.7 - 3.2%
 - Scraping fouled surface: not effective
 - Anaerobic digestion -96% (if all thermal energy can be used)
 - Combination of strategies: -25 up to - 105%

- ### Other mitigation strategies
- Methane
 - Garlic based feed additive (allicin UK)
 - More concentrates
 - More fat: cottonseed (-21%)
 - Vaccine to neutralize microorganism (Australia, NZ -15-30%)
 - Nitrification inhibitors
 - CO2 sequestration

- ### Initiatives from the processing industry
- Europe
 - Focus on energy (pilots with chain programs)
 - US
 - Industry programs on reducing carbon footprint



- ### Example: dairy chain project on energy
- Pilot project with feed company, dairy processor and dairy farmers
 - Focus on feed and farm
 - With feed company
 - Effect of choice of ingredients for concentrates on sustainability based on LCA analysis.
 - Possibilities to save energy in feed production process
 - Effect of replacing concentrates with raw materials or by products

- ### Example: dairy chain project on energy
- With farmers
 - Information on energy use in chain → chain partners present their plans
 - New indicator: "Carbon footprint" emission of greenhouse gases based on LCA: CO₂ eq/kg milk
 - Benchmarking
 - Discussion on possibilities to reduce use of energy
 - Pilot project
 - Communication within chain very important
 - Possibilities are there to reduce use of energy → stronger triggers are needed for change of behavior

- ### Carbon footprint: conclusions
- Will be major issue in near future
 - Actual impact will depend on political decisions
 - Methods to assess GHG emission on farm level in development
 - Integrated approach is necessary (CH₄ ↔ CO₂)
 - Big differences on farm level
 - between farming systems
 - within farming systems
- Chain approach seems appropriate



References and websites

Agrisearch now, *Facing the climate change challenge*. In: *Agrisearch now* 14 (2008).

Arsenault, N., P. Tyedmers and A. Fredeen, 'Comparing the environmental impacts of pasture-based and confinement-based dairy systems in Nova Scotia (Canada) using life cycle assessment'. In: *International Journal of Agricultural Sustainability* 7 (2009) 1, pp. 19-41.

Bannink, A., *Feeding strategies to reduce methane loss in cattle*. Rapport 34. Animal Sciences Group, Wageningen UR, Lelystad, 2008.

Basset-Mens, C., S. Ledgard and M. Boyes, 'Eco-efficiency of intensification scenarios for milk production in New Zealand'. In: *Ecological Economics* 68 (2009), pp. 1615-1625.

Boadi, D., C. Benchaar, J. Chiquette and D. Massé, 'Mitigation strategies to reduce enteric methane emissions from dairy cows: Update review'. In: *Canadian Journal of Animal Science*. April, 2004.

Ellis, J.L., E. Kebreab, N.E. Odongo, B.W. McBride, E.K. Okine and J. France, 'Prediction of Methane Production from Dairy and Beef Cattle'. In: *Journal Dairy Science* 90 (2007), pp. 3456-3467.

Oldenhof, S., *Uitgebreide Energiestudie Zuivelindustrie*. KWA Bedrijfsadviseurs bv, Amersfoort, 2004.

Olesen, J.E., K. Schelde, A. Weiske, M.R. Weisbjerg, W.A.H. Asman and J. Djurhuus, 'Modelling greenhouse gas emissions from European conventional

and organic dairy farms'. In: *Agriculture, Ecosystems and Environment* 112 (2006), pp. 207-220.

Pastoral Greenhouse Gas Research Consortium, *Developing solutions to reduce New Zealand agricultural emissions*. Annual Report to the Crown 2008. Pastoral Greenhouse Gas Research Consortium, NZ, 2009.

Pastoral Greenhouse Gas Research Consortium, '5 Year Science Progress'. In: *Report 2002-2007: Developing Solutions to Reduce New Zealand Agricultural Emissions*. Pastoral Greenhouse Gas Research Consortium, NZ, 2007.

Saunders, C., A. Barber and G. Taylor, *Food Miles - Comparative Energy/Emissions Performance of New Zealand's Agriculture Industry*. Research Report no. 285. Auru Lincoln University, July 2006.

Schils, R.L.M., J.E. Olesen, A. del Prado and J.F. Soussana, 'A review of farm level modelling approaches for mitigating greenhouse gas emissions from ruminant livestock systems'. In: *Livestock Science* 112 (2007), pp. 240-251.

Smink, W, K.W. van der Hoek, A. Bannink and J. Dijkstra, *Calculations of methane production from enteric fermentation in dairy cows*. Senter Novem, Utrecht, 2005.

Steinfeld, H, P. Gerber, T. Wassenaar, V. Castel, M. Rosales and C. de Haag, *Livestock's Long Shadow - Environmental Issues and Options*. FAO, Rome, December 2006.

Thomassen, M.A., M.A. Dolman, K.J. van Calker and I.J.M. de Boer, 'Relating life cycle assessment indicators to gross value added for Dutch dairy farms'. In: *Ecological Economics* 68 (2009), 8-9, 15 June 2009, pp. 2, 278-2,284.

Vellinga, Th, M. de Haan and A. Evers, *Decreasing greenhouse gas emissions on dairy farms*. Animal Science Group Wageningen UR, Lelystad, March 2009 (in Dutch).

Victoria Department of Primary Industries, 'Greenhouse in Agriculture'. In: *Newsletter* 11 (11 October 2008).

Weiske, A, A. Vabitsch, J.E. Olesen, K. Schelde, J. Michel, R. Friedrich and M. Kaltschmitt, 'Mitigation of greenhouse gas emissions in European conventional and organic dairy farming'. In: *Agriculture, Ecosystems and Environment* 112 (2006), pp. 221-232.

Websites

- www.carbontrust.co.uk/default.ct
- www.carbontrust.co.uk/default.ct
- www.agresearch.co.nz/science/agenvironsections.asp
- www.agresearch.co.nz/science/agenvironsections.asp
- www.bcg.org.au/cb_pages/Communicating_Climate_Change.php
- www.bcg.org.au/cb_pages/Communicating_Climate_Change.php
- www.guardian.co.uk/environment/2009/feb/17/cadbury-dairy-milk-cows
- www.guardian.co.uk/environment/2009/feb/17/cadbury-dairy-milk-cows
- www.climatebiz.com/news/2008/04/28/dairy-industry-set-measure-milks-carbon-footprint
- www.climatebiz.com/news/2008/04/28/dairy-industry-set-measure-milks-carbon-footprint
- www.foodbev.com/report/fonterra-report
- www.foodbev.com/report/fonterra-report
- www.pggrc.co.nz/
- www.livestockemissions.net/Publications/tabid/63/Default.aspx
- www.livestockemissions.net/Publications/tabid/63/Default.aspx
- www.ars.usda.gov/Main/docs.htm?docid=17355
- www.ars.usda.gov/Main/docs.htm?docid=17355
- www.dairyuk.org/index.php?option=com_content&task=view&id=187&Itemid=270
- www.dairyuk.org/index.php?option=com_content&task=view&id=187&Itemid=270
- www.stuff.co.nz/national/farming/3003208/Fonterra-wants-scheme-changed
- www.stuff.co.nz/national/farming/3003208/Fonterra-wants-scheme-changed

Appendix 2

Key Performance Indicators (KPIs)

Introduction

To develop new farm strategies or to check the chosen strategy or tactics measurements are needed. Important measurements are called Key Performance Indicators (KPIs). Rudy Giuliani, former mayor of New York, once said: 'The best KPIs don't simply measure performance, they improve it.' According to members of Global Dairy Farmers (GDF), figuring out your own figures/KPIs wakes you up. Furthermore, benchmarking with yourself or others, with support of KPIs, is the most important goal in time.

To select KPIs for your business it is important to know:

- what are your goals with the KPIs?
- what you will measure or what you can measure?
- to what extent can you influence the KPI?
- can the KPIs stand the test of time?

A KPI, measured or calculated last week, can already be out of date today (for instance the Somatic Cell Count).

As mentioned by Shirley Roenfeldt (2004), a KPI must start with a definition. For example, if you use milk fever as an indicator of fresh-cow management, then you can define the indicator as 'the number of multiparous animals that develop clinical or sub-clinical signs of hypocalcaemia'. That tells everyone what the indicator is. So also does SCC for instance. An indicator like ownership equity is often mentioned but does not fulfil all requirements for a KPI because the estimation of the value of assets often differs.

A KPI consists of a numerator and a denominator. The numerator (top number) is what is being measured. The denominator tells you what period of time, amount (for instance kg milk) or group of animals is being measured. More information can be found at www.dairyworks.com.

KPI-workshop with GDF members

A KPI-workshop with members of Global Dairy Farmers (GDF) during the GDF congress in China (June 2009) indicated some bases for goals after the above introduction:

- Farm management issues (for instance ROI);
- Rules from government (mineral pollution, et cetera);
- Rules from the supplier or processor (SCC, temperature of milk, other standards).

These bases show different levels for KPIs. At farm management level you can distinguish between:

- Strategic/tactical/operational/day by day: ROI = strategic/tactical, SCC = day by day;
- Financial/non financial: ROI = financial, SCC = non financial.

The following can be distinguished at chain level:

- Coming from the chain: SCC, TBC;
- From primary farm(er) to the chain.

In the workshop the GDF members discussed which KPIs they consider important for running their business. Generally the GDF members see financial KPIs as very important but in their opinion those KPIs, to a large extent, result from or rely on non-financial KPIs like milk production per cow per year.

When assuming that the amounts in financial KPIs are prices times quantities it is remarkable that the GDF members emphasise quantities more than prices. They probably consider prices to be a given although some try to find better potential markets for their milk, resulting in higher milk prices. Within these searches they make use of the GDF network.

During the available time, which was unfortunately limited, the GDF members described their KPIs. The following table gives those KPIs, split up into financial or non-financial and shorter or longer term.

KPIs mentioned by GDF members at the GDF congress 2009 in China

Daily - operational KPI	
Financial	Non financial
Return over feed/cow	Milk production/hour
Concentrate costs/kg milk	Milk production/month
Total feed costs/kg milk	Milk production/kg bodyweight
Costs of pasture production	Kg milk/kg DM roughage
	Kg concentrates/kg milk
	Days in milk on average related to monthly milk production
	Visits per day to the robot
	Activity/kg milk
	Number of mastitis incidents
	Culling rate
Tactical - strategic KPI	
Financial	Non financial
Feed costs of total costs	Milk production/cow annual
Medicine costs/cow/day	Milk production/cow lifespan
Investment/m ²	Milk production/ha
Debt/cow	Cows/person
Working capital/month	Age of first calving
ROI	Cows leaving within 30 days after calving

Milk production per cow per year, milk production per hectare and feed costs were named most often. For the non-financial KPIs the focus is on operational as well as on tactical or strategic KPIs. The financial KPIs are more often at the tactical-strategic level.

An outsider in the mentioned KPIs was the satisfaction at farm level. Everyone in the workshop agreed that satisfaction, both for employer(s) and employee(s) is very important. However it is difficult to find a clear definition and (a) good measure(s) for this type of KPIs. All participants use several, rather than only one or two, KPIs to manage their farms.

Conclusions and additions

According to the reactions of the participants, resulting key points of the KPI-workshop are:

- Many financial KPIs depend heavily on non-financial KPIs;
- Milk production, especially per cow per year, is a main KPI;
- Among financial KPIs, the feed costs are the most important;

- Investment KPIs are second to financial KPIs;
- Although there is attention for operational or daily KPIs, the focus is on tactical or strategic KPIs. This indicates a global management of the farm with attention for detail where considered necessary;
- KPIs for the People part in the triple-P (people, planet, profit) are really missed: currently these KPIs often lack a clear definition and good measures.

Experts of Rabobank addressed 11 indicators that they see as important:

- Costs for feed and crops per 100kg 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 100kg milk;
- Milk price per 100kg milk;
- Labour (paid + private withdrawals) per 100kg milk;
- Capital costs (interest, rent and lease) per 100kg milk;
- Tax income per 100kg milk;
- Capacity to set aside per 100kg milk (farm income + depreciation - private withdrawals);
- Structure of total cost price milk.

Logically, because of their financial background, these experts mainly discuss financial indicators. The first 5 of the list of the Rabobank experts were also mentioned by the GDF members. If the GDF workshop on the KPIs would have been more financial-oriented the similarity between both lists could have been even bigger. On the other hand, both lists are good additions to each other.

An article of Gary Sipiorski in Hoard's Dairyman of January 2009 presents 12 indicators of which the majority have already been named. Ownership equity and assets turnover can be valuable additions but both can have definition problems (how do you value the assets, exactly?).

Sipiorski also presents minimum (when for example talking about profit/revenues) and maximum (in the case of costs) values for his indicators. Those values highly depend on farm structure, markets, government policies and environmental/regional conditions. For a Holstein breed in the US he sets a value of 24,000 lbs/cow whereas a Jersey cow in New Zealand has a good production at half of this value. Goals for KPIs are at least region specific and even farm specific; the latter of course not excusing a poorer performance!

Another important point is the mutual relations between KPIs. If the milk production per cow is high, medicine and feed costs per cow can also be somewhat higher but not too much. When setting up a system of KPIs for your dairy business a good starting point is a KPI that covers (nearly) the whole farm, for instance ROI or capacity to set aside per 100kg milk. From this global view over the business you can go into more detail where necessary and define or use the KPIs you think are needed. When your set-up is ready at the basic or most detailed level you can start to implement and use the system you developed in this way. Then your KPI-system will deliver the indicators you want in a coherent whole.

In all cases various, not only one, key performance indicators are suggested and used to manage the dairy business. The KPIs mentioned in this article are not altogether exhausting. However given the agreement between different sources the KPIs in this article are a very good set to look back at recent history, to manage the current situation and to plan for the future in the shorter and longer run.

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