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Annexure MB14

International Farm Comparison Network, A Global Review – The Supply of Milk and Dairy Products

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A Global Review – The Supply of Milk and Dairy Products

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1. Executive summary and key conclusion

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Introduction

The world dairy sector has developed very dynamically in the last few years. Moreover the expected changes in agricultural policy (WTO, etc) and the technology for dairy farming and processing will lead to significant shifts in production shares around the globe. The aim of this study is a) to summarise in an "easy" way the status of world milk production/processing and b) to identify trends of the past. Both should lead to a better understanding of the future lying ahead of us.

Methodological challenge

The dairy sector with its complexity of milk types (cow, buffalo, etc.), its various milk production systems and the wide range of dairy products requires a significant level of data and methods. Unfortunately the databases available do not match with the needs especially if a global review is required. Moreover several milk equivalent methodologies exist to link the milk production volumes and the processed dairy products. This study is mainly summarising the FAO production and processing statistics (www.fao.org - year 1981-2001) by using the milk equivalent concept of total solids. The results of the milk production side are based on the work of the IFCN Dairy Network, analysing dairy farming systems globally since the year 1997 (www.ifcndairy.org). A comparison between the IFCN approach and other farm comparisons made in this study was done to validate the IFCN results.

Status quo: World milk production and processing

Milk is produced almost in all countries of the world. The EU-15 and South Asia (India, Pakistan) are the most important milk producing regions and cover more than 42% of world milk production. The USA represents 13% and Oceania (Australia and New Zealand) only 4.1%. Most countries in the world are not self sufficient in milk production. The milk surplus (net export) regions are North America, Europe, Oceania and the countries Argentina, Chile, Uruguay.

World dairy exports are dominated by Oceania and the EU-15, which cover around 80% of the exports. Major import countries are: Japan, China, Mexico, Algeria, Brazil, Saudi-Arabia, Russia and a wide range of countries in Southeast Asia.

Little world dairy trade: As mentioned in several studies, the world dairy market is very small. Only around 7% (EU-15 intra trade excluded) of milk produced is traded in the form of dairy products. Nevertheless around 22% of the tradable products produced (butter, dry products, cheese, condensed milk) are traded among countries.

Based on the existing **milk processing** statistics and the milk equivalent concept of total solids 11% of world's milk is converted into cheese, 11% into dry products, 8.6% into butter/ghee and 1.2% into condensed milk. This means around 32% of world milk is converted into tradable dairy products. The remaining 68% are used for fresh products provided by the formal channels or go into the informal dairy markets.

Among the countries the **processing structure** differs significantly. High shares of tradable products are produced in most of the European countries as well as in Australia and New

Zealand. In general, the share of milk processed into tradable dairy products is low in developing countries, like Asia, Africa and selected countries in Latin America.

The farming situation: The IFCN has analysed (based on the year 2003) dairy farms in 31 countries which represent more than 70% of the world milk production. The costs differ between 10-60 US-$ per 100 kg milk. Milk prices differ in a similar range as trade policies in nearly all countries restrict the competition of national dairy products with imported dairy products.

Cost of milk production can be seen as an important indicator for competitiveness of milk production. Low production costs of milk producing farms are found in South America, Asia and parts of Oceania. In Western Europe, most countries of Eastern Europe and Northern America production costs are higher than 30 US-$ per 100kg.

A world milk supply curve has been estimated to combine the individual farm results with the countries production volume. The countries deducted represent more than 70% of worlds milk production.

Curve 1 – is based on average sized farms in the countries. It shows that the weighted world average costs are around 28 US-$. Around 30% of the milk could be produced below 20US-$/100 kg milk. Almost 50% of world milk production needs a price of more than 30 US-$ per 100 kg milk. **Curve 2** is based on the best farms analysed in the countries and gives an indication about the milk production in the country after structural change in the future. It shows that around 44% of world's milk can be produced with a milk price below 20 US-$ per 100 kg milk. Both curves indicate that in case of a liberalised dairy market the Southern Hemisphere, Eastern Europe and South Asia are the gaining regions. Countries like the high cost countries in Western Europe (CH, NO, FI, AT, DE, FR) will face significant pressure.

Trends in milk production and processing

World milk production increased around 10% between 1992 and 2001. High growth rates can be found in Oceania, South Asia, East South Asia and Latin America. Milk production decreased mainly in the CIS countries and Eastern Europe, while it is nearly unchanged in Western Europe.

Milk surplus / deficit quantities remained stable in most cases between 1992 and 2001 which means that production and consumption have developed parallel in most regions, exemptions are Oceania where production rose much faster than consumption and East &South East Asia where consumption rose much faster than production.

Trends in processing of dairy products show over the last 20 years minor changes. Dry products gained in share of production, this is significant for Oceania, while butter production decreased among most of the regions, except in South Asia (ghee). Cheese production has increased relative against other products in Western Europe and Northern America.

The milk processing sector is in a continuous progress of change, with an increasing speed. Investment activities are mainly done by private companies on the domestic market. Per year, around 150 investment activities in the dairy industries are being observed; the mostly affected product group was cheese.

Milk supply responses measured in elasticities are found in a wide range for countries, whereby values differ significantly within the countries. This study has identified a significant uncertainty in this field, which lead to an uncertainty about the economic models applied for trade policy analysis.

Relation of milk production and milk prices in the past
An analysis based on FAO milk prices covering 90% of world milk production show for the period 1995 to 2001, the average milk prices around 28 US-$ per 100 kg. The relation between milk price and milk production has shown the following result: Low milk price and loss in production was found in Eastern Europe and the CIS countries, a low price and strong

growth in Asia, Oceania and Latin America and a high price in combination with a small growth in production was seen in Western Europe, North America and the Middle East.

Potential of milk production

As the potential of milk production is highly linked to the milk price a scenario with 25 US-$ per 100 kg milk was specified:

EU-15, USA/Canada, KR, JP, CH, NO, IS: A reduction of milk production can be expected. The speed of structural change towards more efficient farming systems and their cost potential will define how much milk will be produced under such a scenario.

Eastern Europe/CIS countries: A significant increase can be expected. Doubling production would not be a problem. Political stability and access to capital/know how would be the limiting factors.

Latin America: A significant increase of production can be expected at 25 US-$ milk price. Limiting factor would be the competitiveness of milk/ towards other agricultural commodities like soybeans. Moreover political and macroeconomic stability are a challenge for investments.

Oceania: The growth potential is smaller than in Eastern Europe/South America due to land and climate restrictions. Nevertheless the milk price of 25 US-$ would allow the intensification by using more concentrate which leads to higher milk yields.

Asia: As these countries have already now a milk price close to 25 US-$ a strong production increase cannot be expected. Nevertheless better genetics and feed managements can lead to significantly higher milk yield and milk production.

The marginal milk producer in world with more liberal trade rules

It seems that in the long run the large scale milk producers in the USA and Western Europe (UK, Ireland, Denmark and may be also Germany, France, Netherlands, Spain) are the marginal milk producers. Based on economic theory the market price will be equal the average production cost of the marginal producer. Based on the condition 2003 (exchange rates, feed prices, beef prices) this would be around 28 US-$ or 25 Euro or 17.7 GBP per 100 kg milk at 4% fat and 3.3 % protein. The reader should consider this figure an estimate based the 2003 data + analysis. Changes in farm management, input prices, exchange rates etc. around the world have a significant impact on this figure.

The look into the crystal ball:

Looking to the subject from one side covers only a part of the story. The conclusions drawn here sum up the existing knowledge from the farming and milk supply side. To get a more solid view into the crystal ball of the “global dairy sector” ongoing approach of merging data and people like experts from milk processing, dairy market research and dairy policy and the farm level side would be quite useful to come to more solid projections about the future.

2.1 World milk production and self-sufficiency

Introduction and method

The aim of this chapter is to give a global overview about milk production and also the self-sufficiency of milk. The data basis for this analysis are FAO production, processing and trade statistics. Additionally other sources like Eurostat, USDA, ZMP have been used if FAO data where not sufficient. Based on the concept of milk equivalents the IFCN network has developed a method to provide an overview about the dairy world seen from a farm level perspective.

Milk production

Milk is produced in each country of the world and from different animals such as cows, buffaloes, goats, sheep, camels and yaks. The dominating production regions in terms of share of world milk production are:

EU-15: 22 % (EU-25 = 26.7 %)
South Asia: 20 %
USA: 13 %
Oceania: 4.1 %.
CIS countries: 11 %.
Latin America: 9.8 %. The dominating countries are Brazil, Argentina, Mexico and Colombia.
Africa: 4.7 %. The largest milk producing countries are Egypt, Sudan, Kenya and South Africa.
Near and Middle East: 3.7 %. The dominating countries are Turkey and Iran.
East and South East Asia: 3.1 %. The dominating countries are China and Japan.

Milk surplus and deficit

In most countries of the world the self-sufficiency rate for dairy products is below 100 % which means they import more dairy products than they export. In total around 7 % of the milk produced worldwide is traded (EU intra trade is excluded).

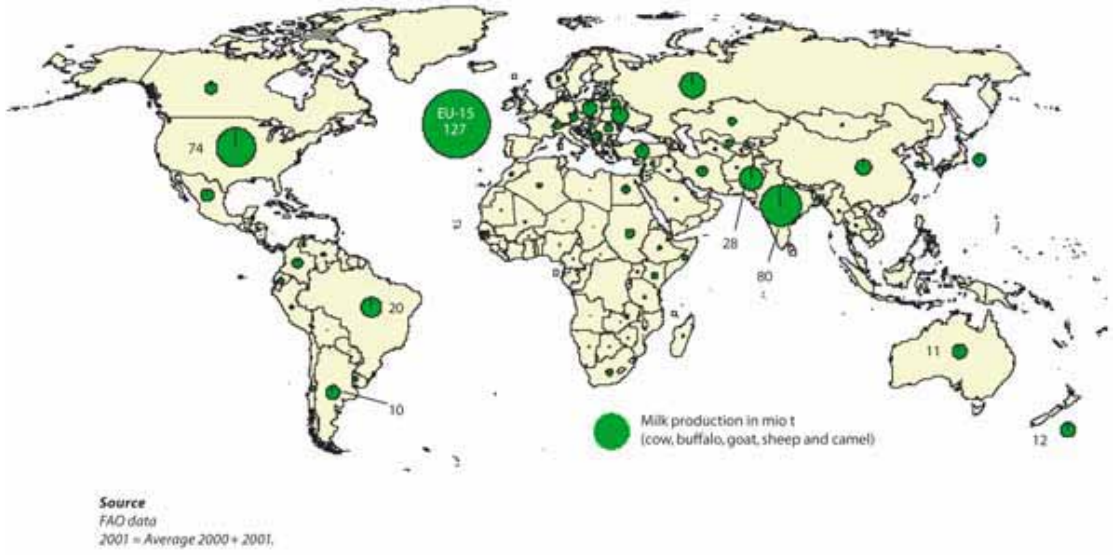
Self-sufficient countries are India, Pakistan, Kyrgyzstan, Somalia, South Africa and French Guiana.

Net exporting regions are North America, EU-15 (Northern countries), Eastern Europe, Chile, Argentina, Uruguay and Oceania. 77 % of the world market share is divided among New Zealand (34 %), EU-15 (29 %) and Australia (14 %). The ten new member countries of the EU had a market share of 6.6 % in 2000/01 and were therefore the fourth export region of the world. The market shares of the USA and Argentina range between 3 and 4 %.

Net import regions are mainly East and South East Asia, Africa, Latin America (excl. the exporters), Middle East and the CIS countries. The main net import countries are Mexico, Algeria, China and Japan. A very low self-sufficiency (< 25 %) was observed in the Philippines, Vietnam, Malaysia, Afghanistan and selected Central African countries.

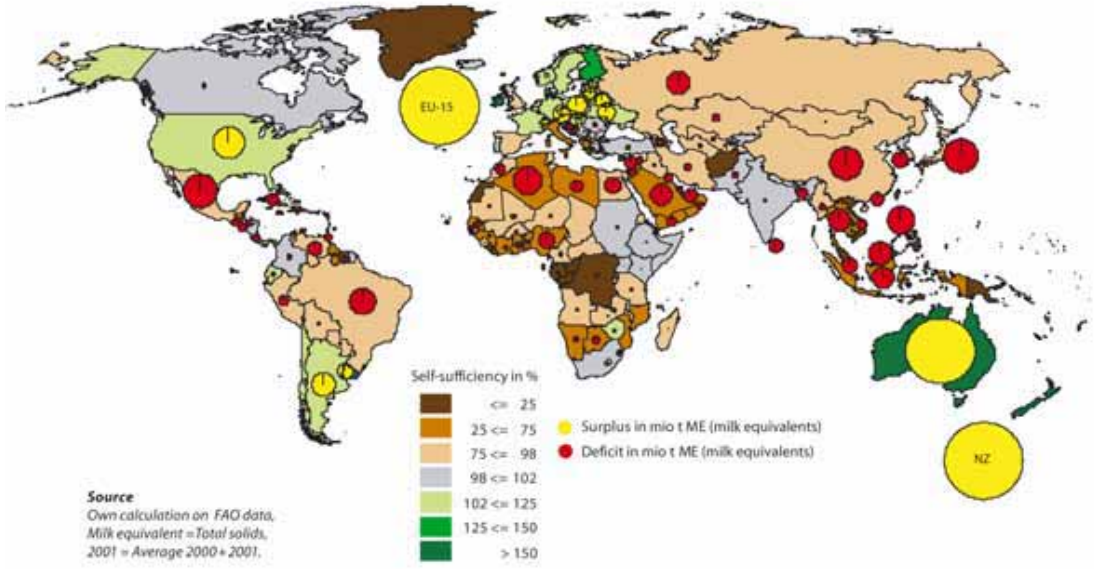
Method explanation and variables
Source of data: FAO production yearbook, www.fao.org, own calculations. **Analysis:** Hemme et al., IFCN Dairy Report 2004.
Method: The method "Total Solids Content" proposed by IDF in 2003 was used. Formula = 1 kg milk equivalent = Total solid content (Sum of fat, protein, lactose and other non water items) of one kg dairy product * 7,874 .
Year specification: Here the average of 2000 and 2001 was taken as it provides globally the most reliable results.
Milk surplus/deficit: Milk production – milk consumption (production + exports + imports– stock changes in milk equivalents), Self sufficiency: Milk consumption / milk production
Milk: Cows, buffaloes, goats, sheep, camels and yaks milk is included.

Milk production by volume



Source
FAO data
2001 = Average 2000 + 2001.

Surplus/Deficit and self-sufficiency of milk / dairy products



Source
Own calculation on FAO data,
Milk equivalent = Total solids,
2001 = Average 2000 + 2001.

2.2 Milk processed: Tradable products and export share

Introduction and method

The aim of this chapter is to give answer to the following two questions:
a) How much milk in a country is processed into tradable dairy products?
b) How much of the milk produced in a country is exported in form of dairy products?
The analysis is based on the similar data and milk equivalent method used in Chapter 2.1.

Milk processed in tradable dairy products

A high share indicates that a lot of milk is going through the formal sector. Moreover it indicates that the national dairy industry will face stronger competition from other countries in a more liberal agricultural trade. The results can be summarised as follows:

High shares: Based on the method applied the countries Australia, New Zealand, France, Germany, Netherlands, Belgium, Denmark Ireland and the Czech Republic convert more than 50% of the milk produced into tradable dairy products.

Moderate shares: Results around 30 – 50% are found for North America, Argentina, Chile, Peru, Venezuela, Italy, Sweden, and Finland, Iceland, Switzerland, Poland, Hungary, Estonia, Lithuania, Korea Japan and selected developing countries.

Low shares: In general the share of milk processed into tradable dairy products in developing countries is quite low (0-20%) as the informal markets are dominating the sector. This is the case for Asia, Africa and selected countries in Latin America. Moreover the countries Spain, Ukraine and Russia have low figures as well.

Share of milk products exported

Globally around 7% of the milk produced is exported (EU intra trade is excluded). This figure increases to 12% if the EU-15 intra trade is deducted. Between the countries the share of milk exported differs significantly. The results can be summarised as follows:

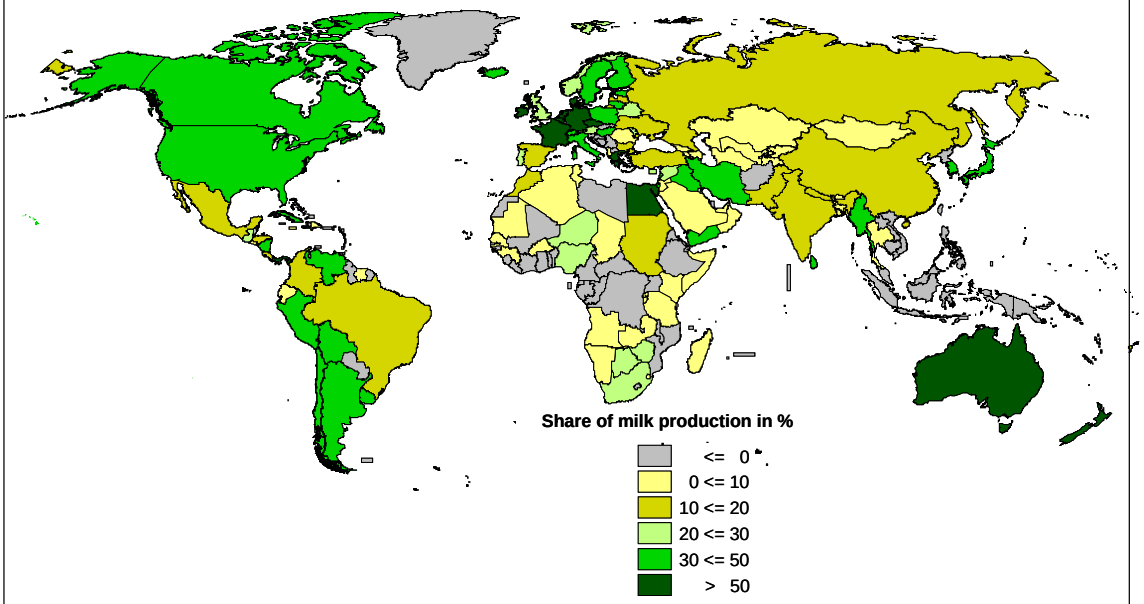
General picture: In most of the countries the share of milk being exported is below 10%.

High shares: High shares are found in the main milk exporting countries (New Zealand 96%, Australia 45%, Ireland 53% and the Netherlands 59%. Moreover high shares have been found in selected developing countries with very little milk production volumes but significant dairy trade activities (i.e. Malaysia, Philippines, Cote d'Ivoire, Saudi Arabia, Oman). It can be assumed that these countries act as a trading platform for dairy products in the region.

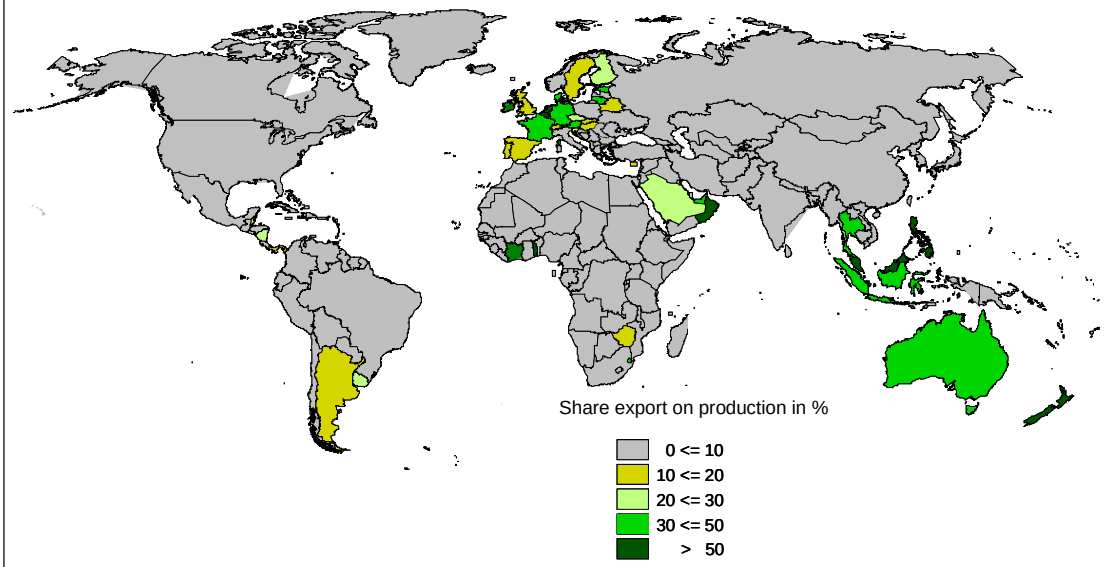
Special cases
EU 15: In general the share of milk exported in the EU is quite high due to the common agricultural market. Besides Ireland, the Netherlands and Belgium the countries Germany, France, Denmark and Austria export a significant share of their milk production.
USA/CA: The USA is exporting 5%, Canada around 12 % of its milk production.
South America: Significant export shares have been found for Argentina and Uruguay.

Method explanations
Tradable dairy products: Condensed milk, cheese, dry milk products, butter/ghee.
Methodological challenge – tradable products: In case a country is producing large amounts of fresh cheeses the average milk equivalent factor for cheese lead to an overestimation of milk used for cheese production. This might be the case in Egypt, Greece, Israel, and selected Middle East and may be also selected developing countries.
Methodological challenge – processing data: It can be assumed that the processing data in a lot of developing countries are based more on estimates than on a structured data collection procedure.

Share of milk processed in tradable products



Share of milk production exported



2.3 Production quantities of major dairy products

Introduction

This chapter shall provide an overview about milk processing in the world.

Method

Like in Section 2.1 the farm level perspective was chosen. Therefore the dairy products have been converted into milk equivalents by using the total solid concept. The Annex 2 describes the data basis and the coefficients applied. It should be mentioned that besides the total solids method 5 other milk equivalent methods exist which produce quite different results (Hemme, 2004, p.128f.).

What is behind "residual"?

The milk processing statistics cover the products butter, milk powder, cheese and condensed milk quite well. Unfortunately the section fresh dairy products and the whole informal sector are not covered in most countries. Therefore we have been forced to combine these into residual.

Milk processing structure per region

In most countries most of the milk (solids) is used for the section residual (fresh dairy products and the informal milk).

Oceania: 80% of the milk is turned into tradable products. The main segment is dry products (50%), followed by butter and cheese.

North America: 40% of the milk is converted into tradable products. Cheese and dry products dominate this segment.

EU-15: 50% of the milk is processed. Cheese and dry products dominate the tradable products.

Eastern Europe: The share of tradable products is with 30% significantly lower than in the EU.

Other regions: Here the share of milk used for tradable products ranges around 15 – 20%. This reflects the relatively high share of informal markets which represents for example in India 85% of the milk produced.

Milk processing – the dairy products

Butter/Ghee

Following the FAO processing statistics about 8.6% of world milk is converted into butter/ghee. The major butter producer is South Asia and the EU-15 counting for 60% of world butter/ghee production. The regions North America, Oceania and CIS-countries each count for 7-9% of the production.

Dry milk products

About 11% of world milk is converted into various dry dairy products. The main players in these segments are the EU-15 (38%), followed by Oceania (20%), North America (17%) and Latin America (11%). In this section Africa and Asia have a market share of only 1.4%.

Cheese

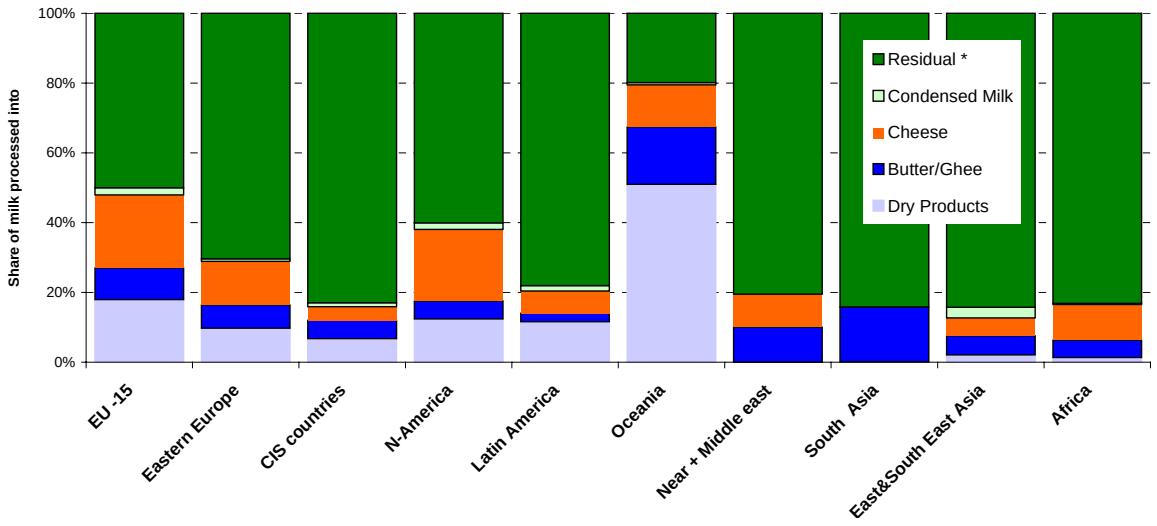
About 11% of world milk is converted into cheese. The major cheese producer is the EU-15 (43%) and North America with 27% of world cheese production.

Condensed milk

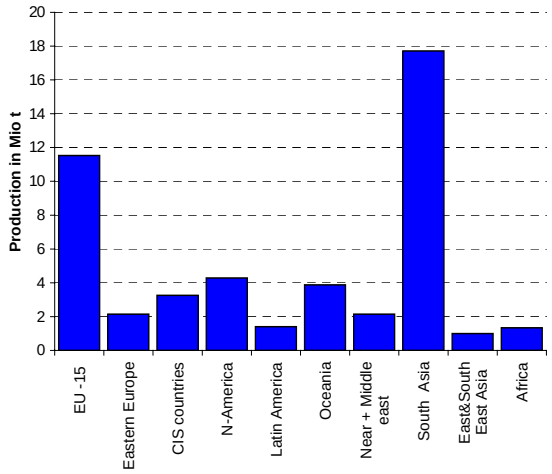
About 1.2% of world milk is converted into Condensed milk. The mayor player is the EU-15 followed by North America, Latin America and the CIS-countries.

Explanations:
Data: Based on 2001, own calculations on base of FAO production yearbook. www.fao.org. **Analysis:** Hemme et al., IFCN Dairy Report 2004.
Residual: Fresh dairy products, milk used in the informal sector, on farm consumption, on farm processing.
World regions: Definitions of regions: See Annex A 1 (world map).
Dry products: Dry buttermilk, dry skimmed cow milk, dry whey, dry whole cow milk, casein, lactose.

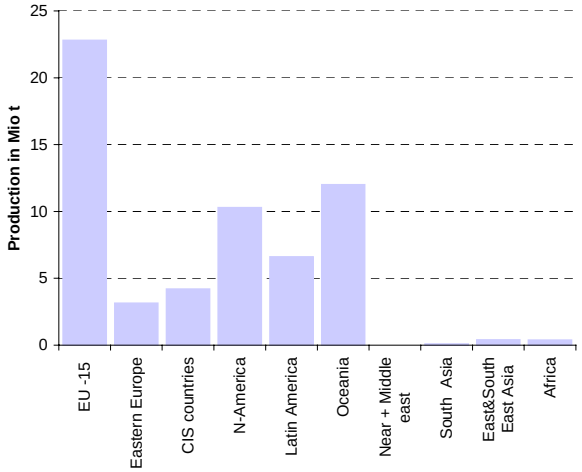
Milk processing structure



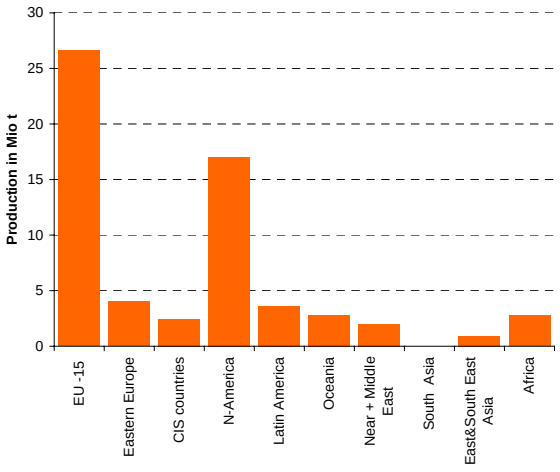
Milk processed into Butter/Ghee



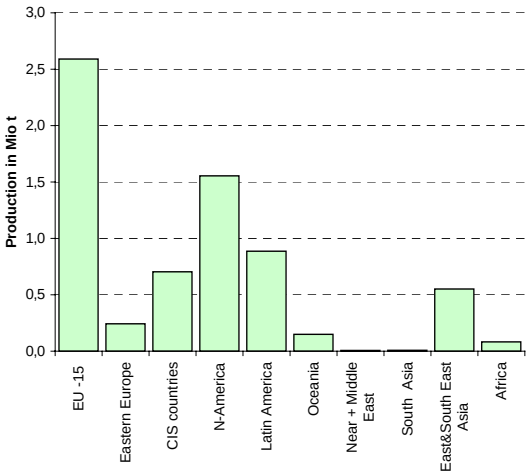
Milk processed into Dry milk products



Milk processed into Cheese



Milk processed into Condensed milk



2.4 Costs of milk production for typical farms

Introduction

This chapter gives a global overview about the competitiveness of milk production.

Method

The analysis is based on the IFCN methodology of typical farms and the harmonized accounting/cost calculation model TIPI-CAL. The data refers to the year 2003. The countries deducted represent more than 70% of world milk production.

Costs of milk production only in 2003

The cost indicator used can be directly related to the milk price received. Five cost categories measured in US-$/100 kg milk can be described:

- **< 18 US-$:** Poland, Argentina, Pakistan, Vietnam, New Zealand, Western Australia, larger farms in Brazil and India and the smaller farms in CL, CN and AU-210VI.
- **18 - 28 US**-$: Estonia, Czech Republic, Bangladesh, China, Thailand, the smaller farms in Brazil and India and the farms UK-183, US-2400TX and US-1710CA.
- **28 – 35 US-$:** Spain, Denmark, Ireland, UK, Hungary, most US farms and the larger farms in Germany, Netherlands and Israel.
- **35-45 US-$:** Austria, France, Sweden, and the smaller farms in Netherlands and Israel.
- **> 45 US**-$: Switzerland, Norway, Finland, Canada and the small German farm.

Special cases

In certain countries (AU, AR, NO, ES, CL) special cases like drought, flood, special regional policy programs or growth steps in the farm types need to be considered for interpreting the results. Details see IFCN Dairy Report 2004.

Top performing farms in 2003

Based on cost of milk production in US-$/100 kg milk, the top performing farms in the regions are:
10 US-$: Argentina 350 cows
11 US-$: Pakistan rural 10 cows
12 US-$: Western Australia 605 cows
14 US-$: Poland North West 50 cows
28 US-$: UK 183 cows
28 US-$: USA 1710 cows

Methods of cost analysis

In the past 2 studies have been found that have made an international comparison for milk, covering different world regions (Isermeyer 1989; Baker 1986). Unfortunately the database is around 20 years old. Other studies cover only countries in one world region (s. Annex 3).

IFCN vs. results of national analysis

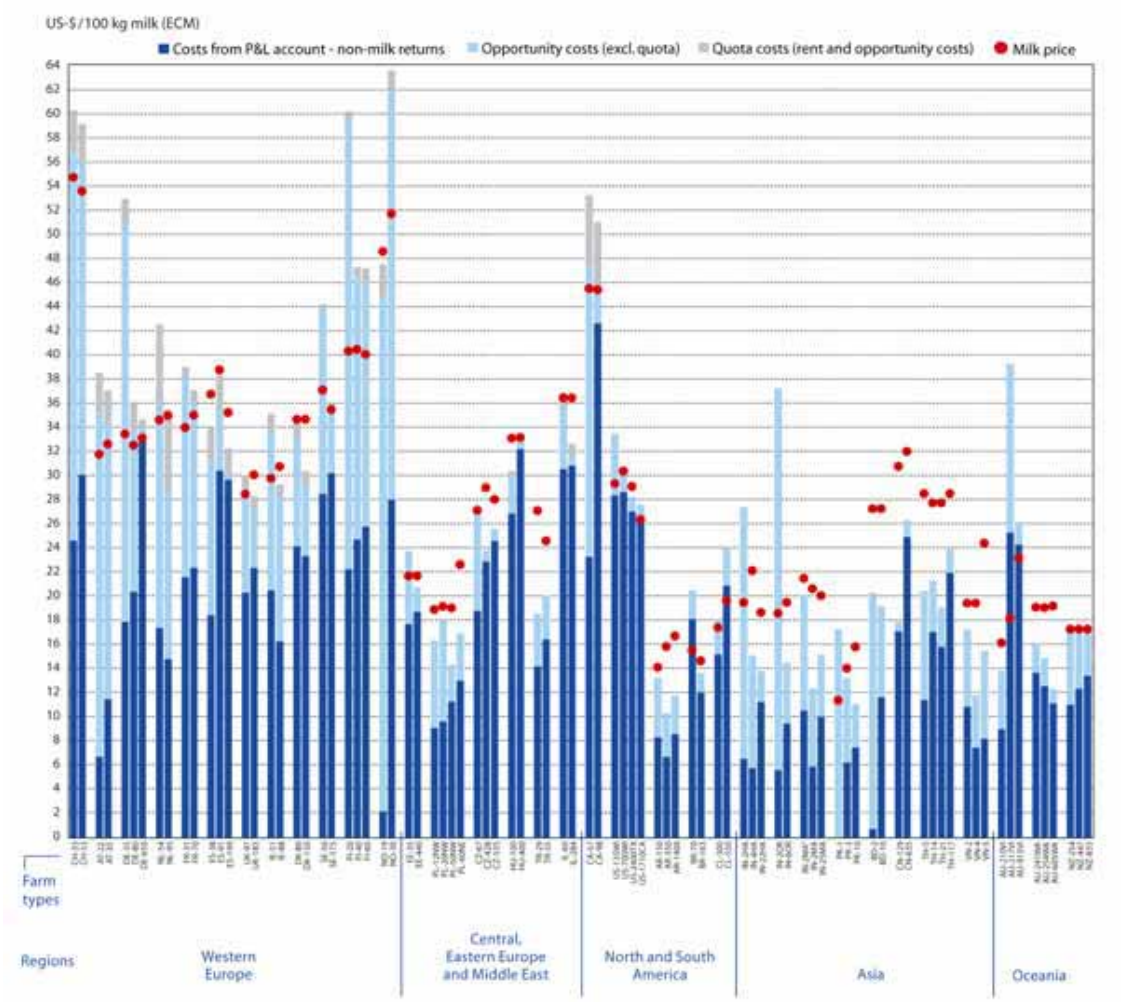
There exists a wide range of national cost analysis. The Annex 4 describes a comparison for Germany, United Kingdom, USA and Australia. Annex 5 is a study of IFCN where the IFCN results have been compared with FADN results. In both cases finding the right reference clusters and the method difference in calculating cost puts a real burden on the comparison.
The annex 4 shows cost differences of around 10% between IFCN and the national analysis. In Australia the differences are bigger as the drought affecting part of the farms lead to a not too meaningful average. Here the IFCN focussing on farm types in certain regions provides a better picture.

Validation of IFCN results

The Annex 5 shows in detail the difficulty in validating farm accounting results with IFCN results and vice versa. Finally it should be mentioned that all IFCN partners validate their IFCN farms with the best available accounting statistics in their country.

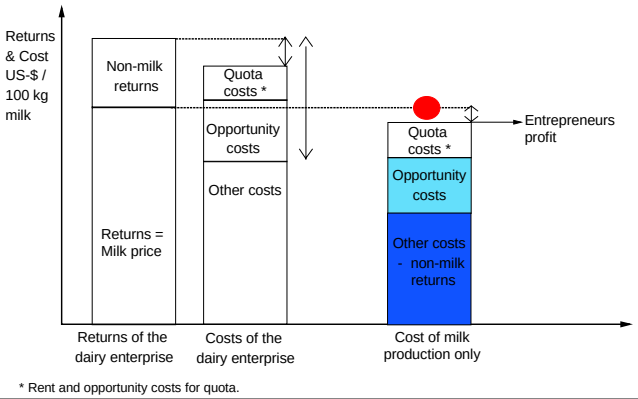
Explanation of variables
Farm codes: Example DE-35 = German 35-cow farm.
Year / Data: 2003, Oceania = season 2002/2003. **Analysis:** Hemme et al., IFCN Dairy Report 2004.
Other costs: Costs from the P&L account minus non-milk returns (cattle returns and direct payments, excl. VAT).
Opportunity costs: Costs for using own production factors within the enterprise (own land, family labour, own capital).
Quota costs: Quota rents paid + opportunity cost for quota owned (3 % interest on quota value).
Milk price: Average milk prices adjusted to energy corrected milk (ECM 4 % fat, 3.3 % protein, excl. VAT).

Costs of milk production only and milk prices



Method

The total costs of the dairy enterprise are related to the total returns of the dairy enterprise including milk and non-milk returns (cattle returns and direct payments). Therefore the non-milk returns have been subtracted from the total costs to show a cost bar that can be compared with the milk price. This figure explains the method.



* Rent and opportunity costs for quota.

A more detailed method explanation of the IFCN Cost Comparison can be found in the Annex 6, page 33.

2.5 World milk supply curve

Introduction
The aim of this chapter is to estimate a world milk supply curve.

Method:
The analysis is based on the IFCN cost analysis of typical farms and the milk production per country. The selection of one farm type per country and linking it with the countries milk production builds the basis for a very rough world milk supply curve. As a wide range of farm types exist per country, two "supply curves" are build: a) for an average farm type and b) the best farm type per country showing the potential supply curve after structural adjustments in the future. The results shall be seen as first estimates based on the data and knowledge available so far. The countries deducted represent more than 70% of world milk production

Supply curve 1- Average sized farms
The production costs range between 14 - 60 US-$ per 100kg milk. The weighted average lies around 28 US-$ per 100 kg milk. The curve shows 4 main steps:

0-20 US-$: Based on the simplified method applied 30% of the "milk" can be produced in this range (mainly countries from the Southern Hemisphere, Eastern Europe and selected Asian countries.
20-30 US-$: 25% of the "milk" can be produced in this range (mainly India + UK).
30-40 US-$: 30% of the "milk" can be produced in this range (mainly USA + selected EU countries).
> **40 US-$:** 15% of the "milk".

Supply curve 2 - Best farm types
The production costs range between 10 - 60 US-$ per 100kg milk. The weighted average lies around 25 US-$ per 100 kg milk. The curve shows four main steps:
0-20 US-$: Based on the simplified method applied 50% of the "milk" can be produced in this range (mainly countries from the Southern Hemisphere, Eastern Europe and selected Asian countries incl. India).
20-30 US-$: 23% of the "milk" can be produced in this range (mainly USA, UK, Ireland, Denmark).
30-40 US-$: 21% of the "milk" can be produced in this range (mainly Germany, Spain, the Netherlands, France, Sweden, Austria).
> **40 US-$:** 5.5% of the "milk".

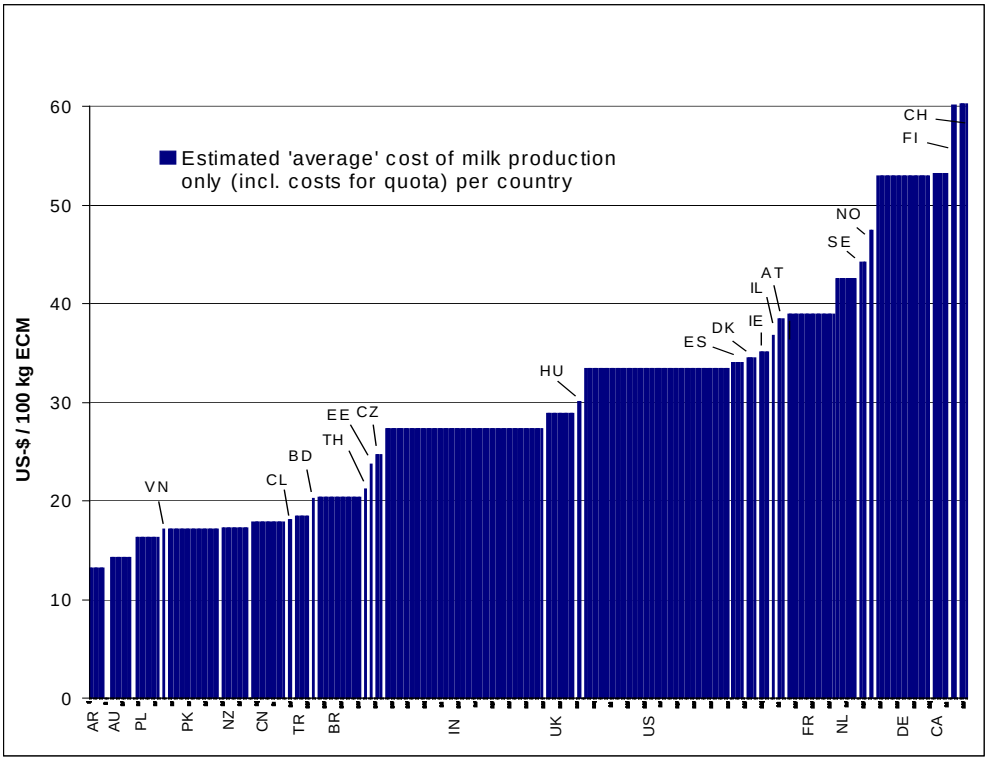
Liberal world dairy trade & supply curve 1
Assuming the supply curve one (average sized farms) is valid, a new equilibrium milk price might be around 28 – 30 US-$ per 100 kg milk. The marginal milk producing countries (defining the new world market price) in this case would be India and the USA. It can be assumed that milk from average sized farms in Western Europe will be replaced by countries from the Southern Hemisphere.

Liberal world dairy trade & supply curve 2
Assuming the supply curve two (best farm types) is valid, a new equilibrium milk price will be below 28 US-$ per 100 kg milk. The marginal milk producers would be the large scale milk producers in the USA with around 1000 – 2000 cows per farm followed by large scale dairy farms in the UK. This means the milk price they can survive on would be the new world market price.

This scenario assumes that the decline of milk production especially in Western Europe will be compensated by countries being able to produce below 20 US-$ per 100 kg milk. If their production potential at around 28 US-$ per 100 kg milk exceeds the decline in Western Europe a declining milk production in the USA/UK and a lower world market milk price can be expected.

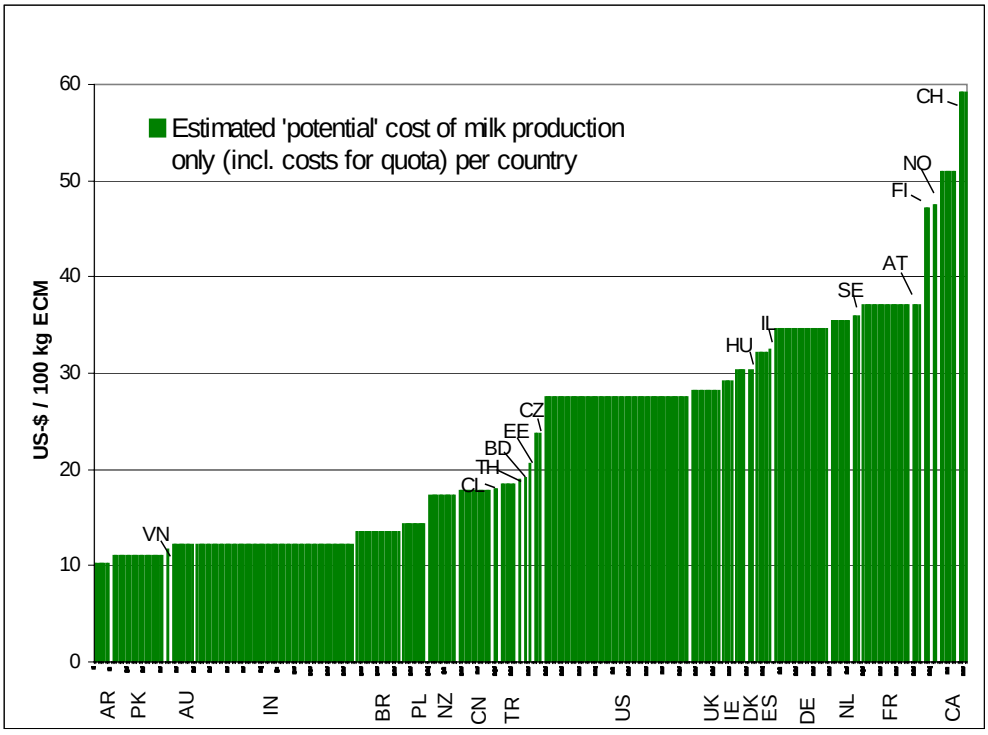
Explanations
Database: Year 2003. **Source:** Based on analysis of Hemme et al. IFCN Dairy Report 2004.
Average sized farm: A farm type that is close to the statistical average – usually the smallest IFCN farm type analysed.
Best typical farm: The farm type with the lowest milk production costs – this farm is an indicator of the cost potential.
Indicator: Cost of milk production: See chapter 2.4.

Milk supply curve – based on average sized farms



Milk production per country (sorted and accumulated)

Milk supply curve – based on the “best” farms



Milk production per country (sorted and accumulated)

3.1 Trends in production and self sufficiency

Introduction

This chapter is summarising the developments of milk production, consumption and the surplus/deficit of milk.

Milk production 1992 – 2001

The world milk production increased about 10 % during 1992 - 2001. The annual growth rate was 1 %. Developments are:

Western Europe: Most countries have a milk quota system that leads to a constant milk production. Norway has reduced its quota over a period of time.

Eastern Europe: Milk production decreased as a result of the restructuring process.

CIS countries: The 30 % reduction of milk production was much higher than in the Eastern European countries, nevertheless growth can be observed in the Southern CIS countries (from Georgia to Kyrgyzstan).

North America: Milk production increased by 11 % in ten years.

Latin America: Milk production increased around 32 % within 10 years.

Africa: Milk production increased by 30 %. The pattern between the countries is quite different. While strong growth was observed in Northern Africa, especially Egypt and Tunisia, a decline in milk production was found in Botswana, Zambia and Zaire.

Near and Middle East: Milk production increased by 16 %, strong growth rates were found in Saudi Arabia and Iraq whereas milk production in Turkey declined.

South Asia: Milk production in this region increased by 51 %. The annual growth rate was highest in Pakistan (6.8 %), followed by India with 3.9 %.

East and South East Asia: Milk production increased by 58 %. This is, per region, the highest growth observed. It should be mentioned that China doubled and Thailand tripled its milk production.

Oceania: Milk production rose by 55 % which is comparable to South and South East Asia.

Production, demand and surplus/deficit 1981 - 2001

Milk surplus/deficit quantities remained stable in most cases. Major changes are observed in Oceania and East & South East Asia.

Western Europe: With the introduction of the milk quotas, milk production was reduced by quota cuts. The surplus (exported via export subsidies) remained stable at around 10 million t of milk (ME).

Eastern Europe: Production and consumption declined by 20 – 25 %. The increasing export quantities (0 – 3 million t) are driven by a faster decline in consumption compared to production.

CIS countries: From 1981 to 1990 milk production and consumption increased by 20 – 25 %, after 1990 it fell by 45 %. The milk deficit decreased, since 2001 CIS countries became net exporters.

North America: Milk production and consumption increased at a parallel rate, surplus remained in a range of 1 – 3 million t.

Latin America: Here the production and consumption also increased simultaneously. Nevertheless the region remained a net importer of milk with a deficit of 1 - 5 million t of milk.

Africa: Milk production and consumption increased at a parallel rate. The milk deficit remained stable at around 5 million t of milk.

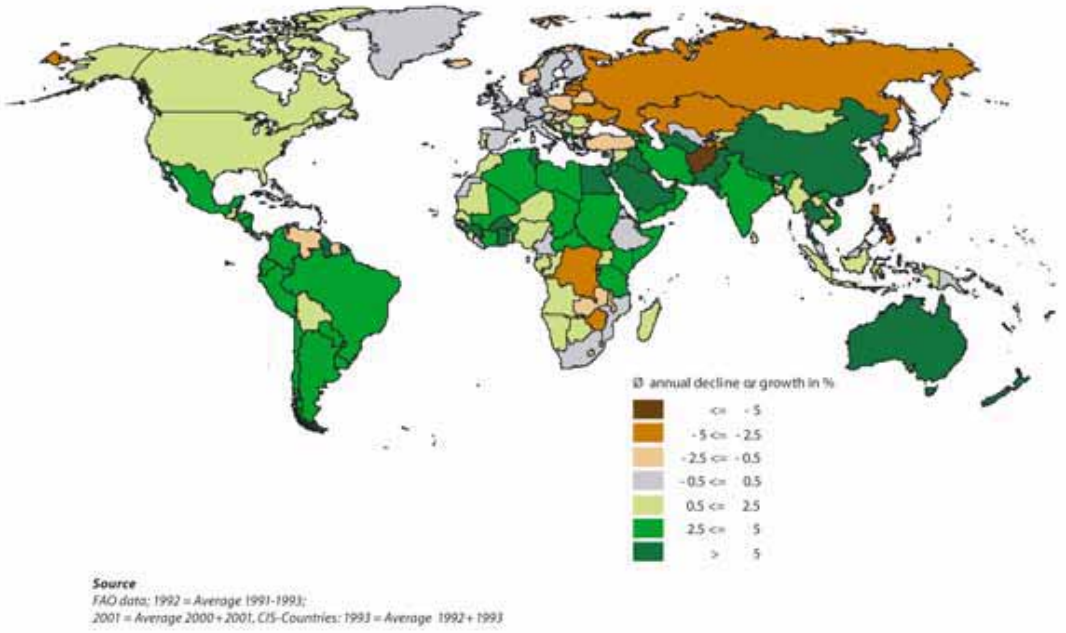
Near and Middle East: Milk production increased slightly faster than the demand that led to a lowering of the milk deficit.

South Asia: Traditionally the milk production and consumption have been very similar. The net imports remained stable at around 1 million t of milk.

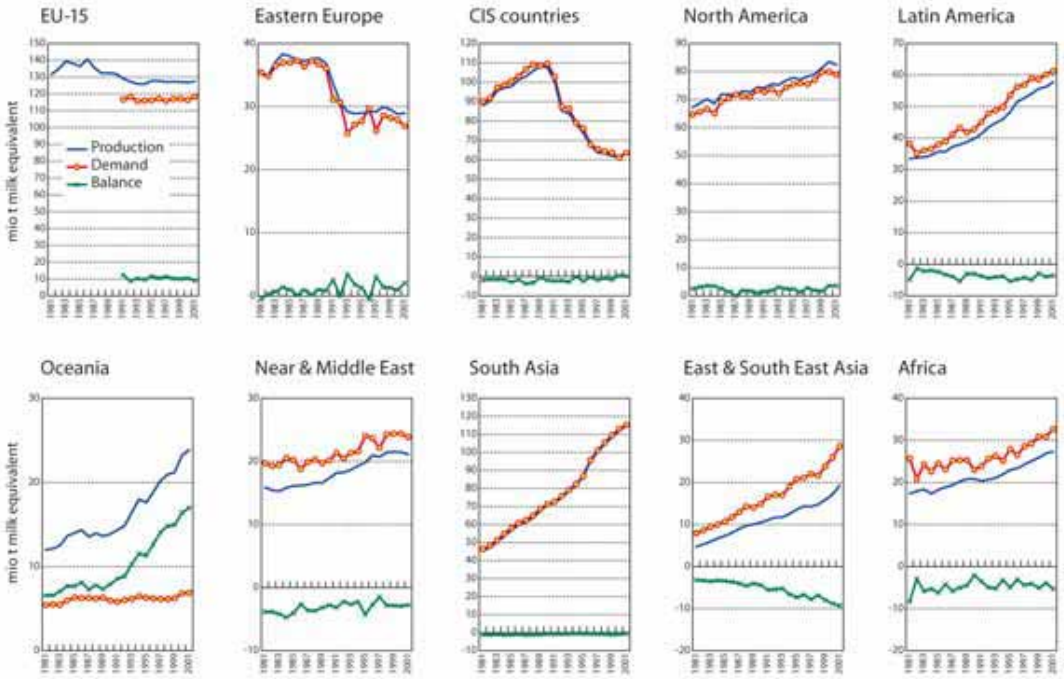
East and South East Asia: Milk consumption was rising much faster than production, resulting in a strong increase of the milk deficit from 3 – 10 million t of milk.

Oceania: A strong increase in production and a moderate growth on the domestic market has incremented the milk exports. The net export has increased from 8 to 17 million t of milk.

Growth in milk production per country



Milk production, demand and surplus or deficit in million t milk equivalents



Method explanation and variables

Ten-year trend: Annual growth rate calculated on the average 2000/01 towards 1991/92/93**.**
Source of data: FAO production yearbook, www.fao.org. **Analysis:** Hemme et al., IFCN Dairy Report 2003 / 04.
ME: Milk equivalent. For further information on the calculation please refer to Annex 5.
CIS countries: Common Independent Countries (Former countries of the Soviet Union).
Plausibility: It should be mentioned that statistical estimation on milk production in smaller developing countries is quite difficult as farmers keep 1 - 2 animals and most of the milk is not delivered to dairy factories.

3.2 Trends in milk processing structure

Introduction

Trends in processing vary little among the various regions of the world. Differences can be found in the trend of total amount of milk production as well as in the share of the different products. The production and development discussion that follows for each region is based on the period 1981 to 2001. The table in Annex 6 in presenting the developments in processing share in relative terms.

Trends in processing

EU-15: In the EU-15, production controls in form of the quota system and the stagnant domestic demand for dairy products resulted in steady to slightly lower milk production at a level of 125 million tons. The EU-15 is by far the largest producer of cow milk world-wide. Ratio between the products nearly unchanged, cheese share of production increased little and represents about 30% of milk production. Residual (~50%) is low in comparison to other regions.

Eastern Europe: Production decreased about 10% to 32 million tons, whereas butter lost share of production. Cheese, butter and dry products have a 10% share each, condensed milk is not worthy of mention.

CIS countries: The former Soviet Union has undergone massive structural adjustments following the days of central planning. Milk production fell sharply as most subsidies were withdrawn and inefficient farms failed. Milk production dropped from its peak in 1990 nearly 50% to 62 million tons, the cheese production remained stable (4%). Dry products are not produced. Recently, production in some of these countries has been stabilised.

North America: Production edged upwards in the United States as domestic demand increases boosted prices, particularly during the late nineties. Canada, employing supply management programs, increased production on a lower level. Production is about 82 million tons (+ 15 million tons in comparison to 1981), cheese gained in importance (share of ~20% in 2001).

Latin America: Milk production rose sharply over the period (+ 90%) in the major exporting countries, such as Argentina, Uruguay and Chile, due to relatively high international dairy prices. Proportions of products remained stable, share of milk processed to dry products increased comparative slightly.

Oceania: Australia and New Zealand as one of the major exporting countries almost doubled production up to 24 million tons in the observed period. Portion of residual milk decreased by one third, this part has been overtaken by an increased dry products output.

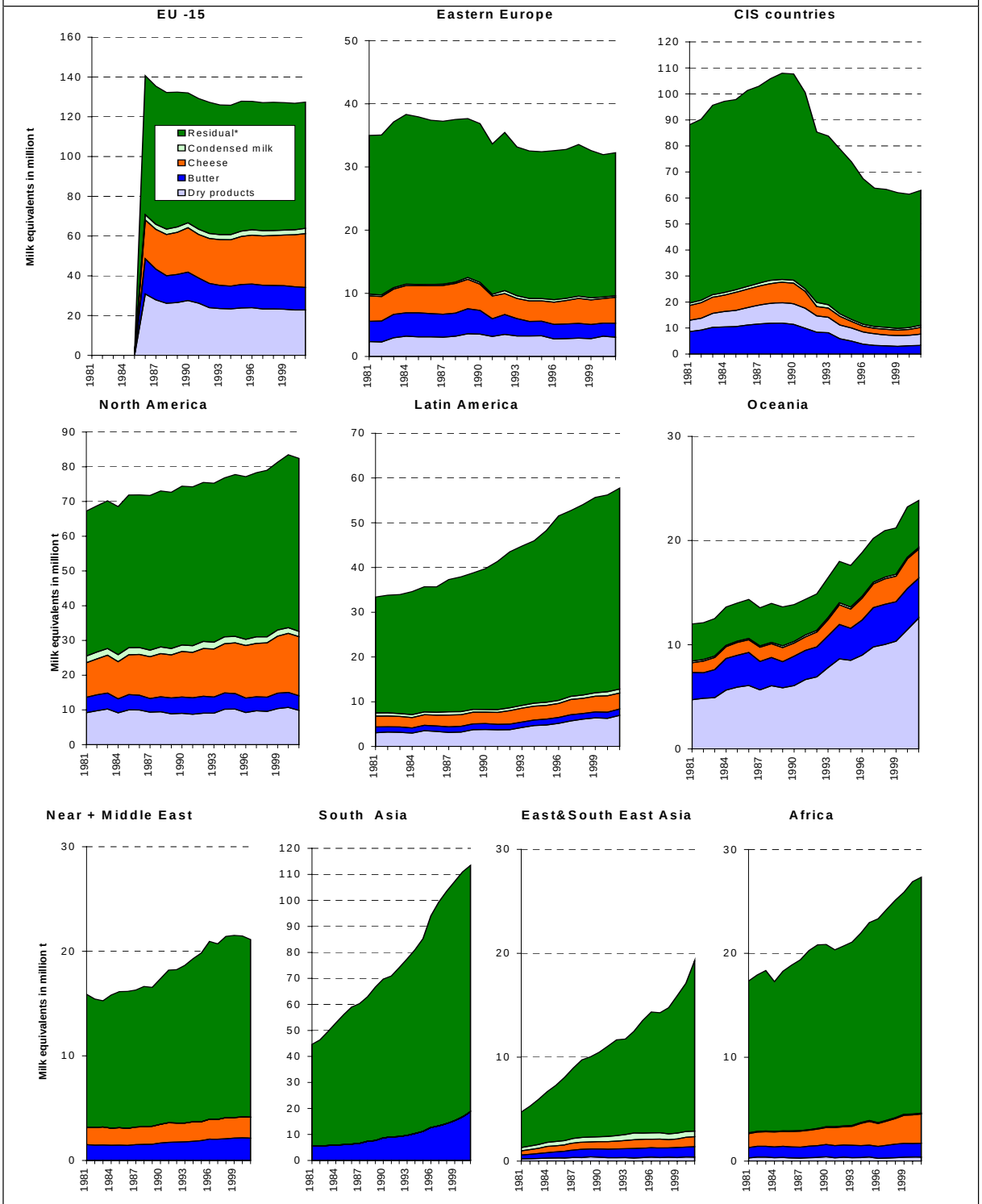
Near and Middle East: Total milk production level is similar to Oceania. After a constant increase between 1983 and 1996 by around 4 tons, production recently has been stabilized. Condensed milk and dry products is not of importance. This region continues to be an important market for dry products. 80% of the milk is residual, the rest is distributed to cheese and butter in similar shares.

South Asia: Behind the EU, South Asia is the largest producer of milk, including a relative high share of buffalo milk in India and Pakistan. Milk production rose substantially and constant (nearly triplication in the period) as their domestic markets expanded. Market segmentation has been carried out by residual (85%) and butter production.

East & South East Asia: A strong increase of production, mainly by China and Thailand, can be observed. It is noticeable, that in comparison to other regions the share of milk as residual grew in relative to other processed products, which nearly unchanged its proportion. Mentionable is the high share of condensed milk processing.

Africa: Africa is showing a strong increase in milk production, but development within the region is quite different. More than 80% of the milk is residual.

Development of milk production and milk processing 1981 - 2001



Explanation
Source of data: FAO production yearbook, www.fao.org. **Analysis:** Hemme et al., IFCN Dairy Report 2004.
EU: Data 1981 to 1985 is not available.
CIS countries: Common Independent Countries (Former countries of the Soviet Union).
ME: Milk equivalent: Method "Total solids content" proposed by IDF was used, see also Annex 5.
World Regions: Definition of regions see Annex1 (world map).
Residual: Fresh dairy products, milk used in the informal sector (if not specified), on farm consumption, on farm processing (Milk production minus specified products).

3.3 Trends of investments in milk processing

Introduction

The dairy industry processing sector as one of the most important components of the world food system is in a continuous progress of change, with an increasing transformation speed (1992: World top 20 dairy companies: USD 60 billion turnover; 1999: USD 100 billion turnover). Forces behind these developments are for example the wishes of the dairy industry to gain market share, to take advantage of economics of scale, shifting consumption trends and technological improvements. The results in this chapter are based on a literature review and an own survey for the year 2004.

Literature review 1998 - 2003

Unfortunately not a lot of studies deal with this topic. The best source is the statistic extract from the Rabobank database (Griffin et al., 2004) that resulted in the following conclusions referring dairy investment activities:

- Private companies more active (68%)
- 80% of activities are domestic or regional
- Acquisitions dominate with 80%
- Ø 150 investment activities per year
- Ø 60% activities involve Europe
- Cheese mostly affected product group

Statistical survey 2004

The survey is based on the Dairy Industry Newsletter 2004. We tried to follow up and structure the information. Details can be found in Annex 6.

- Nearly 60% of activities investor owned
- 84% international orientated
- Acquisition and new/extension is dominating investments
- Ø 148 investment activities
- Companies main target regions are West-EU and North-America
- Liquid milk and cheese are standing for mostly product investments

Results

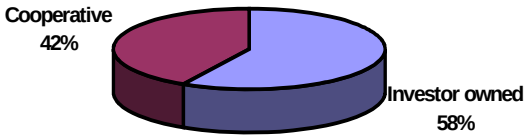
The results of the statistical survey are in line with the literature review. Investments in the dairy processing occur at a high rate, probably putting pressure on cooperatives to seek new forms of foreign investments to remain competitive. Direct investments in form of acquisition or new plants are still preferred, retaining a higher control for the investor. Investments in perishable products such as liquid milk and yoghurt will still take place mainly within a region. A higher rate of investment activities is expected in Asia, stimulated by economic growth. The quoted investment volume for one third of all investment activities was US-$ 2.7 billion.

Conclusions

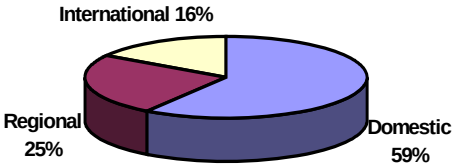
The two approaches give a first direction of investments in milk processing. Nevertheless it can be assumed, that the data gathering covers only a part of the activities. For the future a better monitoring would be beneficial for the dairy sector. In some cases only a small number of activities has been observed, so explanatory power is limited.

Explanation
Parmalat: The collapse of Parmalat has not been taken into account.
Forms of investment: acquisition: incorporation of a company into the structure of another company; **joint ventures:** cooperation between companies through the establishment of a new, joint operational juridical entity; **merger:** combination of two or more companies of equal standing brought under central management control; **alliance:** partnership between equal companies to create mutual benefit through the sharing of selected activities. The group **assumed** is the share of activities, which are not for sure yet (i.e. an agreement on the part of an authority is missing).
Investments by product: The group **other** mainly consists of ice cream and ingredients.

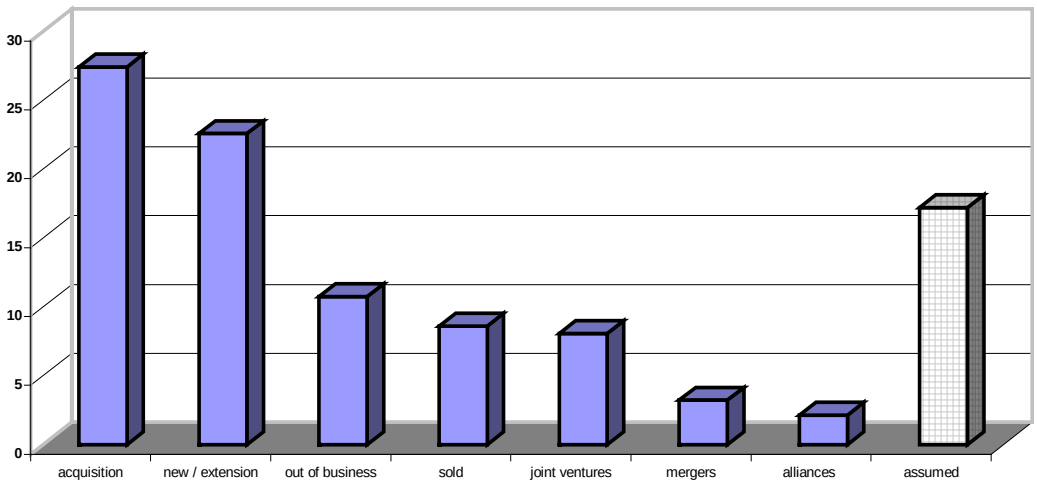
Legal structure of investing companies in %



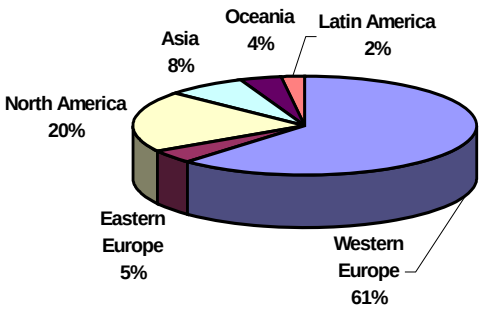
Categorisation of investments by orientation in %



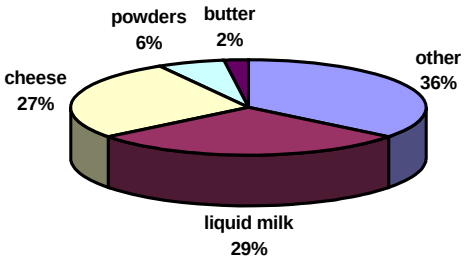
Form of investment classified by type in %



Companies target region in %



Investments made by product category in %



3.4 Milk supply at changing milk prices – Elasticities

Introduction

The aim of this chapter is to summarise the existing knowledge about the supply responses for milk at changing milk prices.

Method

The analysis is based on the milk supply elasticity. The elasticities describe the reaction in a change of the quantity supplied after a change of its price by 1%. The value for supply elasticity is positive, because an increase in price is likely to increase the quantity supplied to the market and vice versa. The work in this chapter is based a) on a literature review of studies that have estimated milk supply elasticities and b) an overview about the elasticities applied in world agricultural trade models.

Literature review

A wide range of studies has been found that specify the milk supply elasticities (cf. Appendix 8). Main results are:

- The elasticities found for the countries selected range from negative to 2,8.
- Within the single countries the values differ significantly.
- The number of studies analysing supply elasticities are very little. Except the USA only 3-6 studies have been found per country or country group.

Global trade models

The table on the next page is summarising the elasticities applied in different world trade models like FAPRI, Swopsim, GTAP, ERS, GAPSI, Cox, OECD and Abare. It should be mentioned that only in a few cases the elasticities where fully document in the publication (FAPRI, Swopsim, ERS). In the other it was rather difficult to extract a “milk price / milk supply elasticity” (GTAP) or the researchers are not allowed to publish the elasticities (OECD).

Example - 10% higher milk prices

The aim of this calculation is to provide a rough estimate how much more milk might be produced if milk prices rise by 10%. The results can be summarised as follows:

- Applying the average elasticity found the big milk producing regions India, USA and the EU-15 will increase their milk production between 3- 4.5 million t of milk.
- The countries Poland, New Zealand, Australia, and Argentina will increase milk production by ca. 0,5 million t milk. Brazil will increase ca. 1 million t.
- The uncertainty in supply response seems to be very high for the EU-15, India, New Zealand, Australia, Argentina and Brazil
- Following the elasticities found a milk price increase for all countries of 10% would lead to a supply response between 5.7 – 26 million t of milk. Average 14,1 million t.

Uncertainty + methodological challenge

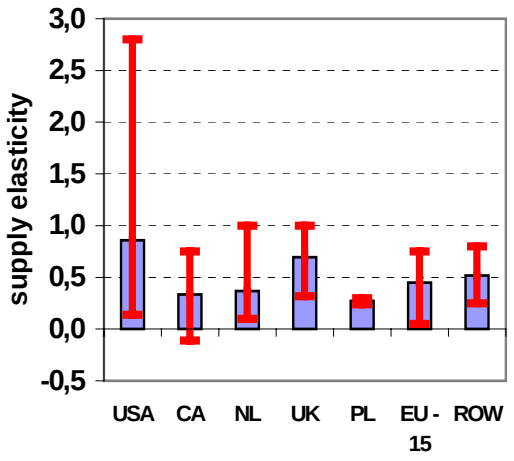
There are a lot of models applied using quite different supply elasticities. In several cases these are not documented in the studies done. There are a number of concerns (Coleman 2002, 2003, Traill et al. (1978)), about supply elasticities like:

- How can supply elasticities estimated if the sector is facing significant structural changes?
- Are elasticities for price increasing and price decreasing the same?
- How can supply elasticities be estimated under milk quote regime like the EU?
- What is the right base for short, medium and long-term elasticities?
- How does the farm size influence the supply elasticities?

Especially in the dairy sector having a very little share of production being traded the uncertainties in elasticities can lead to significant difference about the world in a free trade scenario. It seems that market and farm economists have not developed a reliable method in this field.

Literature review: Milk supply elasticities

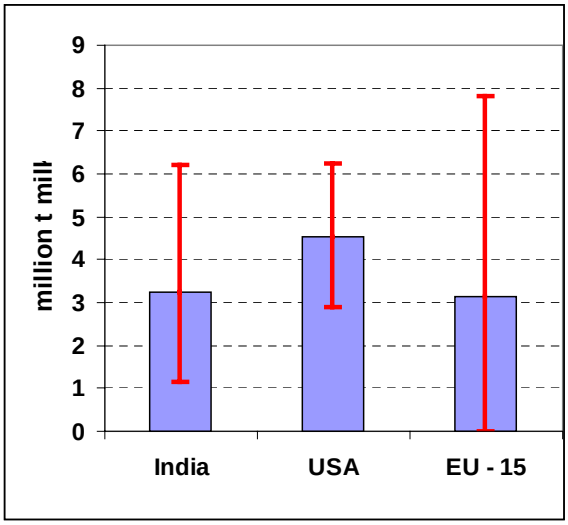
	Ø	Max	Min	n
USA	0,86	2,80	0,14	22
CA	0,34	0,75	-0,11	4
NL	0,37	1,00	0,10	6
UK	0,70	1,00	0,32	4
PL	0,27	0,30	0,24	3
EU - 15	0,45	0,75	0,05	4
ROW	0,52	0,80	0,25	3

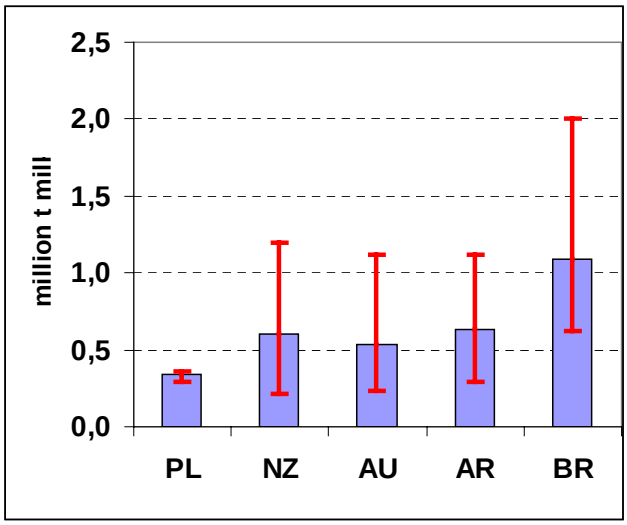


Global trade models: Milk supply elasticities applied

	FAPRI	Swopsim*	GTAP	ERS	GAPSI	COX	OECD	Abare**
IN	0,15	0,30	n.d.	n.d.	0,8	n.d.	n.d.	n.d.
USA	0,73	0,50	n.d.	0,5	0,8	0,37	n.d.	n.d.
EU-15	0,05	0,65	n.d.	0,35	0	n.d.	n.d.	n.d.
PL	0,24	0,3	n.d.	??	0,3	n.d.	n.d.	n.d.
NZ	0,14	0,60	n.d.	0,25	0,8	n.d.	n.d.	0,23
AU	0,18	0,50	n.d.	0,25	0,8	n.d.	n.d.	0,17
AR	0,21	0,55	n.d.	0,25	0,8	n.d.	n.d.	n.d.
BR	0,26	0,43	n.d.	0,25	0,8	n.d.	n.d.	n.d.
ROW	n.d.	0,50	n.d.	0,25	0,8	n.d.	n.d.	0,25 ***

Milk production increase based on 10% milk price increase





* EU-10 ** Elasticity for third year *** Countries with large export share n.d. = not documented

Explanation
Data basis: Only intermediate and long-term elasticities have been taken into account.
Period of elasticities: short-term: 1 to 3 years; **intermediate:** 3 to 6 years; **long-term:** 6 to 10 years
Countries: CA=Canada, NL=Netherlands, PL=Poland, ROW=Rest of the world, IN=India, NZ=New Zealand, AU=Australia, AR=Argentina, BR=Brazil.

3.5 Opportunities & limitations in milk production

Introduction

This chapter should summarise the key facts and trends around the topic “potential of milk production”. The milk price paid to the farmers is the main driver for realising a production potential. Therefore the relation between milk price and growth of milk production is analysed.

Milk price 2001

The map is based on various statistics covering about 90% of world milk production. Results:

The weighted average price was around 28 US-$ per 100kg milk.

High prices (>27 US-$): In North America, Western Europe, parts of Northern Africa, Japan, South Korea, Thailand, Philippines.

Very low prices: (< 20 US-$): In South America, Eastern Europe, and the CIS countries, Oceania.

Medium prices (20-27 US-$): In South Asia, China and selected other countries.

Milk price and growth of production

Based on the two graphs next page, three main groups can be identified:

Low prices and loss in production: Eastern EU and CIS countries.

Low prices and strong growth: East & South East Asia, South Asia, Oceania, Latin America.

High price and small growth rates: EU-15, North America, Near & Middle East.

Besides that Africa (high price + high growth rate) and the countries with very high milk prices and declining milk production should be mentioned (KR, JP, CH, No, IS).

The potential of milk production

As already mentioned the potential of milk production is highly linked to the milk price. Therefore a scenario of a milk price of 25 US-$ was specified (Workshop topic IFCN Dairy conference 2001).

EU-15, USA/Canada, KR, JP, CH, NO, IS: A reduction can be expected. The speed of structural change towards more efficient farming systems and their cost potential will define how much milk will be produced under such a scenario.

Eastern Europe/CIS countries: A significant increase can be expected. Doubling production would not be a problem. Political stability and access to capital/know how would be the limiting factors.

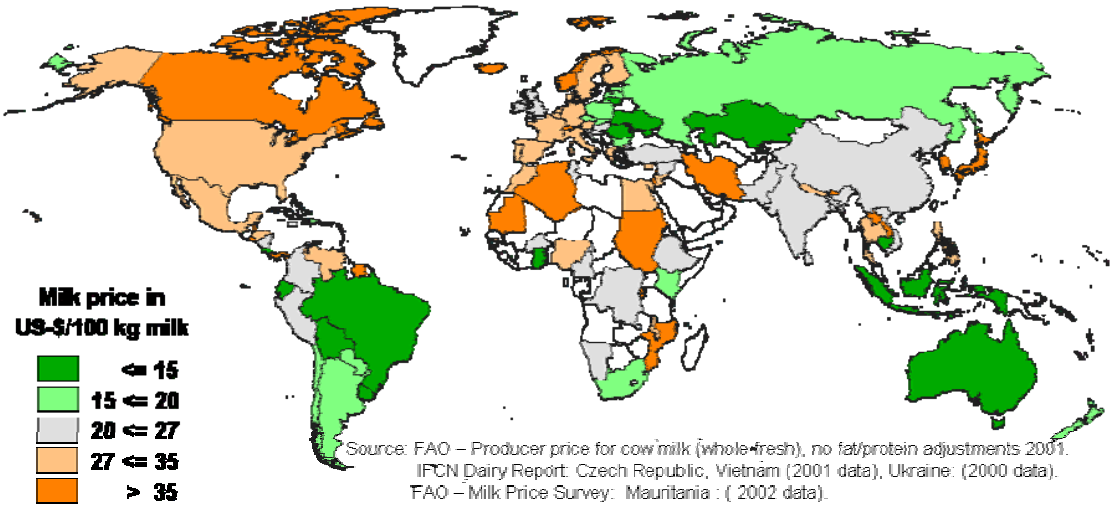
Latin America: A significant increase of production can be expected at 25 US-$ milk price. Limiting factor would be the competitiveness of milk/ towards other agricultural commodities like soybeans. Moreover political and macroeconomic stability are a challenge for larger investments.

Oceania: The growth potential is smaller than in Eastern Europe/ South America due to land and climate restrictions. Nevertheless the milk price of 25 US-$ would allow the intensification by using more concentrate which leads to higher milk yields.

Asia: As these countries have now already a milk price close to 25 US-$ a strong production increase cannot be expected. Nevertheless better genetics and feed managements can lead to significantly higher milk yield and milk production.

Explanation
Data: 1995 to 2001 is used as available from FAO statistics.
Source: FAO production yearbook, www.fao.org, IFCN Dairy Report 2004, own calculations.
Milk: Cow and buffalo milk is included, no fat standardisation
Explanatory power: Over 90% of worldwide milk production is covered.
Milk price: No fat and protein adjustments have been done. Prices are in US$ per 100kg, VAT adjusted?
World regions: Change in the definition of regions, see Annex 1 (table) for further information. Abbreviations: Korea (KR), Japan (JP), Switzerland (CH), Norway (NO), Iceland (IC).
Relation graphics: Calculated on the average annual change between 1995 and 2001.
Potential of production: Expectation of the potential to change their production based on estimations by authors (IFCN knowledge): **++** doubling possible; **+++** more than doubling possible; **?** Estimation is difficult.

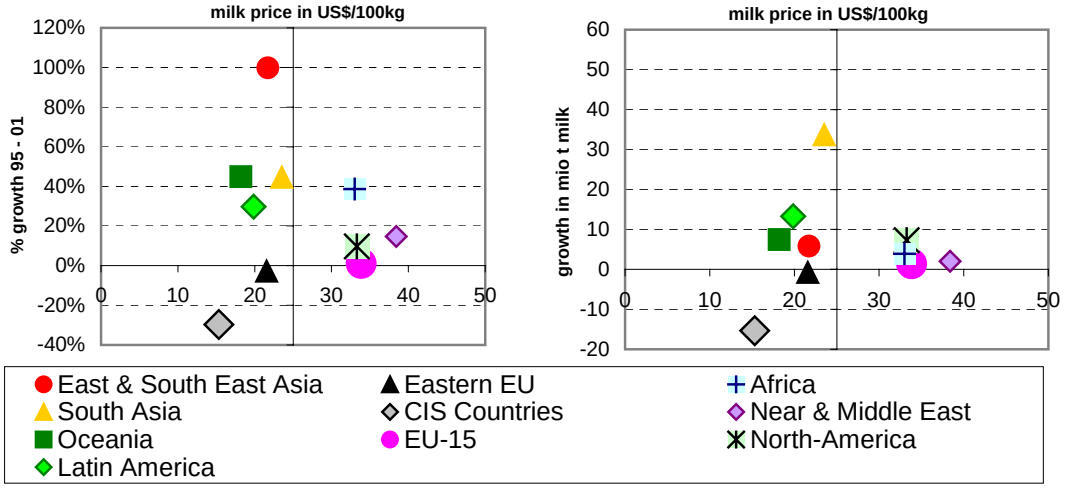
Milk prices 2001



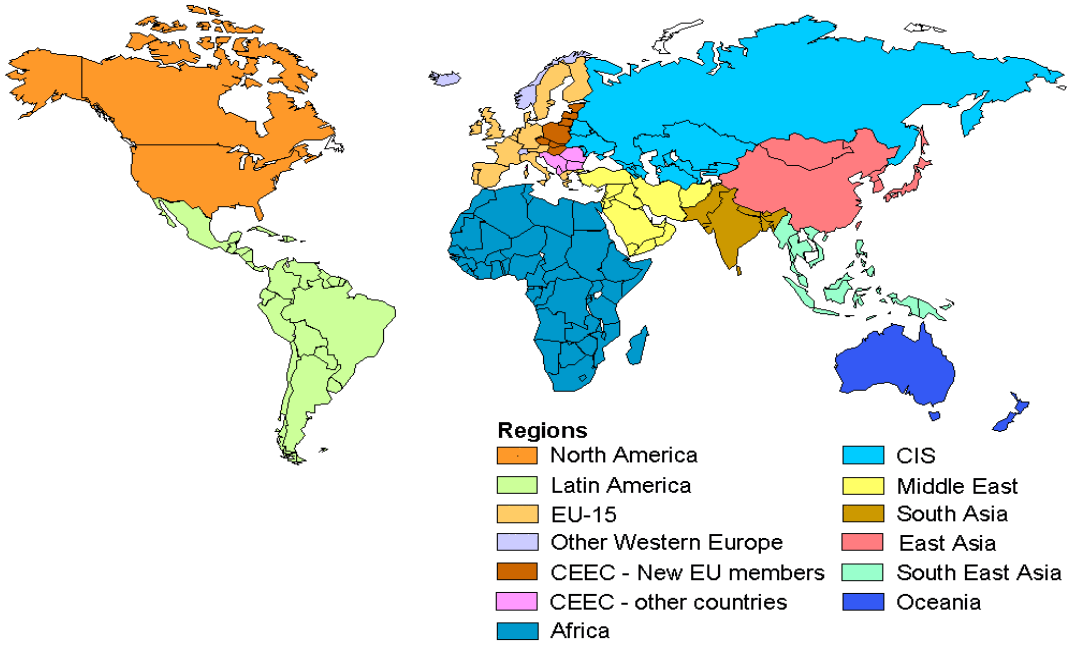
Milk price, milk production & potential at 25 US$/100 kg milk

	Milk price		Milk production				Potential
1995 - 2001	average ($/100kg)		2001 (mio. kg)	change in %	change in mio t		milk price 25 US$/100kg
EU-15	34		122	1%	1,4		reduction
Eastern EU	22		26	-3%	-0,7		++
CIS Countries	15		36	-30%	-15,4		+++
North-America	33		83	10%	7,3		reduction
Latin America	20		58	30%	13,3		+++
Oceania	18		24	45%	7,4		++
Near & Middle East	38		16	15%	2,1		?
South Asia	24		109	45%	33,7		?
East & South East Asi	22		12	100%	5,8		?
Africa	33		14	39%	3,9		?
KR; JP, CH, NO, IC	65		14	-5%	-0,7		reduction
Average/sum	**28**		**514**	**11%**	**58**		

Relation of milk price and growth of milk production 1995 - 2001



A 1 Specification of world regions



Specification of world regions to calculate the milk production potential (Chapter 3.5)

EU-15	Austria	Belgium	Denmark	Finland	France	Germany	Greece	Ireland
	Italy	Luxembourg	Netherlands	Portugal	Spain	Sweden	United Kingdom	
Eastern EU	Bulgaria	Croatia	Cyprus	Estonia	Hungary	Latvia	Lithuania	Malta
	Poland	Romania	Slovakia	Slovenia				
CIS Countries	Kazakhstan	Russian Federation						
North-America	Canada	United States						
Latin America	Argentina	Barbados	Belize	Bolivia	Brazil	Chile	Colombia	Costa Rica
	Dominican R	Ecuador	El Salvador	Honduras	Jamaica	Mexico	Nicaragua	
	Panama	Paraguay	Peru	Suriname	Trinidad; T	Uruguay	Venezuela	
Oceania	Australia	New Zealand						
Near & Middle East	Iran	Israel	Jordan	Syrian	Lebanon	Turkey		
South Asia	Bangladesh	Bhutan	India	Nepal	Pakistan	Sri Lanka		
East & South East Asia	China	Cambodia	Indonesia	Philippines	Thailand	Laos		
Africa	Burundi	Algeria	Egypt	Tunisia	Ethiopia	Gambia	Ghana	Kenya
	Malawi	Mauritius	Mozambique	Namibia	Nigeria	South Africa	Sudan	
Other Western Europe	Japan	Korea, Republic of	Norway	Switzerland	Iceland			

A 2 Methodological background - Milk equivalents and data

Dairy product		Data availability for different segments					
	ME-factor	Processing in t	Exports in t	Imports in t	Stocks in t	Exports in US $	Imports in US $
Butter and ghee	6,57	X	X	X	X	X	X
Dry products							
Dry butter milk	7,60	X	X	X	X	X	X
Dry skimmed cow milk	7,60	X	X	X	X	X	X
Dry whey	7,48	X	X	X	no data	X	X
Dry whole cow milk	7,56	X	X	X	X	X	X
Casein	7,40	X	X	X	no data	X	X
Lactose	7,40	X	X	X	no data	X	X
Cheese (all kinds)	3,84	X	X	X	X	X	X
Condensed milk							
Skimmed milk, condensed	1,62	X	X	X	no data	X	X
Skimmed milk, evaporated	1,62	X	X	X	no data	X	X
Whey, condensed	1,30	X	X	X	no data	X	X
Whole milk, condensed	2,00	X	X	X	no data	X	X
Whole milk, evaporated	2,00	X	X	X	no data	X	X
Fresh products							
Cow milk whole fresh	1,00	no data	X	X	no data	X	X
Cream fresh	3,21	no data	X	X	no data	X	X
Skimmed milk of cows	0,72	no data	X	X	no data	X	X
Whey fresh	0,44	no data	X	X	no data	X	X
Yoghurt	1,00	no data	X	X	no data	X	X
Yoghurt concentrate	1,00	no data	X	X	no data	X	X
Buttermilk, curdled milk, acidified milk	1,00	no data	X	X	no data	X	X
Reconstituted milk	1,00	no data	X	X	no data	X	X

Legend: X = Data available and deducted

FAO: 1981 – 2001 Production, processing, trade data,
1981 – 2001 Stock changes for butter and cheese (all countries except EU 15)

Eurostat: 1981 – 2001 Stock changes for the EU 15 countries

USDA: 1981 – 2001 Stock changes for dry products in selected countries (USA, Australia, New Zealand, Brazil, Canada, Mexico, Japan and Poland.

ZMP: 1981 – 2001 Casein statistics and milk delivered to dairy where data available

Stock changes have been treated with care as it is not always clear if all stocks in the country or only government stocks are deducted.

A 3 Cost of milk production - Literature review

	Countries	Approach	Data basis	Method	Year	Publication year	Quelle
The Economic Research Service (ERS)	USA and regional	survivor technik; every 3-8 farms updated	statistics, bookkeeping; estimations	full cost; updated each year (price, acreage, production changes);	started 1979	every year	http://www.ers.usda.gov/Data/CostsAndReturns/data/current/C-Milk.xls
ABARE / (DEXCEL)	Australia, New Zealand	farm notes	bookkeeping, statistics	family farm income	2000 -01 and 2001 - 02	2004	http://www.dairyaustralia.com.au/template_home.asp
Wageningen Economic Papers (FADN)	Netherland	farm notes	FADN for sandy soils	family farm income	1989 - 1993	1996	http://www.wau.nl/wub/wep/nr9602/wep02_3.htm
Farm Business Survey (FBS)	Ireland	selected on random basis	bookkeeping	full cost	1997 and 2001	2002	http://www.dardni.gov.uk/econs/file/farminc/econ0032i.pdf
Department of Agriculture and rural Developement (FBS)	Ireland	selected on random basis	bookkeeping	gross margin	2001 -02and 2002 - 03	2004	http://www.dardni.gov.uk/econs/file/farminc/econ0032a.pdf
European Dairy Farmers	EU	farm notes	bookkeeping; questioning of farmers	full cost	since 1995	every year	Dairy Report
Richardson, J. W.; Romain, R.	USA, Canada	engineering approach; survivor technique	panel questioning	simulation model FLIPSIM	1996 - 2002	1997	http://www.afpc.tamu.edu/pubs/0/99/wp97-8.htm
Direct	Australia	n.d.	n.d.	family farm income	1997 - 1998	1998	Tom Phillips & Associates PTY. Ltd.; Warragul. Australia.
Isermeyer	EU-12, USA, Canada, New Zealand	farm notes	bookkeeping; FADN; ERS	full cost	1983	1989	Isermeyer, F. Die Wettbewerbstsellung der deutschen Landwirtschaft in der Milchproduktion. Göttingen.
Dairy Facts and Figures	United Kingdom	n.d.	bookkeeping; based on Dairy Enterprise Costs Study	gross margin	1992 - 1995	1996	Dairy Facts and Figures. Published by the National Dairy Council, London. United Kingdom.
Baker et al.	7- D, F, IRL, NL, CAN, NZ, USA	farm notes	bookkeeping; FADN; ERS	full cost	1986	1990	Baker, D., Hallberg, M. C.. Tanjuakio, R., Elterich, J., Beck, R. L. and Liebrand; C. B.: Estimates of costs of production milk in 7 major milk producing countries 1986. USDA, ERS, Washington.
Fingleton	8- D, B, DK, F, UK, I, IRL, NL	farm notes	bookkeeping; FADN	full cost	1990-1993	1995	Fingleton; W. A.: Comperative costs and returns for milk production in European Countries . Annual Conference of the Agricultural Economics Society of Ireland, Dublin.
Butault et al.	6- D, F, NL, DK, UK, IRL	farm notes	bookkeeping; FADN	full cost	1990-1993	1995	Butault, J. P., Mureau, R. and Rousselle, J.-M.: La variabilité des couts de production dans six pays de L'europe du nord: Allemagne, France; Pay-Bas, Danemark, Royume-Uni et Irelande. Cahiers de L' onilait, 14, 48 - 60.

A 4 Cost of milk production analysis – National studies vs. IFCN

	Germany	
Model	BZA-Rind	IFCN
Region	Schleswig-Holstein	Schleswig-Holstein
Year	2002 - 03	2003
Milk cows per farm	82	80
Milk yield per cow	7.570	8.003
Cost of production	38,2	42,6
Method differences to the IFCN calculation		
Data collection: Bookkeeping data used; 98 farms in BZA-Rind sample		
Labour costs: Based on manager qualification and per labour unit (base salary + a possible bonus)		
Non milk returns: 50% lower: diffferent direct payment handling?		
Field inventory: Valuation of field inventory changes is carried out		
VAT: Including VAT		
Interest rate: Different methods are possible for calculation		
Capital costs: Based on profit and loss account		
Depreciation: Farm values based on tax depreciation		
Quota costs: Oppportunity costs for total quota on basis of stock exchange (without depreciation)		

	United Kingdom	
Model	FBS	IFCN
Region	average	North-West
Year	2001	2003
Milk cows per farm	106	97
Milk yield per cow	6.173	7.154
Cost of production	31,9	34,3
Method differences to the IFCN calculation		
Data collection: Bookkeeping data used; 214 farms in sample; 85% of the farm output refers to the dairy sector		
Milk output: Output per kg milk is not defined (including cattle and other receipts?)		
Milk ingredients: Milk output is fat and protein corrected?		
Rental value: Factor to compare owner occupied farms with farms on which rent has to be paid. But most regions don't turn out a rental value. Conclusion: All farms are rented in this regions?		
Land use: Effective hectares, i.e. hectares of rough grazings are calculated down as permanent pasture (- > reducing amount of hectares)		
Change in stock: Crop and livestock valuation changes are excluded		
Labour costs: On base of labour requirement to manage that business		
Interest payments: No interest payments or depreciation charges made against "landlord type" assests, but for "tenant type" assests (i.e. livestock, crops, machinery)		
Finance: Interest is including rate for own capital?		

	United States	
Model	ERS	IFCN
Region	average	Wisconsin
Year	2003	2003
Milk cows per farm	96	135
Milk yield per cow	9.086	10.386
Cost of production	42,4	38,1
Method differences to the IFCN calculation		
Data collection: Ers model developed results in 2003 fom survey based on year 2000		
Fertilizer value: Return from fertilizer value of the produced manure		
Interest: Payments on operating capital, but not on own equity		
Milk ingredients: Milk output is fat and protein corrected?		
Labour costs: Definion of own labour costs (per unit, per hours?) is unclear		

	Australia		
Model	Abare	IFCN	IFCN
Region	average	Victoria (non irrigation)	Norther Victoria (irrigation)
Year	2002 - 03	2002 - 03	2002 - 03
Milk cows per farm	188	210	217
Milk yield per cow	4.700	6.160	4.048
Cost of production	22,2	17,3	41,8
Method differences to the IFCN calculation			
Data collection: Bookkeeping data used			
Opportunity costs for land: Rent paysments for own land deducted?			
Interest: Interest payments for equity deducted?			
Milk ingredients: Milk output is fat and protein corrected?			
Labour unit: One labour unit is one year at 40 hours per week			

A5 Cost of milk production analysis - FADN vs. IFCN

(Jägersberg, IFCN Dairy Report 2002)

4.3 Cost of production analysis carried out with FADN and IFCN

Petra Jägersberg

What has been done?

This study is the first step to analyse and compare dairy farms by using FADN (Farm Accountancy Data Network in the EU) and IFCN data and methods. For a typical IFCN-farm of each country (DK, FI, DE) a sample of similar sized FADN farms was selected. The number of farms in the sample varies (DK=53 farms, DE=244 farms and FI=217 farms). Although the data were obtained from different years (IFCN data from 2001, FADN data from 1999) preliminary conclusions will be drawn.

Farm sizes, number of cows and milk yield

The number of cows are quite comparable in the sample of FADN and IFCN farms. The milk yields are, in general, higher in the IFCN farms (DK, FI). The FADN farms seem to have more land (FI, DE). Finally, the specialisation in dairy production is much higher on the IFCN farms.

Comparing costs of the dairy enterprise

Total costs are a great deal higher on the IFCN farms especially in Finland and Germany. This appears mainly in the different opportunity costs which are estimated in both systems. The labour costs, for example, are much higher on the IFCN farms. The labour productivity estimated by the experts is 20 to 40 % lower than on the FADN farms that have used the labour units given.

Comparing non-milk returns

In Finland and Germany the non-milk returns are much higher on the IFCN farms. It seems that the direct payments in the two systems might be collected differently.

Ranking IFCN farms in the FADN distribution

The indicator chosen to rank the IFCN farms in the FADN sample are the costs of the dairy enterprise from the P&L account. This indicator is not distorted by different systems estimating opportunity costs and the non-milk returns. Moreover, it can be assumed that these costs did not change markedly from 1999 to 2001. It seems that the typical Danish farm (DK-65) fits quite well and represents an average performing 65-cow dairy farm in Denmark. The typical Finnish and the typical German farm seem to have significantly higher costs and correspond to the upper end of the distribution curve. In the case of Germany, this might be explained by the fact the IFCN 35-cow farm represents a Simmental farm in the South that usually has higher costs compared to 35-cow Holstein farms.

Conclusions and next steps

By comparing the IFCN with the FADN farm data some weaknesses still accrue:

- The comparison deals with different reference years (1999/FADN versus 2001/IFCN). This causes major differences in milk prices and confuses the issue of comparing the farm's income parameters.
- Being aware of these difficulties, the comparison of the farm income (per 100 kg FCM) indicates actually a higher value in the IFCN farms, especially in Finland and Germany. This might be additionally explained by the difference in calculating the depreciation (purchasing value/IFCN versus repurchasing value/FADN) and by the difference in direct payments between both approaches.
- »Costs of the dairy enterprise from P&L account« - right indicator for the distribution curve?
- Can the averaged FADN farm represent a specific farm type in a region?
- Can cost allocation or variable generating procedure distort the sample performance?

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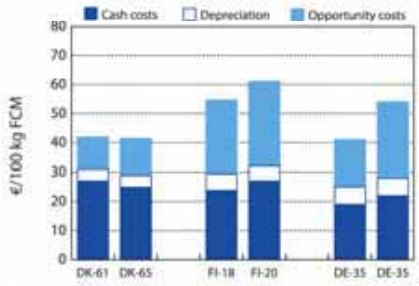
4.3 Cost of production analysis carried out with FADN and IFCN

Farm description

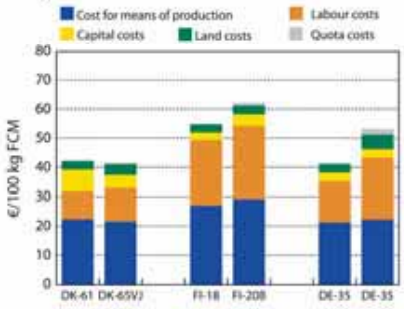
	Denmark		Finland		Germany	
	FADN	IFCN	FADN	IFCN	FADN	IFCN
Herd size (no. of cows)	61	65	18	20	35	35
Milk yield (kg FCM/cow)	6,912	7,987	7,209	8,935	6,076	5,977
Acreage whole farm (ha)	55	62	40	24	50	39
Returns from dairy (%)	84	100	62	100	80	100

Costs of the dairy enterprise

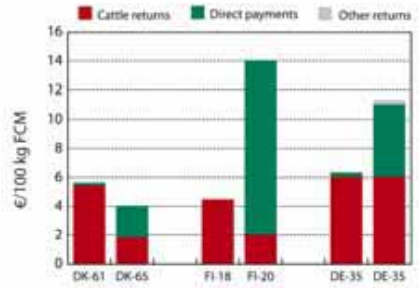
by cash and non-cash costs



by cost items

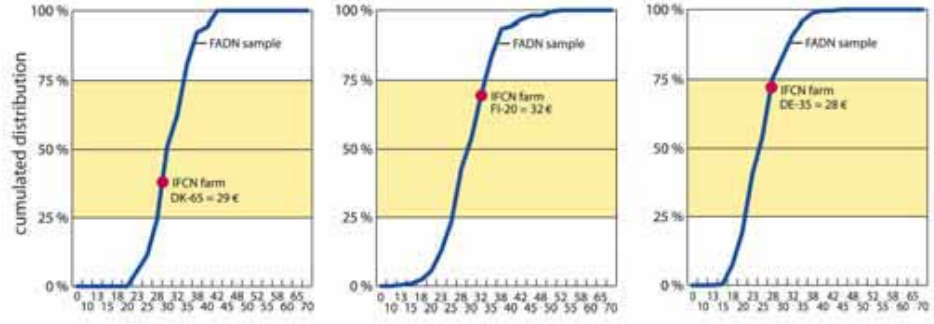


Non-milk returns



Costs of milk production only

Comparison of IFCN farms with distribution of FADN farms



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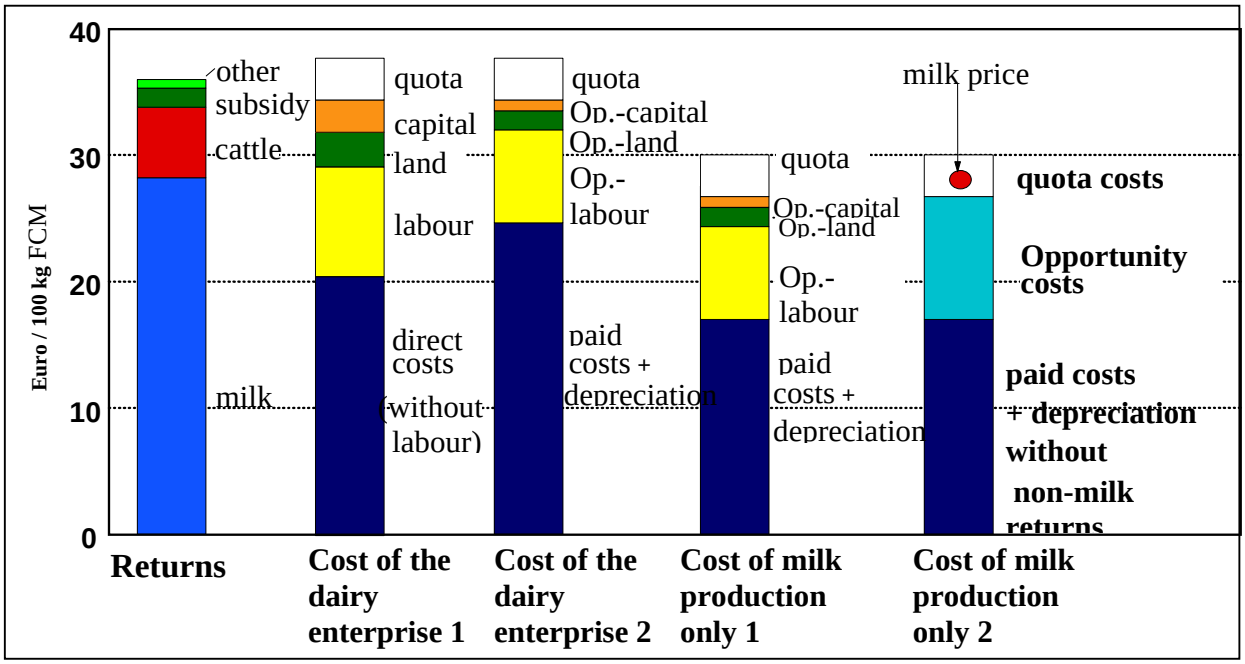
Annex 6 Method of the IFCN Cost Comparison



Introduction
The aim of this chapter is to describe the method of the IFCN Cost Comparison.

Returns of the farm
The returns of a dairy farm consists mainly of **milk returns**, beside this, returns from **non-milk returns** appear: Cattle returns, subsidies and the group “other” (all other output related to the farm).

Costs of the farm
The costs of the farm are divided into 4 columns, describing the different steps to the “cost of milk production only”.

Cost of the dairy enterprise 1
Direct costs: Costs from the profit and loss account.
Labour costs: Costs for hired and family labour.
Land costs: Costs for own and rented land.
Capital Costs: Costs for own capital and liabilities.
Quota costs: Costs for own and rented quota.

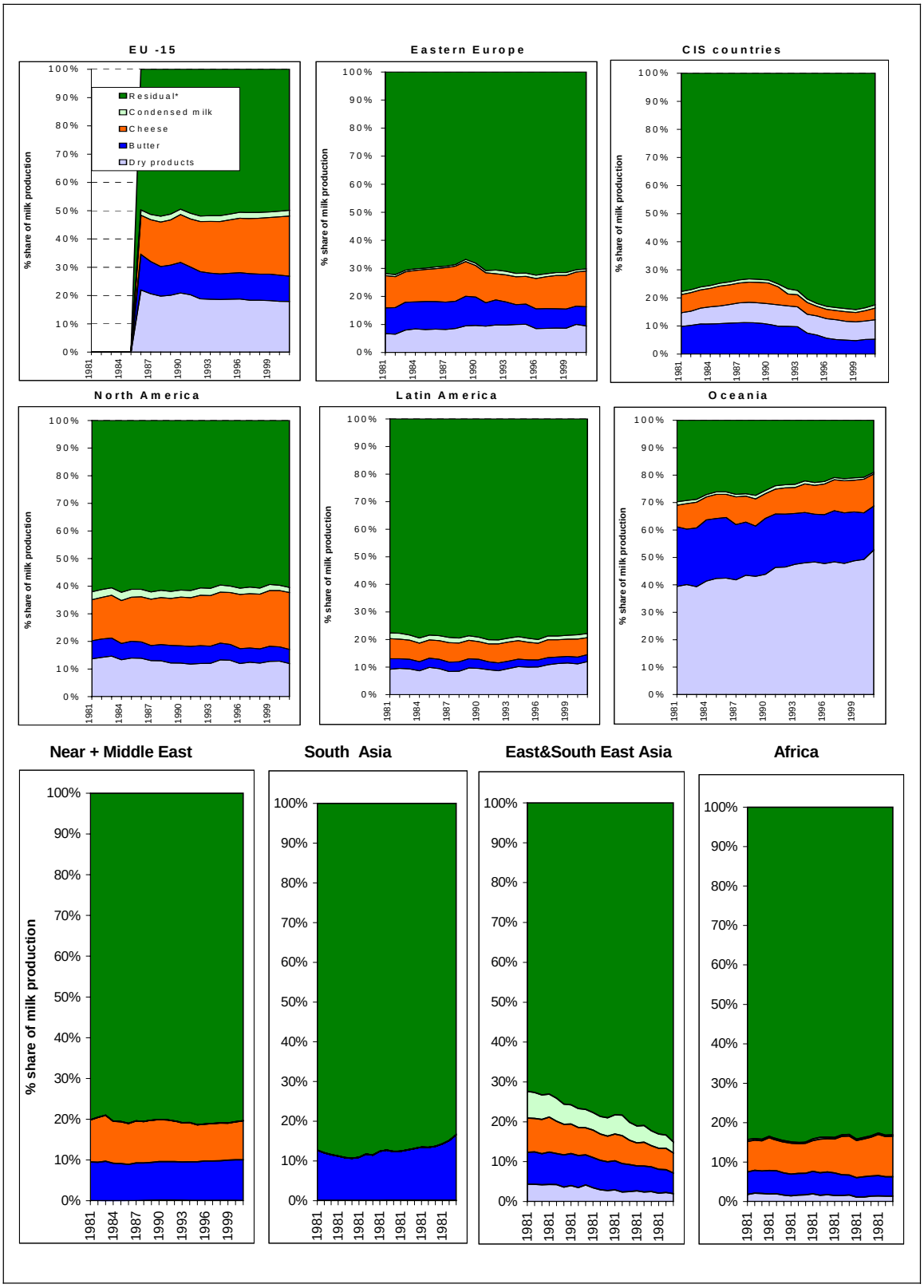
Cost of the dairy enterprise 2
Depreciation and the costs for hired labour, rented land and liabilities are added to the direct costs (=paid costs).

Cost of milk production only 1
Subtraction of the non-milk returns from the total costs.

Cost of milk production only 2
This costs bar is reflecting the costs for milk production only, consisting out of the costs blocks for quota, opportunity costs and paid costs, including depreciation.

Entrepreneurs profit
Milk price minus the **costs of milk production** only (in this case the profit is negative).

A 7 Trends in milk processing – Results in %



A 8 Investments in milk processing - Survey for 2004

					legal status		Orientation			form of investment								product						
	company of initiative	country of initiative	company of target	country of target	investor owned	cooperative	domestic	regional	international	acquisition	new / extension	out of business	sold	joint ventures	mergers	alliances	assumed	other	liquid milk	cheese	powders	butter	investment in m $
1	ACC	UK	Leeds Dairy	UK		1	1					1							1				
2	Milk Link	UK	Newlands Farm	UK		1	1			1									1				2
3	Danone	FR	Gonen Dairies; Mis (Nestlé)	CH	1				1	1									1				
4	Campina	NL				1	1				1								1				52
5	Campina	NL	DMV International	NL		1	1				1							1					82
6	Bongrain	FR	Dabon International	IN	1				1					1					1				
7	Moody PLC	UK	Moodyparts	US					1				1										
8	Blackmoore Vale Cream	UK	Shaftesbury Dairy	UK			1				1							1					1,83
9	Milk Link	UK	Peninsula Dairy	UK		1	1			1									1				4,6
10	Dale Farm	IE	Cullybackey	IE	1		1				1						1					1	7
11	Hansa Milch	DE	Upahl Plant	DE		1	1				1						1		1				5
12	Glanbia Foods	UK	Clovis Dairies	US	1				1		1						1			1			190
13	Fonterra	NZ	Sanlu	CN		1			1					1						1			
14	Graham	UK	Angus Dairies	UK	1		1			1									1				
15	Arla Foods	DK/SE	Express Chilled	UK		1	1					1							1				
16	WBD (Wimm-Bill-Dann)	RU	Uzmyasomolprom	UZ	1			1						1					1				7
17	GCMMF	IN		LK		1		1			1						1	1					4,4
18	Unimilk	RU			1		1				1						1		1				37
19	Madeta	CZ	Cesky Krumlov Dairy	CZ	1		1				1									1			5,7
20	Numico	NL	Opole Dairy	PL	1			1			1						1	1					31
21	Stater Bros. Markets	US	Santa Dairy Inc.	US	1		1			1								1					
22	Fonterra	NZ	Soprole	CL		1			1					1			1		1				
23	Dairygold	IE	Tine	NO		1		1						1						1			
24	Lactoland	DE	Edgeware Foods Inc.	CA	1				1					1				1					
25	United Milk Company	BG	Vitalakt Milk (Delta Dairy)	GR	1			1		1								1	1				3,3
26	Schreiber Foods	US	Dynamix Dairy	IN	1				1						1					1			3,8
27	Dreyer's Grand Ice Cream	US	Häagen-Daz (General Mills)	US	1		1			1								1					
28	Milk Link	UK	Glanbia Foods (Cheese Company Holdings)	UK		1	1							1						1			146
29	Campina	NL	Hilversum Dairies	NL		1	1					1					1	1					
30	Danisco	DK	Rhodia	FR	1			1		1								1					397
31	Danone	FR	National Foods of Australia	AU	1				1				1						1	1			91
32	United Dairy Inc.	US	R. Bruce Fike & Sons Dairy	US	1		1			1									1				
33	Morningstar Foods	US	South Park Street Dairy	US	1		1					1					1		1				
34	Land O'Lakes	US	Tulare Dairies	US	1		1				1						1			1			
35	Danone	FR	Yakult	JP	1				1					1				1					
36	Medina Dairies	UK	Watson Dairies	UK	1		1			1									1				13
37	Nordmilch	DE	Seckenhausen Dairy	DE		1	1					1								1			
38	Nestlé	CH	Staverton	UK	1			1				1					1			1			
39	Arla Foods	DK/SE	Bamber Bridge	UK		1		1				1					1	1					
40	Emmi	CH	Craamer	NL		1		1		1										1			
41	Campina	NL	Niedermörmter Dairy	DE		1		1				1					1			1			
42	HP Hood	US	Crowley Foods; Marigold Foods (National Dairy Holdings	US	1		1			1									1				
43	General Dairy and Product	LR				1							1				1						
44	Meiji Dairies	JP		JP		1	1				1						1		1				
45	Akkerman Group	NL		UK	1			1			1						1	1					46
46	Interfood	NL	Vonk Dairy Products	NL	1		1			1										1			
47	Oetker	DE	Onken GmbH	DE	1		1			1								1					99
48	Coca-Cola Israel	IL	Tara Dairies	IL	1		1			1													39
49	Granarolo	IT	Sitia-Yomo	IT		1	1									1		1					
50	Dean Foods	US	Central Lechera Vallisoletana; El Prado V´Cervera	SP	1				1	1							1						
51	Numico	NL	Kampen Dairy	NL	1		1						1										
52	Campina (DMV International)	NL		DE		1		1			1							1					8
53	Tine (Diplom Ice Cream)	NO	Triumpf Glass	SE	1			1								1		1					
54	Belgomilk	BE	BZU	BE		1	1								1								
55	Dean Foods	US	Plants in Madison, San Leandro, Sulphur Springs,	US	1		1					1											
56	Kerry	IE	Cremo Cheese (Arla Foods)	DK		1		1		1										1			
57	Müller	DE	Uniekaas	NL	1			1		1								1					
58	Tatura Milk	AU	Ingredia	FR		1			1							1		1					
59	Uniq	UK	Minsterley (Northern Foods)	UK	1		1			1								1					30
60	Arla Foods	DK/SE	Stourton	UK		1	1				1												
61	Arla Foods	DK/SE		UK		1		1			1								1				
62	Van Drie	NL	Schils	NL			1			1											1		
63	Chr. Hansen Inc.	DK	West Allis	US	1				1		1									1			10
64	Associated Milk Producers Inc.	US	Glencoe	US	1		1					1							1				
65	Nestlé	CH	Dreyer's Grand Ice Cream Co	US	1				1		1							1					100
66	Numico	NL	Valio	FI	1			1		1								1					25
67	Nestlé	CH	Valio (Valiojäätelö)	FI	1			1		1								1					78
68	Arla Foods	DK/SE	Aarhus Dairy	DK		1	1					1					1		1				
69	Bank Banco Intesa	IT	Sitia-Yomo (Granarolo)	IT	1		1							1				1					
70	Alsi Beheer in te Raalte	NL	Numico (Leympf)	NL			1			1											1		
71	Sodiaal	FR	Factory at Vesoul	FR		1	1					1										1	
72	Lactalis	FR	Central Lechera Vallisoletana; Grupo Prado-Cervera	ES	1			1		1									1				
73	Arla Foods	DK/SE				1	1				1						1			1			11
74	Yakult	JP	Pasteur Milk	KR	1		1			1									1				

A 8 Investments in milk processing - Survey 2004 (continued)

					legal status		Orientation			form of investment								product						
	company of initiative	country of initiative	company of target	country of target	investor owned	cooperative	domestic	regional	international	acquisition	new / extension	out of business	sold	joint ventures	mergers	alliances	assumed	other	liquid milk	cheese	powders	butter	investment in m $
75	Müller	DE	Nestlé	CH	1			2		1								1					
76	Campina	NL	Quality Brands International (QBI)	GR		1		1		1										1			
77	Barry	CH	AM Foods	DK				1		1								1					
78	Arla Foods	DK/SE	Kronost	SE		1	1							1						1			
79	Dean Foods	US	Meadow Gold	US	1		1					1											
80	Hochwald	DE	Starmilch	DE		1	1								1			1					
81	Dairy Crest	UK	Yoplait Dairy Crest	UK		1						1						1					
82	Heler	UK			1		1				1						1			1			2
83	GCMMF	IN				1	1				1						1				1		22
84	Blackmoore Vale Cream	UK					1				1									1			2
85	Nestlé	CH	Eismann	DE	1			1					1					1					
86	Senoble	FR			1		1				1						1	1					42
87	3i Group	UK	Senoble	FR	1			1						1				1					
88	Kingsoak Homes	UK	Uniq	UK			1			1								1					35
89	Alsi Beheer in te Raalte	NL	Numico (Nutricia Lyempf)	NL			1			1											1		
90	Arla Foods	DK/SE		UK		1		1			1						1		1				27,5
91	Roncadin	DE/IT	Glacio	BE	1			1							1			1					
92	Dairy Farmers of Britain	UK	ACC	UK		1	1			1									1				137
93	Rolmlecz	HU	Strzelce Krajenskie	HU		1	1			1								1					
94	Nestlé	CH		CL	1				1		1						1		1				10
95	Gossner Foods	US		US	1		1				1						1			1			40
96	Spring Hill Dairy	UK	Dairy Farmers of America	US	1		1			1										1			
97	Well's Dairy	UK	Fruit-Ices Corp.	UK	1		1			1								1					
98	Numico	NL	Valio	FI	1			1		1								1					71
99	Granterre Unigrana	IT	Parmareggio Spa	IT	1		1			1										1		1	
100	URCVL (Union Regionale des Co-op de Vente de Lait)	FR	Forez Fourme	FR			1			1										1			
101	Fonterra	NZ				1	1				1										1		
102	Dean Foods	US	Plant in Michigan	US	1		1					1	1					1					10,2
103	Lakeland Dairies	IE	Omagh	IE		1	1					1	1								1		
104	Dairy Crest	UK	The Cheese Co / ACC	UK		1	1			1										1			7,3
105	Foremost Dairies	Hawaii			1		1					1							1				
106	Meadow Gold Dairy (Dean Foods)	UK			1		1				1								1				40
107	Nestlé	CH	Meilu Dairy Products Co	MN	1				1	1	1						1	1					
108	Kraft Foods	US	Breyers	US	1		1						1				1	1					
109	Humana / Nordmilch (Mopro Nord GmbH)	DE				1	1				1						1				1		52
110	Ebro Puleva	ES	not named	MX	1				1					1					1				10
111	DOC Kaas (NL) / Volac International (UK)	NL / UK		NL	1		1				1										1		
112	Open Country Cheese	NZ			1		1				1									1			25
113	Dairy Farmers	AU	National Foods	AU		1	1						1						1				
114	QAF	SG	Challenge Dairy Coop	AU	1				1	1								1					8
115	Danone	FR	Bright Dairy	CN	1				1					1				1					
116	Dairy Farmers	AU	Natfood	AU		1							1						1				
117	Fonterra	NZ		NZ		1	1				1							1					27,5
118	Rachel`s Organic Dairy	UK				1					1								1				5,5
119	First Milk	UK	Robert Wiseman Dairies	UK		1	1									1			1				
120	Linwoods Bakeries	IE									1								1				8
121	Arla Foods	DK/SE	Brorup Mejeri	DK		1	1						1							1				
122	Arla Foods	DK/SE	plant at Kimstad	SE		1	1			1											1		
123	Arla Foods	DK/SE	plant at Västervik	SE		1	1						1							1			
124	Arla Foods	DK/SE	National Cheese Co.	CA		1			1	1										1			
125	Fortuna (Humbold Creamery)	US	Artic Ice Cream (WestFarm Foods)	US		1	1			1								1					
126	Volac	UK	Felinfach Plant	UK	1						1							1					
127	Belgomilk	BE	BZU	BE		1	1								1				1				
128	Lactalis	FR	Fromageries Pochat et Fils	FR	1		1							1						1			
129	Nestlé	CH	Dreyer's Grand Ice Cream	US	1				1		1							1					180
130	Nestlé	CH	Aragua Dairies	VE	1				1		1							1					
131	Bongrain	FR	Emmi	CH	1			1						1						1			
132	Dairy Crest	UK	Coombe Farm	UK		1	1			1									1				
133	Arla Foods	DK/SE	H. T. Webb	UK		1		1				1	1							1			
134	Milk Pro	AZ			1		1				1						1		1				5,5
135	Hoogwegt Internationals	NL	Apollo Milchprodukte GmbH	NL	1		1			1								1					
136	Robert Wiseman Dairies	UK			1		1				1						1		1				55
137	MBO	UK	Ilchester	UK	1		1			1										1			
138	Lactalis	FR	A. McLelland & Son	UK	1			1		1										1			275
139	Provital Milk	CZ	Plzen Plant	CZ	1		1				1						1			1			
140	Mlekpol	PL	Osowa Dairy	HU		1		1		1								1	1				
141	Glanbia	IE	Kortus	DE	1			1		1								1					18
142	Lactalis	FR	Kurow	PL	1			1		1										1			
143	Lactalis	FR	Rondele Speciality Foods	US	1				1	1										1			
144	Nordmilch	DE	Otterndorf	DE		1	1					1	1							1			
145	Kraft Foods	US	South Edmeston Plant	US	1		1					1	1						1				
146	Tillamook	UK	Boardman	UK		1	1				1									1			50
147	Sigma Alimentos (Alfa Group)	MX	NZ Milk (Fonterra)	MX	1		1						1					1					
148	Arla Foods	DK/SE	Campina	NL		1		1							1		1	1					

A 9 Supply elasticities of milk production – Literature review

Author	Model / Method	Result	Annotation	Country	Period	Publication; Year	Source
Adesoji O. Adelaja	ELFAC data with 3 groups of farms (small, medium, large)	0,64	small farms < 40 cows	USA	1971 - 1985	American Journal of Agricultural Economics; 1991	http://aem.cornell.edu/research/researchpdf/wp9808.pdf
		0,35	medium farms 40 to 79 cows				
		0,39	more than 79 cows				
Ken Bailey; Jose Gamboa	Dairy Compact Model	0,35	short run elasticity	USA	n.a.	College of Buisness and Public Administration, University of Missouri; 2001	http://agebb.missouri.edu/commag/dairy/bailey/compact/sect4.htm
Ken Bailey; Jose Gamboa	lit. research Suzuki & Kaiser	0,59	long-run elasticity	USA	n.a.	n.a.	http://agebb.missouri.edu/commag/dairy/bailey/compact/sect4.htm
	lit. research Cox et al.	0,56	intermediate-run elasticity				
	lit. research OMB	0,1	short-run elasticity				
Folkard Isermeyer	lit. research Hammond	0,14	long term elasticities	USA	n.a.	1974	Isermeyer, F.: Prodstrukturen, Produktionskosten und Wettbewerbsstellung der Milchproduktion in Nordamerika, Neuseeland und in der EG. Wissenschaftsverlag Vauk, Kiel.
	lit. research Dahlgran	2,2				1985	
	lit. research Chen et al.	2,53				1972	
Meilke, Sarker, Le Roy	lit. research Elterich and Masud	2,8	long term elasticities	USA	n.a.	1966 - 78	K. Meilke, R. Sarker; D. L. Roy:" Analyzing the potential for increased trade in dairy products: A Canadian perspective.
	lit. research Thraem and Hammond	1,15				1949 - 78	
	lit. research Lafrance and de Gortner	4,8 to 8,0				1950 - 80	
	lit. research Kaiser et al.	0,8				1949 - 85	
	lit. research Howard and Shumway	0,23				1951 - 82	
Cox; Chavas		0,37	medium-run elasticities	USA	n.a.		
Chavas; Klemme		0,22 to 1,17	medium-run elasticities	USA/North-east	n.a.	1986	Chavas, J.-P. and R. M. Klemme: "Aggregate milk supply response and investment behavior on U.S. dairy farms". American Journal of Agricultural Economics, 68. 1986, p. 55 - 66.
Ippolito; Masson	Kessel's model of discriminatory pricing by the FMMO system	0,4 to 0,9	medium-run elasticities	USA/North-east	n.a.	1978	Ippolito, R. A. and R. T. Masson: "The social cost of government regulation of milk". Journal of law and economics, 21. 1978, p. 33 - 65.
Helmberger; Chen		0,583	long term elasticities	USA/North-east	n.a.	1994	Helmberger, P. and Yu-Hui Chen:" Economic effects of U.S. dairy programs". Journal of agricultural and resource economics, 19. 1994, p. 225 - 238.
Loren W. Tauer	single output, single composite input Cobb-Douglas function; 70 farms analysed 9 years	0,68	elasticities are slightly higer for larger farms (50 cows: 0,59; 500 cows: 0,77)	USA	1985 - 1993	Working paper of the Cornell University; USA; 1998	http://aem.cornell.edu/research/researchpdf/wp9808.pdf
ERS/ Penn State Trade Model	partial equilibrium, multiple-commodity, multiple of agricultural policy and trade; nonspatial	0,5	medium-run elasticities	USA	2000	2003	http://trade.aers.psu.edu/model.cfm
		0,35		EU			
		0,25		JP; CA; MX; BR; AR; CN; AU; NZ; KR; ROW			
Balagtas; Sumner	Kessel's model of discriminatory pricing by the FMMO system	1	medium-run elasticities; derived after lit. research	USA/North-East	1999		http://aic.ucdavis.edu/oa/compact.pdf
Maroeska Boots	Symmetric Normalised Quadratic (SNQ); Normalised Quadratic (NQ); SNQ and NQ are models for simulating alternative policies beside the quota system	0,43	NQ	Netherland	1992-1993	Wageningen Economic Papers; 1997	http://www.wau.nl/wub/wep/nr9708/wep08_6b.htm
		0,26	SNQ				
David Colman; Alexander Salomon; Len Gill	literature research: Thijssen	0,1	n.a.	Netherland	n.a.	1992	Supply response of UK milk producers; University of Manchester. 2003.
	literature research: Oskam; Osinga	0,29		Netherland	n.a.	1982	
	literature research: Elhorst	0,12		Netherland	n.a.	1990	
	literature research: Higgins	0,17		Ireland	n.a.	1986	

A 9 Supply elasticities of milk production – Literature review (continued)

Author	Model / Method	Result	Annotation	Country	Period	Publication; Year	Source
David Colman; Alexander Salomon; Len Gill	single equation model	0,32	(averaged)	UK	n.a.	1993	Supply response of UK milk producers; University of Manchester. 2003.
	simultaneus two-equation model	0,63 to 1,24		UK North West	n.a.		
	simultaneus two-equation model	0,42 to 0,62		UK South West	n.a.		
Sylvain Larivière; Karl Meilke	Stylized Model of the International Dairy Sector (World Dairy Model)	0,75	medium-run elasticities	Canada	n.a.	Paper for the Policy Research Symposium; Canada 1999	www.card.iastate.edu/about/events/ dairy_symposium/papers/assessment_of_partial.pdf
		0,75		EU (15)			
		0,81		USA			
OECD	AGLINK:partial equilibrium model; recursive dynamic supply and demand; model for analysing medium-term impacts of agricultural policies	0,2	short term elasticities	Canada	n.a.	Technical paper Directorate for Food, Agriculture and Fisheries, Committee for Agriculture; Paris 2004	www.oecd.org/dataoecd/16/48/34073467.doc
		0,18		EU			
Zohra Bouamra-Mechemache; Vincent Réquillart	INRA Dairy Model (INRADM); spatial equilibrium model	1	long term elasticities; grouped according to land and substitution possibilities	UK;IE; NL; BE; LU; GE; AT	1995	Paper by Bouamra Mechemache, Cox, Chavas and Réquillart; Journal of Agricultural Economics.2001	http://statistics.defra.gov.uk/esg/reports/milkquota/annex3.pdf
		1,5		DK; FR; IT; GR; ES; PT; SE; FI			
GAPSI	international multi-market, non-linear and synthetic, recursive-dynamic, partial equilibrium model; non-spatial	0,3	long term elasticities	DE; NO; FR; PL; HU;	2000	2004	E.-O. v. Ledebur, D. Manegold:"GAPsi simulations updated baseline and EU enlargement under the Mid-Term-Review scenario". Arbeitsbericht, Germany.
		0,8		North-Am.; South-Am.; Oceania; ROW			
ABARE	Aglink model; partial equilibrium model; recursive supply and demand model	0,17	short term elasticities (3 years)	Australia	1999	2004	Shaw, I. and Love, G.:"Impacts of liberalising word trade in dairy products". In ABARE Research 01.4, 2004, Australia.
		0,23		New Zealand			
		0,09		Uruguay			
		0,03		ROW, small exports			
		0,25		ROW, large exports			
CEEC-ASIM	Central and Eastern European Countries Agricultural Simulation Model; Symmetric Generalized McFadden profit function	0,28	medium to long term elasticities	Poland	2000	2005	H. Grethe, G Weber:"Comparing supply systems derived from a symmetric generalized McFadden profit function to isoelastic supply systems: Costs and benefits. Contributed paper at the EAAE seminar in Parma, 3. Feb. 2005, Italy.
FAPRI	partial equilibrium model	-0,15 to 0,1	n.a.	CA; ID; oth. EU; EU; SL; PH	n.a.	n.a.	http://apps.fao.org/faostat/
		0,11 to 0,20		HU; LT; SK; CR; NZ; IN; LV; EE; CH; AU			
		0,21 to 0,3		AR; PL; BR; BG; UA			
		0,31 to 0,4		KR; MY; EG; RU			
		0,41 to 0,75		RO; MX; JP; CN; USA			
Swopsim	price equilibrium model; world supply is equal to world demand	0,20 to 0,40	n.a.	SU; East.-EU; CN; IN; MX; Cent. AM; EG; JP; VE; N.-Africa;	1984 - 86	1989	J. Sullivan, J. Wainio, V. Roningen: A database for trade liberalization studies. Agricultural and Trade Analysis Division, Economic Research Service, U.S. Department of Agriculture.
		0,41 to 0,50		BR; CA; S.-Africa; o. Lat. AM; USA; AU; ROW			
		0,40		Middle East/North Africa			
		0,55 to 0,65		PT; AR; ES; o. W.-EU; NZ; EU-10			

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