

Global Dairy Developments – An Overview on Milk Prices and Milk Production Costs World Wide

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Abstract

Recent years have been marked by very volatile milk and feed prices, which imposes a challenge on dairy farming. The costs to produce milk differ significantly from country to country though, and depending on the farming and feeding systems farmers are facing, fluctuating dairy margins.

From 2000 to 2012, cost of milk production increased in all countries analyzed by the IFCN (International Farm Comparison Network), where especially in China, cost of milk production was estimated 50% above the level in US and Germany due to high salaries and an appreciation of the currency. This emphasizes the importance of annual benchmarking as part of a strategic dairy development and milk sourcing to have an eye on the competitiveness on a global and local level of a country.

Introduction

Around 122 million dairy farms (IFCN estimates) are worldwide producing milk, keeping 363 million milking cows and buffaloes. This means that the world's average farmer keeps 3 milk animals with an average annual milk yield of approximately 2100 kg/animal/year (4620 lb/animal/year). Of course, building averages is an oversimplification. There is a wide range of dairy farms in the world keeping less than 3 cows per

farm on one hand, and on the other hand in some countries, dairy farms are much bigger and keep over 1,000 cows per farm.

The simple example shows that milk production is performed distinctively in different countries and their individual dairy regions. The dairy farming systems differ significantly in terms of farm size, housing, milking, and feeding systems. This article follows the approach of the International Farm Comparison Network (**IFCN**) - a global network of dairy researchers from 95 countries cooperating with over 100 companies representing the dairy chain. The main research focus of the IFCN and its core competence is in the field of milk production, milk prices, and especially dairy farm economics to create a better understanding of milk production worldwide.

Milk and Feed Prices Development 1996 to 2013

Figure 1 describes the development of the world market prices for milk and feed between the years 2006 and 2013. The world milk prices are based on the weighted average of 3 IFCN world price indicators: skim milk powder and butter (35%); cheese and whey (45%), and whole milk powder (20%). The IFCN world feed price indicator represents the world market price level for feed based on the price for a diet comprising 70% corn (energy feed) and 30% soybean meal

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(protein feed). The milk:feed price ratio indicates how much feed a dairy farmer receiving global milk prices and paying global feed prices can buy after selling one kg of milk. The ratio is defined as favourable, when it is ≥ 1.5 , and in general, one can conclude that the higher the ratio, the more favorable is intensive feeding.

Besides this commonly used ratio, the IFCN has developed a new farm economic indicator. This is the margin over compound feed costs. This indicator assumes an average feed intensity of 300 g compound feed per 1 kg milk (0.3 lb/lb milk). This feed intensity could represent a farm with a milk yield of 8,000 kg (17,600 lb) milk/cow/year using 2.4 t (2.6 tons) of compound feed per year. The key improvement is that the milk : feed price ratio is weighting milk and feed price changes 1 to 1, where the margin indicator is weighting the feed price based on the kg compound feed fed per kg milk.

At the beginning of the year 2006, the milk price indicator started showing rollercoaster behaviour of increasing prices and reached a peak of 53.7 USD/100 kg (220 lb) ECM (energy corrected milk at 4% fat, 3.3% protein) in November 2007. However, the increase in milk price was not significantly associated with the feed price as the gap between the two prices increased in 2007 reaching 32.3 USD.

In 2008, milk price fluctuated strongly and fell from a high level of 50.2 USD/100 kg (220 lb) ECM milk in January 2008 to a low level of 19.3 USD/100 kg (220 lb) ECM milk in February 2009. Nevertheless, the price increased to a level of 41.7 USD at the end of year 2009, making it a year of high fluctuations and a comparatively low average price. In 2010, the peak price was 41.3 USD and the amplitude of price fluctuation was lower than for the two previous years.

In contrast to the milk price, the feed price increased at the end of 2010 and beginning of 2011, reaching a level of 31 USD/100 kg (220 lb) feed. In contrast to the feed price, the milk price followed a downward trend reaching 37.3 USD in April 2012. The redemption of milk prices began in January 2013 with the level of 40.2 USD/100. The high acceleration of the milk price increase led to it overtaking the historical price peak of November 2007 and it ended the Q1-2013 with the level of 55 USD/100 kg in April.

Following the prices of milk and feed, it is easy to observe the three main events. The rollercoaster period between January 2007 and January 2010, which was determined by a high fluctuation of prices [max range 34 USD/100 kg (220 lb) ECM] and the milk-to-feed price indicator between 2.9 and below 1.0. It quickly led from a very profitable situation in production to a negative margin over compound feed, which decreased well below the average of 29.2 USD. This phenomenon especially affected milk producers who are based on the more intensive compound feeding systems like the USA and countries in the European Union (EU).

The second period was a period of relative stability which lasted for 2 years between January 2010 and January 2012. In this time, the milk price and feed price followed almost the same trend, allowing dairy farmers to produce milk with a milk-to-feed price ratio below the long-term average from the end 2010, but still around 1.5, and on the other hand, to keep a positive margin over the compound feed cost which was higher than the average. This example shows that two different indicators can give different messages. From the IFCN perspective, the margin over compound feed indicator better describes dairy farm economics, since it considers the feed intensity.

The third scenario started to develop at the beginning of 2012 when milk prices dropped and feed prices rose towards new highs until the middle of the year. This impact had a very negative effect on dairy farm economics as the two indicators (milk-to-feed price ratio and margin) show.

Starting in August, we saw a sharp rise in milk prices and a decline in feed prices until mid-2013. Both farm economic indicators show a positive development.

Here the margin indicator is the better indicator to track dairy farm economics. It clearly shows that dairy farm economics are reaching a similar level as seen in 2007, as soon as dairy farmers receive a milk price which is rising in line with the world market price. This analysis has been done for a moderate intensive dairy farming system of, for example, 8,000 kg/cow/year (17,600 lb/cow/year). For farming systems which operate at a lower milk yield and lower use of compound feed per kg milk, the fluctuation of the margin over compound feed is much lower and nearly only influenced by milk price developments. On the other hand, dairy farming systems with much higher milk yields and higher compound feed use can show much more volatile margins, especially when exposed to world market prices.

Cost of Milk Production 2012 by World Region

The annual IFCN work of comparing typical farms around the world has been an ongoing process since the year 2000. Since then, the number of countries participating has increased from 8 to 51. Moreover, the number of dairy farm types analyzed has increased from 21 to 178.

The IFCN methodology applied for data collection, economic analysis, and results validation uses the three elements:

- A network approach of research continuously co-operating,
- The concept of typical farms described below, and
- A standard model TIPI-CAL (Technology Impact Policy Impact Calculation model) to ensure technical comparability of indicators.

Typical farm approach

A typical farm represents the most common production system which produces a significant proportion of milk in a country or a region. Usually, two farm types are used per dairy region – the first represents an average farm and the second a larger farm type. The typical farms were built and validated by a combination of accounting statistics and a panel of dairy experts. The data collection and validation were done by researchers in the represented countries, researchers in the IFCN Dairy Research Center, and also during the IFCN Dairy Conference held in June 2013 in Turkey.

ECM correction

As the dairy farms operate with milk of very different fat/protein contents, the IFCN uses the energy corrected milk (ECM) approach to standardize milk volumes to 4% fat and 3.3% protein. The following formula was used: $ECM\ milk = (milk\ production * (0.383 * \% fat + 0.242 * \% protein + 0.7832) / 3.1138)$.

Cost indicator

The IFCN uses the indicator cost of milk production only which can be directly related to a milk price. This cost includes all costs from the profit and loss account of the farm. From this

cost level, the non-milk returns from sales of cull cows, heifers, calves, manure, etc. and also returns from coupled direct payments have been deducted. Furthermore, also the opportunity costs for own labor, land, and capital are included. For the creation of the world map, the average size farm from each country was used.

In Figure 2, a simplified global overview on costs of milk production is shown. The illustration is based on the results of the typical average sized farm analyzed per country in 2012. The results can be summarised as follows:

Cost range

Cost of milk production ranges from 4 USD per 100 kg (220 lb) milk in extensive farming systems in Cameroon where beef is the major output and milk is a side product to 128 USD for an average sized farm in Japan. The average cost over all countries analyzed was 46 USD/100 kg (220 lb) milk in 2012.

Low cost regions: Based on the average sized farms, three low cost regions have been identified: a) Argentina, Peru, and Uruguay, b) Central and Eastern Africa, and c) Central and Eastern Europe. Some selected countries in Asia (except Japan and large farms from China) also have low costs.

Western Europe: The leading farms in Western Europe had costs ranging from 40 to 55 USD per 100 kg (220 lb) milk. On an average, the cost in Western Europe decreased by 1.1 USD in 2012 compared to 2011, mainly due to the weakening of the Euro to the USD.

The U.S.: The small farms in Wisconsin and New York had a cost of 50 USD. Within the USA, the large farm from California had the lowest cost of about 33 USD. In general, the average costs of all typical farms analysed in USA

did not change and stayed at a level of 41.4 USD in 2012 compared to 2011 (41.02 USD).

Oceania: The cost level in Oceania was about 35 USD.

Central and East European Countries (CEEC): The average of all household farms from the CEEC witnessed a slight decrease in costs, also driven by devaluation of the local currencies to the USD.

In the year 2012, the increase of the cost of milk production (in national currency terms) continued in most dairy farms in the world following a rise in price of major input items (feed, labor, and land) in many countries. But contrary to the year before, these higher input costs were not counteracted by a higher milk price – quite the reverse, the milk price stayed stable or even decreased in many countries, leading to worsening farm economics.

Cost of Milk Production Developments 2000 to 2012

The results shown in Figure 3 reflect the situation of an average sized dairy farm from New Zealand. In the year 2012, this farm type had 348 cows and represented over 50% of the milk produced in New Zealand. In this time frame, the size of the typical dairy farm had increased from 220 to 348 cows per farm. The milk yield increased from 4000 (8800 lb) to over 4500 kg (9900 lb) milk ECM/cow in that year. Besides the costs in NZD, the exchange rate as an index and the costs in USD are shown.

In USD terms, milk production costs almost tripled in the time frame from 2000 to 2012. The costs increased from 12 USD per 100 kg (220 lb) milk in 2000 to a level of over 35 USD in 2011. Cost reduction in 2012 was an effect of very good weather conditions and related to the improved milk production per hectare.

The increase of costs in USD can be explained by the increasing cost per kg milk in NZD which showed an increase of 52%. This was driven mainly by rising prices for land and labor, which increased by 150%. As dairy farmers in New Zealand do not use purchased compound feed that much, the rising world feed prices did not affect the milk production costs. The second driver was the appreciation of the NZD to the USD. In the year 2000, the exchange rate was 2.2 NZD per USD. In the year 2012, this rate dropped to 1.24 NZD per USD. This was an appreciation of the NZD by 44%. For agriculture, appreciating currencies means increasing costs in the currency used for comparison. The example of the year 2008/2009 shows the rapid devaluation of the NZD decreased milk production costs in USD. During this time, the exchange rate was fluctuating between 1.3 to 1.9 NZD/USD.

Figure 4 illustrates the costs of milk production of selected typical farms the IFCN had been analysing over a certain period of time. The first two letters of the farm describe the country. The numbers describe the farm size in number of cows per farm. The codes after the number illustrate the region, e.g. WI represents the region of Wisconsin in the USA.

Germany (DE-106N): This typical farm with 106 cows represents approximately 60 to 70% of milk production in Northern Germany. In the year 2000, the costs were with 28 USD/100 kg (220 lb) milk, similar to a US dairy farm. From 2000 to 2006, the cost increased towards 42 US\$ per 100 kg (220 lb) milk. The key driver was the appreciation of the Euro (+36%) and moderate increase of costs in Euro terms. In the year 2007, a significant increase of the costs indicator was observed as direct payments were decoupled from the dairy enterprise and lowered the non-milk returns by 7 USD per 100 kg (220 lb) milk. From 2008 to 2012, the costs showed a declining

trend towards 42 USD per 100 kg (220 lb) milk. The key drivers were: a) a devaluation of the Euro by 14% and b) the effect of the typical farm in the quota exit phase increasing farm size from 80 to 106 cows. These two effects have, in USD terms, over-compensated for the effect of higher feed and energy prices.

Poland (PL-65): This farm type represents a larger family farm type in Poland, producing about 30 to 40% of the total milk in Poland. This Polish farm had very low costs in 2003 and 2004 and was almost as cost competitive as dairy farms in New Zealand. After joining the EU, costs increased from 17 to 53 USD per 100 kg (220 lb) milk in 2008. This was driven by an increase of wages, land prices, and an appreciated currency against the Euro. This increase could not be compensated by an increasing farm productivity. After 2008, the farm type followed a similar cost trend as the German dairy farm. The 20% reduction in costs in 2012 was a result of the devaluation of the Zloty (-7%) and improvements in farm efficiency, like milk yield, land, and labor productivity.

USA (US-500WI): This farm type represents a larger family farm type and roughly 30% of milk in the USA. In the US, costs were relatively stable from 2000 to 2006 as inflation driven change of input prices could be compensated by increasing milk yields. Once feed prices started rising, this had a direct impact on these farm and costs, which increased by 50% to a level of 38.5 USD per 100 kg (220 lb) milk. The sharp drop in costs in 2009 can be interpreted as a result of very bad milk prices, when farmers tried to cut costs wherever possible. Until the year 2012, cost had increased – mainly driven by feed prices - towards 44 USD per 100 kg (220 lb) milk. US dairy farms had a significant cost advantage over larger family farms in Germany for over 10 years. In the year 2012, the costs were on a similar level.

China (CN 340): This typical farm with 340 cows represents a larger farm type in China but not the very large farms. We estimate that this farm type represents 30 to 40% of the milk produced in China. The costs on Chinese farms rose steadily from 2000 to 2005, following increases in feed and labor prices. Since 2006, an additional increase in cost due to the appreciation of the Yuan could be seen. In 2012, the Yuan had gained value by + 25% to the USD compared to 2000. The costs on Chinese farms did not drop sharply in 2009 as was observed in most other countries because the drop in prices in national currency was almost fully compensated by the appreciation of the Yuan. From 2010 until 2012, the rising feed prices were a strong driver for increasing cost of production.

Argentina (AR-170): This farm represents an average sized farm in Argentina which keeps about 40 to 50% of the cows. The costs of a 170-cow farm in Argentina have more than doubled since 2002. Nevertheless, the positive trend has slowed in the last 5 years and costs have become more volatile. After a cost decrease in 2011, an increase could be experienced again in 2012. This latest development was mainly driven by a decrease in milk yield due to unfavourable weather conditions.

New Zealand (NZ-348): The typical farm representing an average sized farm in New Zealand was a cost leader in milk production in the year 2000. IFCN identified costs of 12 USD per 100 kg (220 lb) milk, which was the lowest cost level those days. Driven by an increase of input prices and an appreciating currency, costs increased to a level of 35 USD per 100 kg (220 lb) milk. Based on the typical farms chosen for this analysis, the costs in New Zealand were approximately 20% higher than in Argentina and ca. 20% below the costs level in the US and Germany in 2012.

Summary

This article summarizes the research work of the IFCN – International Farm Comparison Network which has been analyzing dairy farm economics since the year 2000. In the year 2013, over 50 countries participated in the annual comparison on costs of production and 95 countries participated in the country profile analysis. The results of this article are summarised as follows:

122 million dairy farms on this planet keeping on average 3 cows per farm

Based on IFCN data collection and estimations, there were 122 million dairy farms and farming households on this planet in 2012. The average dairy farm size has 3 cows or buffaloes with an average milk yield of 2100 kg (4620 lb) milk ECM/milk animal.

Very volatile milk and feed prices - A challenge for dairy farming

Via standardised world milk and feed prices, IFCN tracks the overall farm economic situation for dairy farming. The IFCN developed an indicator “margin over compound feed costs” which is a significant improvement compared to the often used milk:feed price ratio. By using this margin, it becomes visible how much of a threat a dairy farmer faces in a situation like in summer 2012, when milk prices fell and feed prices increased. Within 8 months, this situation changed considerably and dairy farm economics improved significantly, especially in countries where the high world market prices of milk were transmitted by local dairy processors to farmer milk prices.

*Costs to produce milk differs significantly –
The range is from 4 to 128 USD per 100 kg
(220 lb) milk*

Based on the IFCN cost comparison, 178 typical farms in 51 countries were analyzed. Cost of milk production ranged from 4 USD per 100 kg (220 lb) milk in extensive farming systems in Cameroon to 128 USD for an average sized farm type in Japan. The simple average cost over all countries analysed was 46 USD/100 kg (220 lb) milk.

*From 2000 to 2012, cost of milk production
increased in all countries analyzed*

As the IFCN has analyzed typical dairy farms since the year 2000, a time series analysis was possible. The results show that costs in a specific country can double or triple within 3 to 6 years. This is especially the case for countries like Poland, China, and New Zealand where the value of the currency has significantly strengthened to the USD and farm input price like land, feed, and labor have increased significantly.

*Cost of milk production in China is estimated
50% above the level in U.S. and Germany*

An extreme case was observed in China where dairy farming highly depends on purchased feed. In addition, China had the strongest increase in salaries and an appreciation of the currency of 24%. The combined effect of these factors drove the costs in China to about 50% above the level in US and Germany.

*Annual benchmarking is a part of strategic
dairy development and milk sourcing*

In times of significant change in dairy related output prices, farm input prices, and exchange rates, it is extremely important to benchmark the competitiveness of the current

dairy farming system annually. Competitiveness means in this sense costs competitive on the market for dairy products and also competitive on the local market for production factors, especially land and labor. Such benchmarking exercises enable all dairy stakeholders to see and react faster to threats, but even more to anticipate opportunities which will arise.

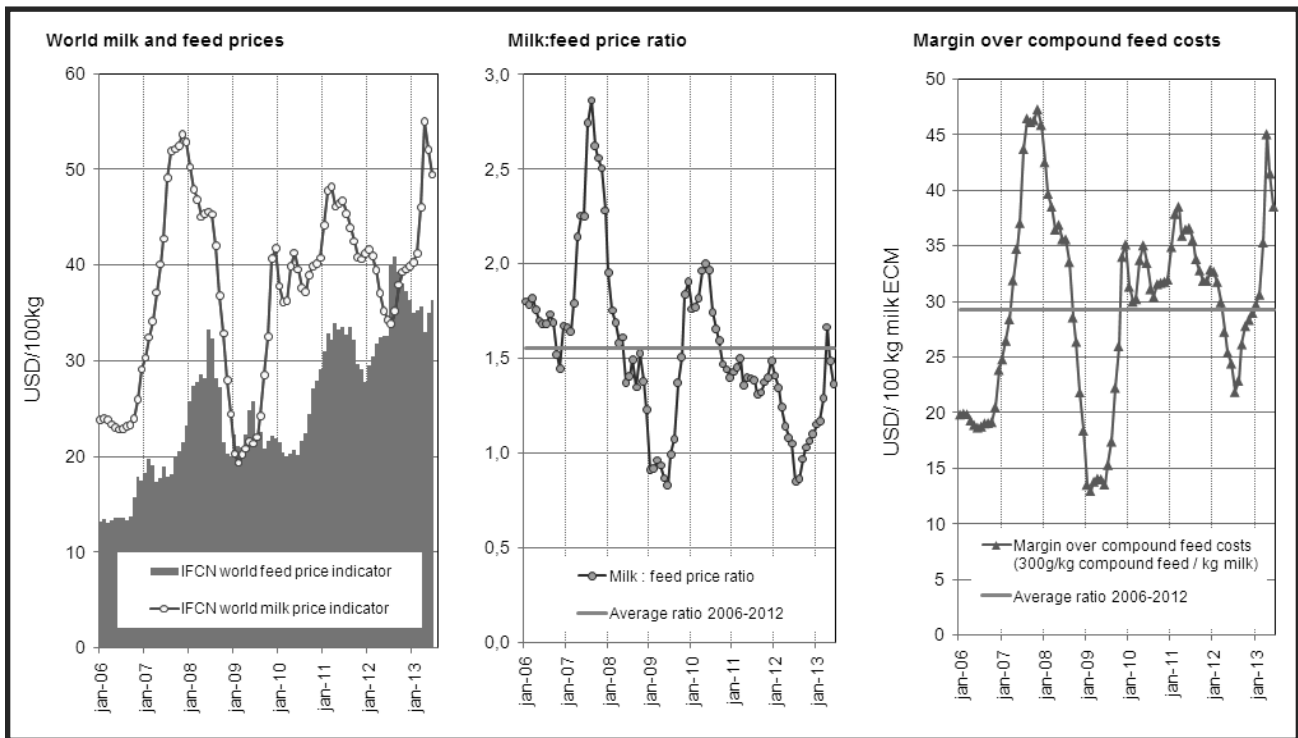


Figure 1. World milk prices for milk and feed 2006 to 2013 (Source: IFCN Dairy Research Center) (100 Kg = 220 lb or 2.2 cwt).

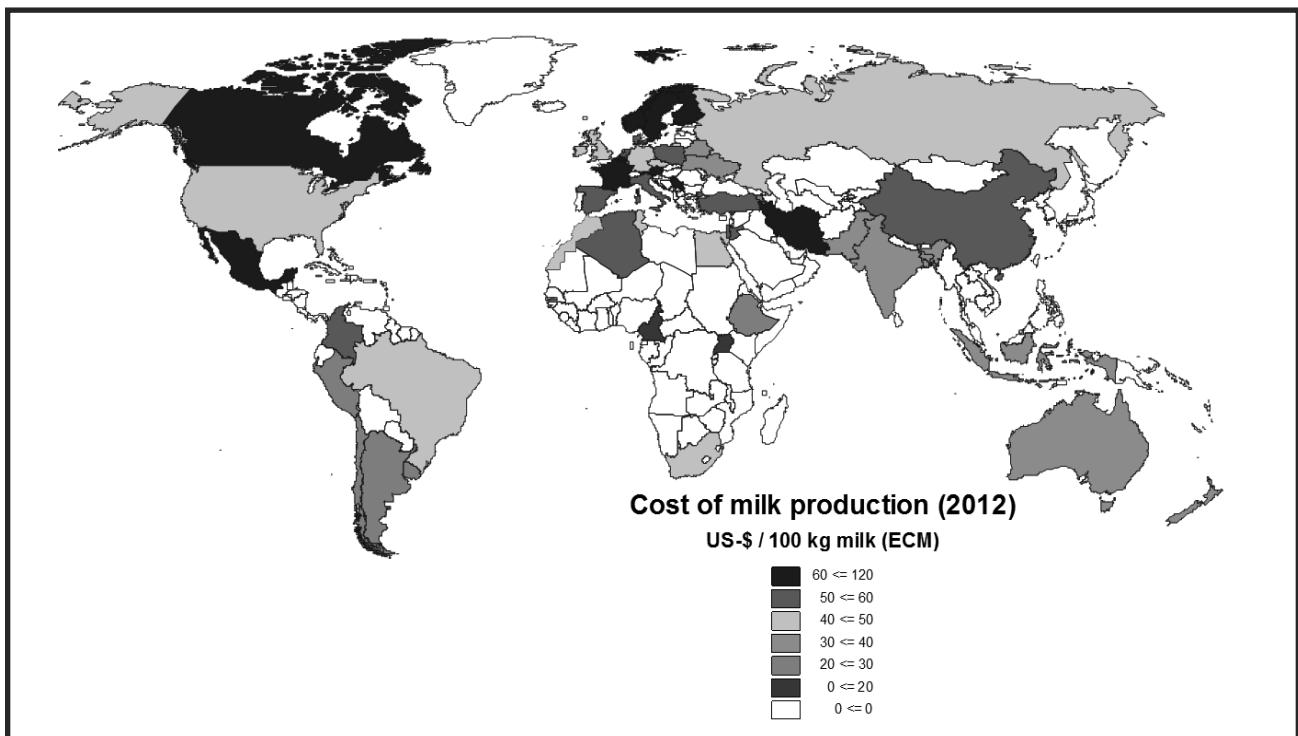


Figure 2. Cost of milk production in average sized farms per country in 2012 (100 Kg = 220 lb or 2.2 cwt).

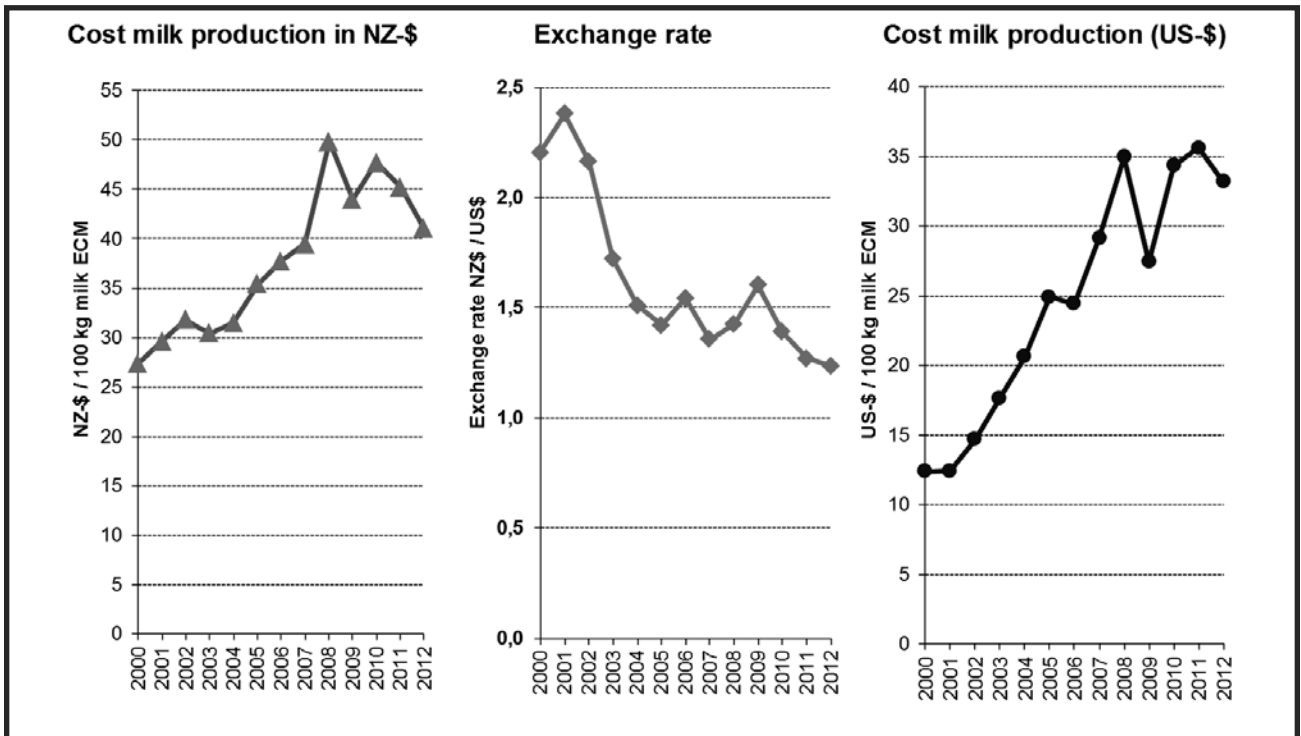


Figure 3. Cost of milk production 2000 to 2012 in New Zealand for an average size dairy farm (100 Kg = 220 lb or 2.2 cwt).

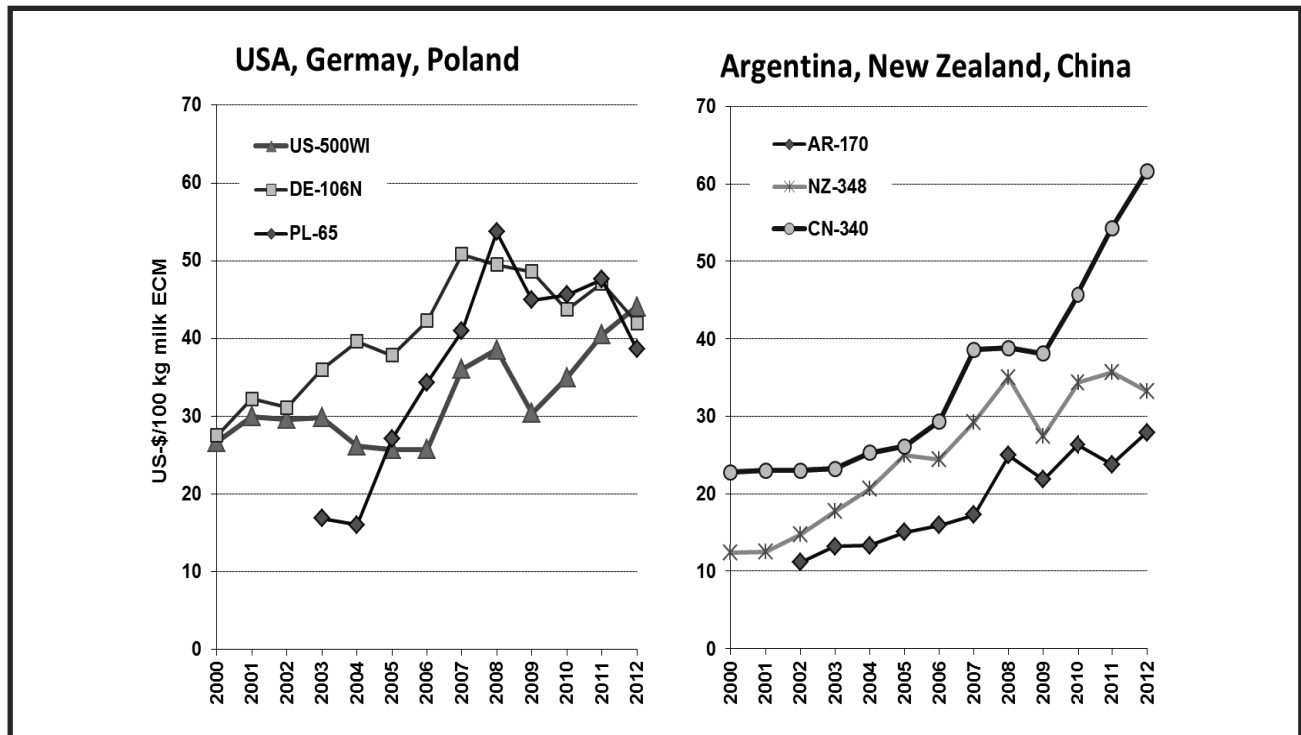


Figure 4. Cost of milk production 2000 to 2012 of typical dairy farms in 6 countries (Country - #cows/farm region; 100 Kg = 220 lb or 2.2 cwt)

