

agribusiness handbook



Milk / Dairy Products





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This handbook is part of a series of agribusiness manuals prepared by the FAO Investment Centre Division, in collaboration with FAO's Rural Infrastructure and Agro-Industries Division. It was prepared for the EBRD Agribusiness team, under the FAO/EBRD programme of cooperation. The production of the manuals was financed by FAO and by the EBRD multidonor Early Transition Countries Fund and the Western Balkans Fund. The purpose of this handbook is to help agribusiness bankers and potential investors in the Early Transition countries (ETCs) and the Western Balkan countries (WBCs) to acquire basic knowledge about the milk sector and to become acquainted with recent economic trends in the sector around the world, with a special focus on the ETCs and the WBCs. This volume was prepared by David Jones, Milk Expert, and reviewed by Inna Punda, FAO Agribusiness Expert, as well as by members of the EBRD Agribusiness team. Electronic copies can be downloaded from www.eastagri.org, where a database of agribusiness companies, including dairies that operate in the ETCs and the WBCs, is also available. Please send comments and suggestions for a future edition of the manual to TCI-Eastagri@fao.org.

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Director
Investment Centre Division
FAO
Viale delle Terme di Caracalla, 00153 Rome, Italy
or by e-mail to: TCI-Eastagri@fao.org

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INTRODUCTION

Lactating mammals produce milk to feed their young. Throughout history, humans have come to recognize in milk a product with uses and benefits far beyond this simple biological fact. Milk is a liquid containing nutrients in suspension. Its exact composition varies from species to species, but for the main part these nutrients may be classified as fat, protein and other solids. Consumers have come to value these nutrients in their diets. Farmers have been encouraged to engage in commercial dairy farming to produce raw milk to satisfy consumer demand, and dairy processors have enabled raw milk to be transformed into a wide variety of products to stimulate this demand. Technology has enabled the use of raw milk and its constituents in many individual products and as components in many foods and food preparations. A major global industry has evolved from humble beginnings. Governments have come to recognize the value of the dairy industry in providing a basis for agricultural and industrial development, and have employed policies accordingly. Not bad for such a simple product!

I. MILK PRODUCTION

I.1 Type and composition

The composition of milk varies according to a range of factors, including species, stage of lactation and diet. Essentially, the product is an emulsion of fats (both saturated and unsaturated), proteins (casein and whey proteins), lactose, minerals (including calcium, potassium, magnesium and zinc), vitamins (including A, B, D and E) and other solids in water. The total solids content of cow's milk is some 13%, with fat representing about 4%, protein about 3.5% and lactose about 5%. Goats' milk has a similar composition. Sheep milk has a typically higher fat content of 5%, a higher protein content and a total solids content of about 16%. Buffalo milk is typically 10% fat and has a total solids content of about 20%. Other mammals (e.g. seals and whales) lactate milk with significantly higher fat contents to feed their young.

Milk is produced commercially across the globe from only a limited number of animal species. Of these, cow's milk production is by far the most significant, but sheep, goats, buffaloes and camels are also used to produce milk for human consumption on a lesser scale.

Table 1: World production of milk by type, 2007

Species	M tons	%
Cow	560.49	83.49
Buffalo	85.40	12.72
Goat	14.80	2.20
Sheep	9.15	1.36
Camel	1.48	0.22
Total	671.31	100.00

Source: FAOSTAT

I.2 Animal numbers and yields

In 2007, there were some 670 million head of milking animals in the world. About one-third of these are cows, producing more than 80% of the world's milk output. Buffaloes account for about 8% of the world's milking animals, and produce almost 13% of the world's milk output. There are also large numbers of milking sheep and goats, but each animal produces only a small volume of milk, and overall these animals (along with camels) account for less than 5% of world milk production.

Table 2: Milking animals and yields, 2007

Species	M head	Kg/year ^a
Cow	245.08	2,287
Buffalo	57.52	1,485
Goat	170.07	87
Sheep	195.36	47
Camel	4.28	345
Total	672.31	1,000

^a - 10 Nov quotation.

Source: International Grains Council Grain Market Indicators, November 2008

The quantity of milk (yield) produced in a year by an animal varies enormously according to breed, feed and management practices. The world average of 2,300 kg/year per cow is somewhat meaningless because it is influenced heavily by the large numbers of poor-yielding animals in less developed countries across the globe. In many developed dairying countries, yields are typically 4,000–5,000 kg/head and exceptionally reach 6,000–8,000 kg/head in particular intensively managed enterprises. In such systems, cows will be selected on the basis of yield, the calving interval will be closely monitored (cows produce milk only when they have been put in calf), inseminations will be with bulls with high-yielding daughters (rather than having cows served by a local bull, for example), the animals will have their feeding rations and regime controlled, probably by computer, and they may be milked three times a day. The cows will produce significant volumes of milk, but will be kept for only a small number of lactations, maybe four or five. After this, the animals will be culled.

The structure of dairy farming varies enormously from country to country. In many developing countries, the owner of the holding has just one cow, while in commercial dairying enterprises the worldwide average herd size is typically more than 100 animals – in the United States, many Californian herds have more than 1,000 animals. About 90% of California's milk is produced in herds of more than 500 animals. Within the European Union (EU), there is a vast difference between the structure of dairying in a country such as the Netherlands and the dairy industries in Baltic countries, for example. In the former, the majority of herds consist in more than 100 animals and the average herd size is 60 animals per holding. In a country such as Lithuania, the average size of a dairy holding is five cows, and only 28% of animals are in herds of more than 50 cows.

1.3 Volume of milk production

Total world production of all kinds of milk amounts to some 670 million tons/year. Relatively little is produced in Africa and Oceania, even though Australia and New Zealand are two of the most important countries for world dairy trade. North, South and Central America produce a quarter of the world's milk supply, with the region's largest producer, the United States, producing around half of this total (84 million tons in 2007). Europe produces some 210 million tons of milk a year, with the EU producing 151 million tons and the Russian Federation a further 32 million tons. Asia accounts for one-third of world's milk production, with India the largest regional producer at 103 million tons. Of this quantity, more than half (57 million tons) is from buffaloes – India accounts for two-thirds of the world's entire production of buffalo milk. China is the other large producer in the region, with 37 million tons of milk.

Table 3: World milk production (million tons)

Region	2003	2004	2004	2006	2007
Africa	32.21	31.96	32.27	33.62	33.40
Americas	146.91	148.76	154.96	160.67	161.28
Asia	193.73	205.55	217.87	229.51	236.93
Europe	217.43	214.76	215.43	214.97	213.43
Oceania	24.49	25.21	24.79	25.65	26.26
Total	614.76	626.24	645.33	664	671.30

Source: FAOSTAT

World milk production has grown at an average rate of 2.3% per year since 2003. However, annual growth in Asia has averaged 5.5% per year, and in the Americas 2.5% per year. In Europe, where much milk output is quota-controlled, milk output has fallen since 2003, and in Oceania the growth has been only 1.8% per year, owing to adverse weather. Finally, in Africa, growth in milk production has averaged less than 1% per year since 2003, illustrating the problems caused by adverse climate and poverty.

1.4 Regulatory regimes

For a variety of reasons, most governments across the globe employ a policy of active management in their countries' dairy industries. In developing countries, these policies tend to be aimed at stimulating domestic milk production, to create wealth in agriculturally-based communities or to reduce the import

bill. In developed countries, the policies tend to be centred more on creating stability in the dairy industry, while ensuring that supplies reach consumers at reasonable prices and taxpayer costs are minimized. In most countries with a developed dairy industry, governments have sought to ensure that a basic level of support is provided to dairy farmers, to ensure that there is a regular and sustainable volume of milk produced to satisfy consumer markets. Over time these methods of price support have fallen into two basic categories:

- market price support – in which governments typically set minimum prices at which surplus product will be removed from the market and taken into store in the form of butter, powder or cheese when market prices are low and sold back to the market when prices are higher;
- deficiency payments – in which governments determine the quantity of product required by the domestic market and pay a subsidy to farmers to encourage the production of this quantity.

The difficulty with both methods is that they are blunt instruments for dealing with a complicated supply chain; many governments (e.g. the United States and Japan), therefore, use a mixture of the two to meet policy objectives. Others (e.g. the EU) have found that relying wholly on market price support has tended to encourage the production of more milk than domestic markets can use and have overlaid a system of milk quotas to control output. In countries where stimulating additional milk output is a priority (e.g. the Russian Federation and China), government policy has included the use of domestic subsidies, rural and industrial development programmes, and trade barriers to encourage the domestic industry. All countries tend to struggle to find policies that are sufficiently flexible to cope with sustainable production of a relatively expensive raw material that is sold in domestic and export markets where there are competitively priced alternative protein and energy food sources.

1.5 Milk quality

Raw milk quality is assessed on the basis of composition and hygiene. As dairy technology has advanced, it has become increasingly important to the manufacturers of dairy products to know that the milk they purchase from suppliers is of a good compositional standard (i.e. fat and protein content), enabling a greater weight of product to be made from a fixed volume of milk, and that the milk is of a good hygienic standard (low bacteria and somatic cells), enhancing product-keeping quality. The more quickly milk is cooled after milking, the fewer handling stages through which it will pass. The speed

with which it can be processed and put on sale to the consumer is key at the various control stages in the dairy supply chain.

The EU has established a hygienic quality regime for raw milk that aims to minimize the risks to human health from harmful bacteria such as listeria, salmonella and E. coli, all of which can be present in raw milk. These bacteria are destroyed by the pasteurization process, but more ever the EU has in place a set of legal standards for raw milk, to minimize public health risks and ensure appropriate animal welfare standards. Raw milk delivered from EU farms must come from herds free of tuberculosis and brucellosis. At milking, the milk must be cooled to a maximum temperature of 8 °C or 6 °C, unless subject to daily collection. The hygienic quality of the milk must satisfy a bacterium standard of $\leq 100,000/\text{ml}$, measured by a plate count and a somatic cell count standard of $\leq 400,000/\text{ml}$. Thus, all milk and milk-based products sold to consumers in the EU will have originated from raw milk that meets these standards. In addition, the cows must be kept in hygienic conditions, be subject to good management practices and be free from disease. The milk must not contain antibiotics and must have a freezing point greater than $-0.515\text{ }^{\circ}\text{C}$, to guard against the presence of added water. The EU applies similar hygiene standards in respect of buffalo, sheep and goat's milk.

Dairies and processing creameries typically encourage farmers to improve the hygienic quality of their milk above these legal standards by applying a system of penalties and bonuses in their contractual arrangements. Most processing dairies will pay a higher price for milk with a better solids content (fat and protein), and farmers are encouraged to breed and feed to meet these higher compositional standards through the price mechanism. Processors obtain the benefit of improved milk-to-product conversion rates.

I.6 Milk collection

As the dairy industry develops, an increasing proportion of milk is delivered to dairies. Farmers have moved away from feeding their milk to livestock and farm households, and have been encouraged to deliver their milk to processing establishments and buy back the products that they need for themselves and their livestock. Today, it is not so much the surplus milk that is sold by the farmer, but rather all the milk, which is the main source of income for the farmer. In many countries (e.g. the United States and Australia), the concept of retaining milk on the farm has almost completely disappeared. In the EU-15, more than 95% of all the milk produced is now delivered to dairies, and even in the ten new EU Member States that joined in 2004, the proportion of milk delivered to dairies has increased from 70% in 2003 to 77% in 2007. For

the latest EU members, the process of structural reform has a long way to go. In Romania, for example, it is estimated that only about 20% of the milk produced is delivered to dairies.

Table 4: Milk deliveries to dairies (percentage of milk produced)

Country	2003	2004	2005	2006	2007
EU-15	95.3	95.4	95.7	96.3	96.2
EU-10	70.4	73.7	77.5	77.2	77.0
EU-27	88.7	88.6	89.6	90.0	89.9

Source: IDF

As structural change occurs and herd sizes increase, farmers have been encouraged to invest in on-farm milk storage facilities, with refrigerated bulk tanks capable of holding the contents of one or two days milking. Milk is collected by the processing dairy using insulated tankers and delivered to the factory. In Europe, the model of milk delivery has developed around regional cooperatives or private factories collecting milk from the farmers in their immediate vicinity, typically up to 100 km. Milk can be transported over longer distances, but logistics and economic factors govern this: milk tends not to be transported over longer distances in Europe, and this helps to minimize costs. In Germany, in 2008, the average cost of transporting milk from farm to factory was EUR 1.06/100 kg or 3% of the price paid to the dairy farmer. The transportation cost varied from EUR 0.80/100 kg in the former East Germany to EUR 1.13/100 kg in the former West Germany. The difference is due to the more advanced consolidation of factories in the former West Germany, meaning that the milk has to travel longer distances from farm to factory. In countries where milk deliveries are less developed and herds are small, the storing of milk on-farm to await collection is not economical. A more usual practice is for farmers to transport their own milk, usually in cans, from the farm to a collection point, where it is put into a central refrigerated bulk tank owned by either a group of farmers or a local cooperative. The tank holds the output from several farms in the vicinity, and the milk is transported from the collection centre to the factory in a tanker. Samples are taken of the milk at all stages, to determine its compositional and hygienic quality so that the farmers may be paid accordingly.

1.7 Milk prices

A milk producer normally has a contract with either a local cooperative or a private factory, and is paid according to the terms of this contract. Typically, the price that the farmer receives for his or her milk varies according to a number of parameters, which are likely to include milk compositional quality, hygienic quality, volume of milk supplied, time of year (seasonality), and the market into which the milk is sold.

Table 5: Average producer milk prices (USD/100 kg)

Country	Currency	2003	2004	2005	2006	2007
Germany	USD	32.20	34.70	34.30	34.30	45.80
Netherlands	USD	36.20	38.50	38.50	37.70	47.90
EU15	USD	32.80	35.70	35.00	34.60	43.50
Poland	USD	18.00	23.10	27.90	29.10	37.60
United States	USD	27.70	35.60	33.40	28.40	42.20
Canada	USD	42.60	46.20	53.00	57.70	64.00
Australia	USD	17.60	22.50	24.40	24.30	39.30
New Zealand	USD	20.30	25.90	23.60	23.90	47.10
Japan	USD	71.80	76.46	74.31	68.78	67.00

Source: IDF

There is significant variation in the prices paid to milk producers, even within a single currency area such as the Eurozone. When EU countries that are outside the Eurozone (e.g. Poland) are included, the variation becomes even greater. Over time, price levels in the ten new EU Member States are coming closer to EU-15 average levels, but there is still some way to go. Dairy products traded across international borders are normally priced in United States dollars, and a comparison of prices in United States dollars reveals the high level of support afforded to producers in Japan and Canada by their national governments. Japanese dairy farmers receive the highest price for their milk, but Canadian producers are not far behind. Traditionally, New Zealand dairy farmers have been reckoned to be the lowest-cost producers of milk, but appreciation of the New Zealand dollar over the 2003–2007 period has wrecked this position, at least for 2007. Countries in South America (Argentina, Chile) are the lowest cost producers, but a return to more normal trading conditions in 2009 is likely to restore New Zealand to the lowest-cost position.

1.8 Costs and margins of milk production

Milk production costs vary with the scale of operation, as well as with the normal fluctuations in operating expenses. Wisconsin is one of the main milk producing states in the United States. It is also a state where enterprises are smaller than the average, and cows are grazed, rather than fed indoors all year-round. In 2007, the total costs of production amounted to USD 34/100 kg. Important costs are labour, depreciation and – on the direct costs side – purchased feed.

Table 6: Costs of milk production in Wisconsin, United States, 2007 (USD/100 kg)

Production cost	<50 cows	>250 cows	Average cost
Direct costs			
Breeding	0.57	0.49	0.51
Chemicals	0.51	0.29	0.51
Custom hire	0.88	1.34	1.30
Purchased feed	6.42	9.79	8.20
Fertilizer	1.65	0.82	1.28
Fuel, oil, gas	1.56	0.99	1.21
Insurance	0.73	0.26	0.46
Rent	0.90	1.37	1.39
Repairs	2.18	1.50	1.90
Seeds/plants	1.34	0.75	0.99
Utilities	1.23	0.66	0.82
Vet & medicine	1.01	1.41	1.23
Other	4.27	6.26	4.98
Indirect costs			
Interest	1.50	2.27	2.05
Labour	2.89	4.70	4.17
Depreciation	3.79	2.58	3.04
Total costs	31.45	35.43	34.03

Source: University of Wisconsin

Labour costs tend to be lower on smaller farms, where less use is made of hired labour. Depreciation costs on smaller farms tend to be higher per unit of milk produced. Interest charges tend to rise as establishments increase in size and undertake greater borrowing. Owners of larger farms also tend to rely more on bought feed than do owners of smaller farms, who rely more on grazing of animals on their own land. Overall, the total costs associated with producing milk in Wisconsin are slightly higher, per unit of milk produced, on larger farms. However, on a per farm basis, the larger farms are significantly more profitable because they produce more milk per establishment.

Net farm income in the United States in 2007 was positive, unlike the previous year. Net farm income is defined as the total of all farm income less all expenses, except the return to management and investment income. On average, farms in Wisconsin made a profit of USD 8.15/100 kg of milk produced in 2007. This equated to USD 942 per cow, or USD 139,328 per farm enterprise. Larger farms made an enterprise profit of USD 484,272 in 2007, while smaller enterprises made a profit of USD 46,488.

Table 7: Net farm income, Wisconsin, United States, 2007

Farm income	<50 cows	>250 cows	Average
USD per 100 kg	10.87	6.88	8.15
USD per cow	1,126.00	803.00	942.00
USD per farm	46,488.00	484,272.00	139,328.00

Source: University of Wisconsin

2. MILK PROCESSING

2.1 General

The milk industry has moved a long way from when milk was either consumed as soon as it came from the cow or churned to produce cream and then butter, with the resulting skim milk fed to livestock. The modern dairy industry is now concerned with maximizing the value of all the solids in milk, and a vast array of technological developments have enabled sophisticated products to be made from the same essential whole milk. There are three main product groupings of processed milk products. Worldwide, approximately 30% of milk production is used as liquid milk and products, 35% is used to manufacture cheese, and the remaining 35% is used to make butter and powdered milk. Of course, these proportions vary enormously within and among countries.

2.1.1 Liquid milk and fermented milk

Raw milk is heat-treated by pasteurization or higher-temperature treatments to produce drinking products, including UHT, extended-life, sterilized and pasteurized milk in a range of fat variants (typically whole, semi-skim and skim). Low-fat varieties are made by combining whole milk with skim milk from the separation process (see below) in set proportions. Cultures may be added to pasteurized milk to produce products such as yogurt, kefir and junket.

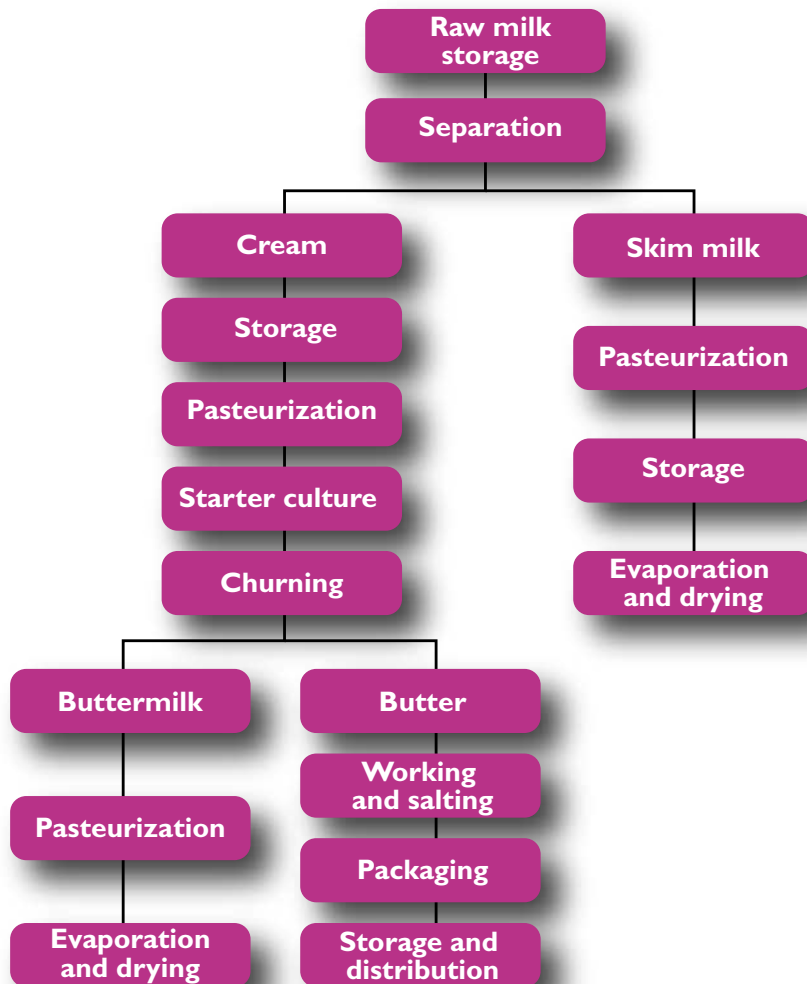
Compositional standards vary from country to country, but typically whole milk has a minimum fat content of 3.5% and a non-fat milk solids minimum of 8.25%. Semi-skim milk has a fat composition of between 1.5 and 1.8%, and skim milk has a maximum fat content of 0.5%.

2.1.2 Cream and butter products

Raw milk is separated into skim milk and cream. The pasteurized skim milk may then be added back to whole milk to produce low-fat milk, evaporated to produce condensed milk, or dried further to produce powdered milk. The cream may be used for consumer products such as whipping cream and coffee cream, or cultures may be added to produce soured cream, crème fraîche and other products. The cream may also be churned to produce butter, which may be sold in salted or unsalted forms to consumers.

Butter has a typical composition of a minimum fat content of 82%, a maximum moisture content of 16% and a maximum content of solids other than fat of 2%. Butter may also be manufactured to 80% minimum fat content and may contain salt, usually up to 1.5%. Powdered skim milk typically has a maximum fat content of 1.5% and a maximum moisture content of 4%.

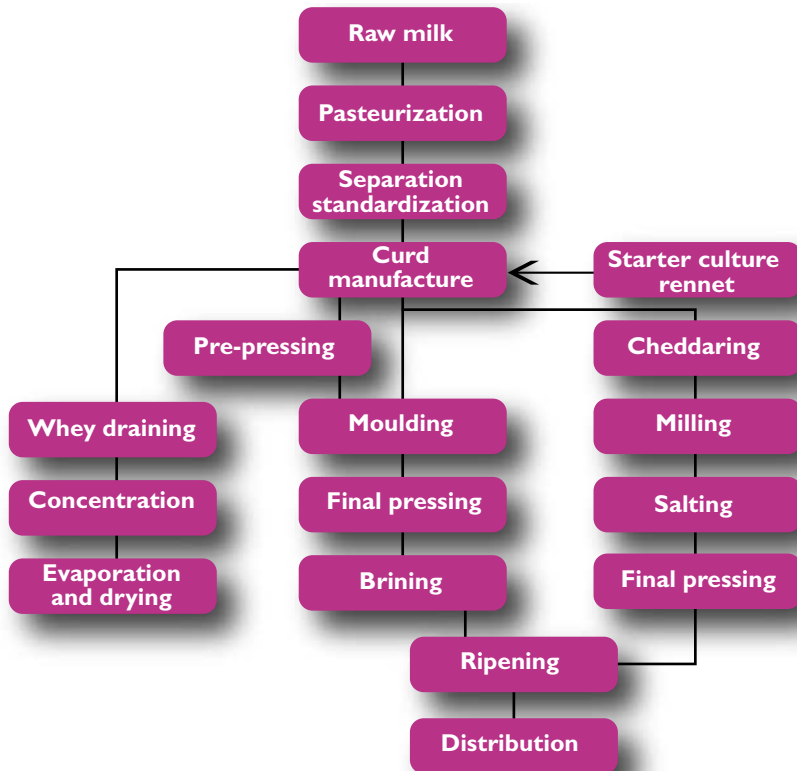
Figure 1: Butter manufacturing process



2.1.3 Cheese and whey products

Raw milk is coagulated by the addition of the rennet enzyme and then separated into curds and whey. The curd may be treated in a variety of ways by adding flavours, moulds and pressings to produce hard, semi-hard, soft, fresh, blue-veined and other types of cheese. The liquid whey may be subjected to further treatments to produce a range of products, including powered whey powder, whey protein concentrate and lactose.

Figure 2: Cheese manufacturing process



Cheese composition varies greatly from product to product. Cheddar cheese normally has a milk-fat content of 50% a minimum in total solids and a maximum moisture content of 39%. Fresh cheeses may have a moisture content of 80% and fat contents in dry matter of just 5%. The product variety is endless.

Most modern factories begin their manufacturing process by taking in raw milk, standardizing it to a specified solids content, pasteurizing it and then using it to manufacture dairy products. Many different processes and products are possible in a modern factory to enable the production for example of either low-fat cheeses or cream cheese. Production standards for dairy products are tightly regulated to ensure the safety of public health and to guard against fraud. Typically, governments determine minimum product standards, covering hygiene and composition, that products must meet before they can be sold in the market. Commercial organizations also use product specifications to ensure that standards are met.

Table 8: Litres of milk (4%) required to manufacture 1 ton of product

Product	Milk required - litres
Cream (35% fat)	8,780
Butter (82% fat)	
Powered skim-milk	20,850
Cheddar cheese	10,400 (skim milk)
Cream cheese(35% fat)	9,500

2.2 Major manufacturing companies

Some of the world's largest food companies have their origins in the dairy business. Nestlé was ranked at the top of the list of the world's largest dairy companies before 2000 and remained there as of 2007, despite its diversification into other product line. Danone moved up to the number two slot in 2007, displacing Lactalis. The merger between Campina and Friesland Foods in the Netherlands created the largest milk producing cooperative in the EU, ranking above Arla Foods. There are several US companies in the list, led by Dairy Farmers of America. The New Zealand-based cooperative, Fonterra, ranks as number seven in the list, and there are also companies from Canada and Italy ranking among the top 15 companies. This demonstrates the global nature of the dairy industry.

Table 9: The world's top dairy companies by turnover, 2007 (billion USD)

Ranking	Company	Country	Dairy turnover
1	Nestle	Switzerland	23.1
2	Danone	France	14
3	Lactalis	France	13.2
4	Friesland/Campina	Netherlands	12.1
5	Dairy Farmers of America	United States	11.1
6	Dean Foods	United States	10.4
7	Fonterra	New Zealand	10.4
8	Arla Foods	Denmark/Sweden	8.8
9	Kraft Foods	United States	6.4
10	Unilever	Netherlands/United Kingdom	6.1
11	Saputo	Canada	5
12	Parmalat	Italy	4.9
13	Bongrain	France	4.7
14	Land o'Lakes	United States	4.2
15	Meiji Dairies	Japan	4.1

Source: Rabobank International

2.3 Scale of production and size of plants

As companies have sought ever-greater processing efficiencies to compete effectively in the global market, dairy processing plants have increased in size and scale. Even so, there is significant variation in size among the major milk producing areas of the world. In the EU, the largest manufacturing plants tend to be in the Netherlands, where butter factories each produce about 22,000 tons/year, cheese factories about 25,000 tons/year and powdered milk plants about 16,000 tons/year. This scale of plant production compares favourably with the United States, but falls well below the scale of plant in New Zealand, where butter factories each produce about 35,000 tons/year, cheese factories about 31,000 tons/year and powdered milk plants a massive 70,000 tons/year.

The size of processing plant production is related to the size of the relevant market. Thus, New Zealand, which serves the world market, has very large processing plants. In the EU, the Netherlands is the major exporter, and plant size reflects this. However, elsewhere in the EU, many plants are smaller, multipurpose and able to switch from one product line to another as market conditions demand.

Table 10: Average plant processing capacity, 2001 (thousand tons)

Country	Butter	Cheese	Milk powder
Ireland	11.6	12	9.9
Denmark	5.7	8.9	18.3
Netherlands	21.7	24.7	16.0
United States	8.5	9.6	16.1
New Zealand	35.2	31.3	69.6

Source: ICOS, USDA

2.4 Milk processing costs

The capital costs necessary to equip a modern dairy factory are large. The larger the factory, the greater the fixed costs associated with product manufacture. However, running costs can be minimized by maximizing the capacity utilization of the factory to produce product at the lowest possible average cost. This is what dairy factory managers seek to achieve.

Table 11: Dairy product manufacturing costs, California, United States, 2007 (USD/100 kg)

Cost Category	Butter	Cheese	Skim-milk powder
Labour	10.295	10.295	7.341
Other processing costs	11.353	19.642	20.326
Packaging	2.8	5.114	3.262
Other ingredients	0.485	2.557	n/a
General/ administrative	2.755	5.07	1.918
Return on investment	1.311	1.477	1.72
Total cost	29.012	44.158	34.568

Source: California Departement of Food and Agriculture

For cheese, the average processing costs in 2007 in California, the United States, amounted to USD 440/ton, or 17.5 percent of the USD 2,490/ton support price. For butter and skim-milk powder, the average manufacturing costs were USD 290/ton and USD 345/ton, respectively, representing 16% of the support prices of USD 2,315/ton and USD 1,760/ton, respectively. These costs exclude the costs of the raw milk and of marketing the product. Labour is the largest single cost element, followed by other processing costs, including fuel.

2.5 Dairy product prices

Table 12: Domestic wholesale prices for dairy products (national currency/100 kg)

Product/country	Currency	2004	2005	2006	2007	2008	2008 USD/100Kg
Butter							
Netherlands	EUR	300.5	279.3	252.9	336.9	262.3	383.5
France	EUR	296.7	276.2	249.5	325.3	260.8	381.4
United States	USD	400.7	341.2	272.5	301.3	323.0	323.0
Cheese							
Germany ^a	EUR	378.3	369.6	351.8	384.2	439.5	642.7
Italy ^b	EUR	589.3	552.9	546.7	553.3	612.5	895.7
United States	USD	363.8	329.0	272.6	387.1	411.0	411.0
Skim-milk powder							
Germany	EUR	208.6	203.3	213.6	326.9	228.2	333.7
Netherlands	EUR	204.4	197.0	212.2	316.2	212.5	310.8
United States	USD	191.0	215.8	234.2	411.9	282.9	282.9

^a - *Emmental*; ^b - *Grana Padano*.

Sources: PZ, USDA

The majority of milk produced throughout the world is made into liquid milk and fresh products and consumed locally, or manufactured into storable dairy products such as cheese and butter. Most of these products are consumed in local markets and, with the major exception of New Zealand and to a lesser extent Australia, do not enter into world trade. Overall, less than 10% of global milk output is traded across international borders. Milk producers are, therefore, significantly dependent on the domestic prices for dairy products in their local markets to determine their return from milk sales.

These prices are by and large supported by national governments through the use of minimum price regime and other safeguards, but they show considerable volatility above these minimum levels, particularly in recent years. Since 2004, the EU has cut its support price for butter from an effective level of EUR 274.70/100 kg (90% of the intervention support price) to the current level of EUR 221.80/100 kg. Generally, domestic prices have traded at a premium of about 10% over the support level, but in 2007 a world shortage of dairy products forced prices higher, to a premium of 50% over the support level. In

2008, domestic prices fell to more normal levels. In the United States, a similar kind of volatility is perhaps even more marked, as domestic market prices react to selling conditions. Cheese prices follow the same general trends as butter and powdered milk prices, even though cheese markets are generally slower to react to market conditions and there is enormous price variation among individual cheese types, with Italian hard-pressed varieties selling at the top end of the market and cheddar types selling nearer the bottom.

Table 13: EU and United States support prices

Country or region/ product	Currency/unit	2005	2006	2007	2008	2008 USD / 100 kg
EU						
Butter	EUR/100 kg	305.23	282.44	259.52	246.39	350.00
Powered skim-milk	EUR/100 kg	195.24	184.97	174.69	174.69	250.00
United States						
Butter	USD/lb	1.05	1.05	1.05	1.05	232.00
Non-fat dried milk	USD/lb	0.80	0.80	0.80	0.80	176.00
Cheddar cheese	USD/lb	1.13	1.13	1.13	1.13	249.00

3. THE WORLD DAIRY MARKET

World milk production increased by almost 10% between 2003 and 2007, and the proportion of total milk production delivered to dairies rose at an even faster rate. Of this milk, roughly 25% is processed into liquid milk. The proportion varies considerably from country to country; in the United States it is 30%, in the United Kingdom 50%, and in the EU 25%. The remainder of the milk delivered to dairies is processed into dairy products, mainly cheese, butter and powdered milk.

3.1 Production of dairy products

Table 14: Production of cheese from cow's milk (thousand tons)

Country/region	2003	2004	2005	2006	2007
Africa	929	886	886	900 ^e	900 ^e
Americas	5,474	5,660	5,810	6,078 ^f	6,246 ^f
United States	4,231	4,378	4,506	4,676	4,745
Asia	1,214	1,288	1,406	1450 ^e	1,500 ^e
China	225	264	275	n/a	n/a
Europe	9,470	9,845	9,933	10,260	10,260
EU	8,346	8,664	8,654	8,994	8,926
Oceania	654	669	681	734	672
World	17,740	18,348	18,716	19,422^f	19,578^f

^e - estimated; ^f - partly estimated.

Source: FAO, USDA, Eurostat

Approximately one-third of all the milk produced in the world is made into cheese, total production of which has increased by more than 10% since 2003 to reach 19.6 million tons. Cheese remains a developed dairy market product in terms of both production and trade. Production is concentrated in Europe and North America, which represent more than three-quarters of world cheese output. The United States is by far the largest producer of cheese, contributing 25% of total world output. The varieties of cheese produced are legion, from hard varieties such as Parmigiano Reggiano and Gruyère, to semi-hard types such as gouda and edam, soft types such as brie and mozzarella, and fresh cheeses and quarg. Sheep and goats' milk are also popular for cheese production.

Table 15: Production of butter from cow's milk (thousand tons)

Country/region	2003	2004	2005	2006	2007
Africa	229	230	228	230 ^e	230 ^e
Americas	873	883	929	980	1,020
United States	564	566	611	657	693
Asia	3,776	3,961	4,171	4,200 ^e	4,200 ^e
China	92	96	100	n/a	n/a
India	2,555	2,700	2,855	n/a	n/a
Europe	2,678	2,609	2,643	2,545	2,567
EU	2,106	2,038	2,089	2,053	2,065
Oceania	628	623	566	563	510
World	8,185	8,307	8,537	8,518^f	8,527^f

^e - estimated; ^f partly estimated.

Source: FAO, USDA, Eurostat

Butter production also accounts for more than 25% of world milk deliveries, and has increased by 4% since 2003. About half of total world output is accounted for by India, with its huge use of ghee for cooking. Production of table butter in India is just 40,000 tons per year. The United States is still the largest producer of butter in the world, but EU countries such as Germany and France are also significant manufacturers, as is New Zealand.

Table 16: Production of powered whole milk from cows' milk (thousand tons)

Country/Region	2003	2004	2005	2006	2007
Africa	20	20	22	25 ^e	25 ^e
Americas	907	959	1,031	1,115 ^f	1,090 ^f
United States	18	19	15	14	14
Asia	71	69	67	70 ^e	70 ^e
Europe	972	938	958	920	920
EU	817	785	800	780	765
Oceania	817	864	798	810	795
World	2,787	2,850	2,876	2,940 ^f	2,900 ^f

^e - estimated; ^f partly estimated.

Source: FAO, USDA, Eurostat

World production of powdered whole- and semi-skim-milk powder has increased by 4% since 2003. The product is largely used for human consumption either in powder form or through recombination into liquid milk, mainly in developing countries. The world's largest producer is New Zealand, with about 25% of world output, almost all of which is traded on world markets.

World production of powdered skim milk has fallen by more than 10% over the last five years, as more remunerative markets have been found for skim milk. These uses are largely in fresh milk products and cheeses in developed dairy markets. The consequence is that less powdered skim milk has been available for international trade over the last five years. The United States is again the world's largest producer of powdered skim or non-fat dried milk.

3.2 Consumption of dairy products

Consumption levels of dairy products vary enormously around the world. Traditionally, consumption levels were highest in Western economies, and to a large extent this remains the case. However, Eastern economies are now starting to develop a taste for dairy products, and consumption levels, although still low in absolute terms, are beginning to increase.

Table 17: Per capita consumption of dairy products, 2007 (kg/head)

Country	Liquid milk	Butter	Cheese
Germany	94.7	6.4	22.2
France	89.4	7.9	24.3
United Kingdom	105.1	3.2	12.2
EU-15	98.0	4.3	19.3
EU-25	93.5	4.2	18.4
United States	83.0	2.2	16.0
Canada	94.3	2.8	12.6
Argentina	43.9	0.7	11.2
Australia	117.4	3.9	11.9
Japan ^a	35.8	0.7	2.0

^a - 2006.

Source: IDF

Per capita consumption levels for liquid milk are highest in Scandinavian countries (in Iceland 150 kg), while in South America consumption levels are typically less than 50 kg, and in China nearer to 10 kg. Europe has the highest per capita consumption levels for cheese, at more than 20 kg (in France 24 kg).

3.3 Trade in dairy products

Table 18: World exports of dairy products (thousand tons)

Product/country or region	2003	2004	2005	2006	2007
Butter/butter oil					
World	850	880	840	840	800
EU	301	333	311	243	211
United States	12	9	9	11	41
Australia ^a	83	74	72	78	66
New Zealand ^a	378	330	320	391	364
Cheese					
World	1,350	1,450	1,450	1,480	1,530
EU	509	576	546	582	594
United States	52	61	58	71	99
Australia ^a	212	237	202	209	217
New Zealand ^a	308	277	283	309	309
Switzerland	55	56	57	56	59
Argentina	23	36	52	58	47
Powered skim milk					
World	1,080	1,180	1,100	1,150	1,100
EU	222	281	189	88	196
United States	147	270	289	292	257
Australia ^a	161	152	165	184	134
New Zealand ^a	287	250	220	316	281
Ukraine	51	63	57	64	60
India	10	17	53	33	32
Powered whole milk					
World	1,600	1,730	1,680	1,700	1,580
EU	481	509	486	434	364
United States	11	15	12	10	12
Australia ^a	159	161	165	144	110
New Zealand ^a	657	629	576	645	680
Argentina	106	182	166	215	115
Brazil	3	22	25	17	42
China	7	8	16	15	58
Singapore	16	15	27	30	42

^a - year ending June of following year.

Source: IDF World Dairy Situation, USDA

World trade in dairy products grew steadily in the first five years of the twenty-first century, but since 2005 the rate of growth has slackened, to begin with

because of the rise in dairy product prices in 2006 and 2007, and then because of the reduction in world economic growth.

World trade in butter amounts to some 800,000 tons/year. The world's major exporters are New Zealand and the EU, and its major markets are the Russian Federation, the Middle East and Mexico. World trade in cheese is largely among the developed dairy nations, and amounts to some 1.53 million tons/year. New Zealand and Australia are important suppliers to the world market, while the Russian Federation, the United States and Japan are the main markets.

Table 19: World imports of dairy products (thousand tons)

Product/country or region	2003	2004	2005	2006	2007
Butter/butter oil					
World	850	880	840	840	800
EU	115	93	82	85	85
Russian Federation	133	101	83	112	75
Egypt	47	48	30	40	26
Iran	28	27	43	26	40
United States	27	40	40	32	29
Mexico	46	63	71	49	59
Cheese					
World	1,350	1,450	1,450	1,480	1,530
EU	175	112	102	105	94
Russian Federation	176	213	260	218	234
Mexico	78	74	78	78	86
United States	216	214	209	206	198
Japan	194	219	212	207	225
Australia ^a	49	50	50	60	64
Powered skim milk					
World	1,080	1,180	1,100	1,150	1,100
Algeria	81	91	84	68	91
China	45	55	43	62	41
Indonesia	72	85	87	86	91
Philippines	110	120	87	95	98
Singapore	37	55	61	60	62
Japan	43	37	34	32	35
Mexico	173	168	155	111	121

Product/country or region	2003	2004	2005	2006	2007
Powered whole milk					
World	1,600	1,730	1,680	1,700	1,580
Russian Federation	20	25	30	82	65
Algeria	130	161	167	182	160
Saudi Arabia	36	49	75	75	70
China	89	90	64	67	58
Indonesia	20	21	26	27	27
Malaysia	65	75	68	59	64
Philippines	44	50	42	40	42
Singapore	40	40	62	60	61
Mexico	45	35	45	43	46
Venezuela	61	45	46	44	47

^a - year ending June of following year.

Source: IDF - World Dairy Situation, USDA

In terms of international trade, powered whole milk powder is more significant than powered skim milk. New Zealand is by far the largest exporter of powered whole milk in the world, followed by the EU. Major markets for powered whole milk are in the Middle East, South East Asia and South America. For powered skim milk, New Zealand and the United States are now the world's major suppliers, with demand concentrated in Southeast Asia, Mexico and Algeria.

Table 20: World prices for dairy products (USD/ton)

Product	2004	2005	2006	2007	2008
Butter	1,870	2,030	1,880	3,090	3,760
Cheddar cheese	2,730	3,040	2,750	4,180	4,780
Power whole milk	2,130	2,290	2,300	4,270	3,920
Power skim milk	2,040	2,230	2,340	4,300	3,160

Source: USDA

During 2006, world prices for powered milk began to increase sharply, almost doubling by the end of 2007. Import demand for these products is largely in less developed countries, and suffered as a result, particularly as oil prices, which had boomed, began to fall to more modest levels. Butter and cheese prices followed the upward trend in commodity prices in 2007, peaking in 2008. Since then, world prices have declined, to stabilize at 2006 levels.

4. THE WESTERN BALKAN COUNTRIES (WBCs) AND THE EARLY TRANSITION COUNTRIES (ETCs)

4.1 Milk production and processing in the WBCs

Milk production in the WBCs totals some 4 million tons/year. Most milk is produced from cows, but there are significant goat and sheep populations in all countries. In terms of milk production, the most significant country in the region is Serbia, which produces about 1.7 million tons of cow's milk/year. Milk yields per animal are low, typically ranging from about 2,200 kg/year in Albania to 2,750 kg/year in Serbia.

Table 21: Milk production in the WBCs (thousand tons)

WBCs:	Species	2003	2004	2005	2006	2007
Albania	Cow	904.0	917.0	930.0	956.0	917.0
	Goat	81.0	72.0	71.0	71.0	73.2
	Sheep	74.0	75.0	75.0	75.0	73.6
Bosnia & Herzegovina	Cow	537.3	582.6	629.4	682.9	587.0
	Sheep	18.4	16.4	18.2	20.6	20.0
FYR Macedonia	Cow	191.5	212.9	197.5	234.7	385.3
	Goat	n/a	n/a	n/a	n/a	29.9
	Sheep	52.5	47.9	48.7	56.6	36.6
Montenegro	Cow	n/a	n/a	n/a	174.3	180.0
	Sheep	n/a	n/a	n/a	9.0	9.5
Serbia	Cow	n/a	n/a	n/a	1,725.0	1,700.0
	Sheep	n/a	n/a	n/a	16.3	16.0
Total WBCs	All	1,858.7	1,923.8	1,969.8	4,021.4	4,028.1

Source: FAO

Table 22: Dairy farming structures in the WBCs

Country	No. of cows (thousand head)	Yield kg/cow	Average herd size	Milk price USD/100kg
Albania	396	2,200	2.1	28
Bosnia & Herzegovina	300	2,430	2.3	18.2
FYR Macedonia	164	2,570	3.2	19.6
Montenegro	75	2,450	2.9	22.4
Serbia	602	2,750	2.7	15.6

Source: Author

More information on milk processing companies that operate in the ETCs and the WBCs can be downloaded from <http://www.eastagri.org/agribusinesses/>

4.1.1 Albania

Farm and herd sizes are small, with an average of 1.5 dairy cows per holding. Only 23% of the milk produced is delivered to dairies, the remainder being used for livestock feeding, consumed on farms or sold by farmers direct to local consumers. Milk quality standards are poor, and milk collection costs are high and exacerbated by the long distances over which milk has to be transported. Because milking quantities are so small, there is no incentive to invest in cooling facilities on farms, and most milk is sold at ambient temperatures. There are some 400 dairies in Albania, but most are small-scale village operations that do not satisfy any health and hygiene standards. Some 25 larger dairies operate in the country, handling between 10 and 40 tons of milk/day. Cheese and yogurt are traditional products in Albania, and total annual output amounts to 12,900 tons of cheese, 14,700 tons of yogurt and 600 tons of butter.

4.1.2 Bosnia and Herzegovina

Livestock farming is a traditional industry in Bosnia and Herzegovina, but the war in the 1990s had catastrophic effects, causing a reduction of 60% in cow herd size, for example. The industry is now recovering, and milk production is increasing, but farm structure is very fragmented, with an average herd size of 2.3 cows per holding. Yields per animal are improving steadily, and now stand at more than 2,000 kg/year. Limitations are the quality of the breeding stock, the poor level of husbandry knowledge and the low feed quality. About 27% of the milk produced is delivered to dairies, and most is used to produce liquid milk (particularly UHT) products. In 2007, the industry produced 140,000 tons of liquid milk, 20,500 tons of fresh dairy products, 3,450 tons of cheese and 400 tons of butter. Foreign companies such as Lactalis (France) and Meggle (Germany) have shown a willingness to invest in the dairy sector. Virtually all dairies are privately owned.

4.1.3 The former Yugoslav Republic of Macedonia

Farm structure is again typically fragmented, with an average herd size of 3.2 cows per holding. Milk production is increasing as yields increase, but these are still less than half of EU levels, although yields at 2,500 kg/cow/year, they are better than many in the region. The standard problems of poor hygienic quality and high transportation costs apply. The industry produces some 230,000 tons of liquid milk each year, with 16,400 tons of fresh milk products and 6,700 tons of cheese in 2006. There is competition from foreign companies in the marketplace, but the largest dairies in the country can process in excess of 200 tons of milk/day. BiMilk processes 150 tons/day at its factory, and Ideal Shipka processes 100 tons/day. Zdravje Radovo is significantly smaller, processing 20 tons/day.

4.1.4 Montenegro

The situation here is typical of the Balkans, with a small and fragmented farm structure. About 90% of holdings have fewer than five cows, and average herd size is 2.9 animals. Yields per animal are low, at 2,400 kg/year, hampered by breed structure, feed quality and farmer knowledge. Only 15% of all the milk produced is delivered to dairies. The remainder is used on farms for feeding to calves or for use by farm households, usually as cheese, yogurt and sourmilk products. Some cheese is sold direct from farms to consumers. The raw milk produced is of poor hygienic quality, and there is no on-farm cooling of milk. There are 19 small processing establishments in Montenegro (2007), which produce a total of 22,500 tons of fresh milk products, 300 tons of cheese and 30 tons of butter each year. There is no foreign investment in the dairy sector; the largest processing establishments – Sma, Doo Mljekara NIKA and Mljekara Zora – are locally based. There is competition from Serbian dairies and Serbian dairy products.

4.1.5 Serbia

Serbia has the largest dairy sector in the region, producing about 1.55 million tons of milk per year. However, farms are still very small and fragmented, with 600,000 cows on 220,000 farms, giving an average herd size of 2.7 animals. The process of privatization away from state control is well advanced in Serbia, and 90% of milk is now produced on family farms. The state sector production has declined to less than 10% of total milk production, but state farms still achieve better annual yields per animal (of approximately 6,000 kg) than do private farms (2,500 kg). Some 27 processing companies each handle more than 10 tons of milk per day, and there are another 230 or so smaller establishments. The largest dairy processor in Serbia is Imlek-Beograd, part of the Danube Food Group, which processes 200 tons of milk per day. The

industry produces 450,000 tons of liquid milk and 200,000 tons of fresh milk products each year. Annual output of cheese amounts to 18,300 tons; butter output is 2,900 tons and powdered milk output is 5,800 tons (2007).

4.1.6 Kosovo

Following the war in 1999, Kosovo's dairy industry is showing signs of strong positive development. There are no accurate statistics for the sector, but there are estimated to be some 83,000 livestock holdings with a total of 140,000 cows. Average herd size is estimated to be fewer than two animals per holding. Most milk is retained on farms or sold direct to consumers. It is estimated that only about 3,000 farmers deliver milk to dairies, accounting for about 10% of all the milk produced. There are some 55 milk collection centres in Kosovo to assist deliveries to dairies, and there are an estimated 19 processing establishments with intakes varying from 1 to 10 tons of milk per day. There is little foreign investment in the sector, although Tetrapak is engaged in a joint venture project with Devolli Dairy. UHT milk processing has seen the most investment since 1999.

4.2 Milk production and processing in the ETCs

Milk production in the ETCs amounts to more than 11 million tons per year. The major milk producing country in the region is Uzbekistan, which produces almost half of this total. Annual milk yields are typically very low, often less than 1,000 kg/cow, and nomadic lifestyles make data collection difficult.

4.2.1 Armenia

During the market-led reforms of 1991–1992, Armenia underwent a transition from the old Soviet regime, based on state and collective farms, to a privatized system. All 42 former state-owned dairies producing liquid milk and cheese have been privatized, and many have closed. Milk production has now increased to about 600,000 tons per year, the major portion produced by small farms each with one to two animals. There are some 300,000 cows in Armenia, with an average annual yield of about 2,000 kg/cow. Most of this milk remains on-farm or is sold locally. The farms that supply dairies are generally larger, with an average of 13 milking animals. Dairy processing is focused on liquid milk, cheese, yogurts, ice cream and sour milk.

Table 23: Milk production in the ETCs (thousand tons)

ETCs	Species	2003	2004	2005	2006	2007
Armenia	Cow	498.1	535.8	573.8	598.0	613.0
	Goat	2.2	3.1	3.3	5.9	3.7
	Sheep	13.4	16.3	17.5	30.8	19.5
Azerbaijan	Cow	1,147.0	1,188.6	1,226.1	1,273.0	1,301.0
	Goat	5.4	5.5	5.5	5.4	5.5
	Sheep	15.4	19.7	20.3	21.2	21.7
Georgia	Cow	743.3	755.0	760.8	690.0	734.0
	Goat	2.6	3.0	3.2	2.9	2.9
	Sheep	19.2	22.3	23.7	21.5	21.1
Kyrgyzstan	Cow	1,159.2	1,132.5	1,151.4	1,165.2	1,192.0
	Goat	2.1	2.9	8.2	8.3	8.5
	Sheep	30.5	29.3	38.0	38.6	40.0
Republic of Moldova	Cow	570.2	604.0	627.1	595.3	573.2
	Goat	5.5	6.0	10.4	12.2	11.5
	Sheep	17.4	17.7	21.1	19.9	18.8
Mongolia	Cow	292.4	328.6	300.0	325.0	335.0
	Goat	29.5	29.0	30.0	30.0	32.0
	Sheep	25.0	28.0	28.0	30.0	32.0
Tajikistan	Cow	424.8	450.4	488.0	494.0	529.0
	Goat	34.4	39.8	45.0	50.9	54.6
Uzbekistan	Cow	4,024.6	4,211.9	4,447.2	4,821.4	5,121.0
	Goat	65.2	68.4	107.5	34.2	36.3
	Sheep	420.0	400.0	450.0	500.0	500.0
Total ETCs	All	9,547.4	9,897.8	10,386.1	10,773.7	11,206.3

Source: FAO

4.2.2 Azerbaijan

Following the breakdown of the Soviet system, the dairy industry in Azerbaijan collapsed and has yet to recover. Some 900,000 milk animals produce 1.3 million tons of milk a year, with an average yield of 1,300 kg/cow. Farming practices suffer from the lack of breeding policy or genetic inputs, poor cow housing and no infrastructure to enable milk delivery to dairies. It is understood that there are about 30 dairies in the country. The largest is Milk Pro, which operates two

plants. The plant in Golchai is the largest in the country, and processes between 25 and 50 tons of milk per day, depending on the season. The other plant is in the capital Baku, where most of the other dairy plants are located. These are generally small: six are estimated to process 5 tons of milk/day, for example.

4.2.3 Georgia

Livestock, especially cattle, are an important part of subsistence family livelihoods in Georgia. Primarily, they are a source of milk for consumption and conversion into cheese. According to a statistical survey conducted in 2007, individual farmers are responsible for 99.7% of Georgia's milk production. Most of the increase in overall milk consumption has been covered by local production, thereby reducing the dependency on imports and increasing the self-sufficiency ratio from 68% in 1995 to 75% in 2005. The increase in total milk production was mainly due to an increased number of cows. Animal productivity is significantly limited by lack of access to veterinary services and animal health products and services, as well as expensive animal feed and poor-quality forage, and average milk yields are about 1,000 kg/cow. In 2007, the Russian dairy giant Wimm-Bill-Dann bought the third largest dairy producer in Georgia and has invested USD 500,000 in modernization of the 80-ton/day dairy plant, to serve the local market as well as the Azeri and Armenian markets.

4.2.4 Kyrgyzstan

In Kyrgyzstan, 87% of the agricultural land is pasture. The livestock sector is the most important activity on marginal lands and high-altitude pastures. It is dominated by cattle, followed by goats, sheep, horses and yaks. Kyrgyzstan has about 1.1 million head of cattle, tended by about 350,000 small farmers. The dairy herd produces about 1.2 million tons of milk, for a total farm-gate value of USD 170 million. Smallholders sell production in excess of on-farm consumption to traders, who then sell to three outlets: the local fresh market, processors and exporters. Export activities dominate in the areas bordering Kazakhstan, with Kazakh milk processors sending tankers to collect raw milk.

Adverse weather conditions over the last three years have put enormous pressure on the feed base. With limited fodder, milk production has declined significantly. Soaring food and fuel prices and declining remittances are forcing farmers (apart from the four to five large dairy farms that grow their own crops for use in prepared feeds) to sell livestock. As a consequence, the dairy processing industry has been developing rapidly for the last several years, while milk production has been relatively stagnant.

The European Bank for Reconstruction and Development (EBRD) has recently invested in the Kyrgyz dairy sector. In 2008, it acquired a 34% stake

in Siut Bulak to support the company's expansion, which had already received financial assistance from the Swiss government. In the same year, under the Direct Investment Facility (DIF), the EBRD also invested about EUR 1.2 million in the Kyrgyz cheese manufacturer Dairy Spring. Earlier, in 2006, Sheen-line, a dairy producer specializing in ice cream and located in Bishkek, obtained a USD 900,000 loan from the Kyrgyz Investment Credit Bank (KICB). KICB was established in 2000 by the EBRD, the Aga Khan Foundation and other shareholders, with technical assistance from Japan.

4.2.5 The Republic of Moldova

Following the dissolution of the Union of Soviet Socialist Republics (USSR), the Republic of Moldova embarked on a programme of privatization and land reform. This resulted in a very fragmented farm structure with many small plots, and led to a collapse of dairy farming. Cow herds and milk production declined. Since 2005, dairy cow herds have started to recover, and milk output has reached 575,000 tons. At 2,800 kg/cow, yields are better than those in many other countries in the region. Average herd size is about six cows per holding, and some large commercial farms each have 100 to 200 animals.

4.2.6 Mongolia

Following the end of the Soviet system in the 1990s, the dairy sector collapsed, and is only now staging something of a recovery. All kinds of animals are milked in Mongolia – camels, mares, yaks, cows, sheep and goats. Much of the milk is made into fermented products for local consumption. Cities have had to rely on imported products. Annual yields are extremely low at less than 500 kg/cow, but there is no real infrastructure to enable commercial farming or processing to take place. Mongolia is three times the size of France, making any kind of national milk collection system unfeasible. Instead, attention has focused on developing dairies near the urban population centres. Only one dairy – the old state dairy at Ulaanbaatar – is capable of processing more than 10 tons of milk a day. The remaining state farms and dairies were looted and equipment lost in the 1990s.

4.2.7 Uzbekistan

Growth potential in the Uzbek dairy sector is high. Today, the country's average milk consumption per capita is about 10 litres/year, compared with almost 90 litres/year in the early 1990s. Products such as milk, kefir, butter and the local dairy products kaymak (a variety of sour cream) and katyk (a variety of kefir) enjoy the greatest demand. In Uzbekistan, consumers make a clear distinction between raw and processed milk. Due to tradition and price factors, the share

of raw, unprocessed milk on the Uzbek liquid milk market is still enormous, at 90% to 95%. Raw milk is fresh milk that farmers or intermediaries sell directly without any thermal treatment. The bacteriological quality of raw milk is usually very poor. Processed milk is both imported and produced locally. However, the appearance of new consumption patterns, at least in urban areas, reveals an increasing demand for quality products in safer and more hygienic packaging.

The modernization of the Uzbek dairy sector is limited by the low performance of local dairy farms, which have low productivity and produce milk of poor quality. The country also suffers from an underdeveloped milk collection system. Finally, the low purchasing power of most Uzbek consumers limits the sale prospects of higher-margin dairy products.

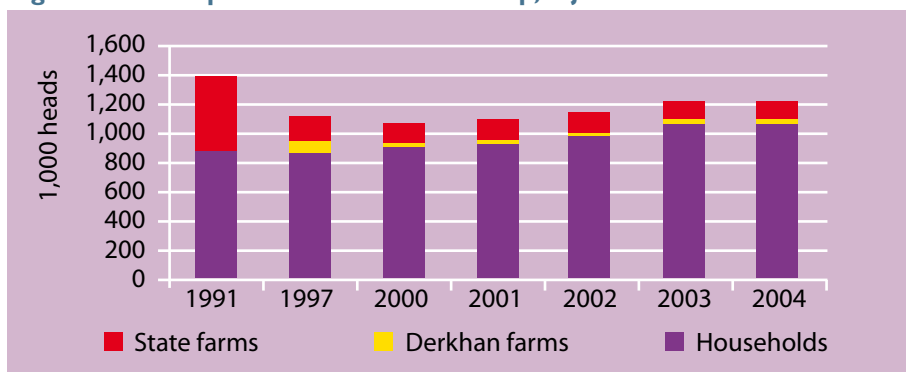
The Uzbek government has recently tried to improve the situation. In March 2006, it issued a decree allowing the opening of collection points working with both agricultural cooperatives and small farms. In 2008, it released 10% of the land used for cotton cultivation for the production of forage (and vegetables).

Despite the constraints, some large dairy companies are operating. In 1996, Nestlé took the strategic decision to invest in the Uzbek market. In 2003, a EUR 7.5 million framework guarantee facility was signed between Nestlé Uzbekistan and the EBRD, with the initial participation of a local bank, Uzjilsberbank. The project aimed to help Nestlé Uzbekistan increase its access to local currency borrowing. Nestlé is now the largest player in the Uzbek dairy market. In 2004, Wimm-Bill-Dann, one of Russia's largest manufacturers of dairy products, juices and beverages, took over and modernized the Tashkent-Sut factory, formerly Uzbekistan's largest dairy plant. On its Uzbek site, Wimm-Bill-Dann currently produces pasteurized milk, cream, sour cream and other dairy products, bearing the Domik v derevne and Veseliy molochnic brands. Wimm-Bill-Dann's total investment in the Uzbek dairy sector is estimated at USD 7.3 million.

4.2.8 Tajikistan

In the late 1990s, the conversion of pastures into farmland in Tajikistan was accompanied by a reduction in fodder crop production. Although livestock herds declined dramatically after independence, in recent years there have been some signs of recovery.

Figure 3: Development of cattle ownership, Tajikistan



Source: World Bank, 2005, based on National Statistics of Tajikistan

The proportion of cows in the dairy herd has also increased, from 38% in 1988 to 52% in 2003, reflecting the increased importance placed on dairy production. Most of the increase in the number of cattle occurred at the households level, with households owning 87% of the national herd. Only 3% of cattle are held by private dekhan farms (small farm units with fewer than 50 animals, created by splitting up kolkhozes and sovkhoses) and 10% by state farms. The privatization of state cattle farms was complicated by the indivisibility of fixed assets such as buildings and milking equipment and by other issues related to the decline of management skills in the agriculture sector. A World Bank assessment of livestock production, conducted in 2005, estimates the average annual milk production at 1,200 litres per cow on dekhan and state farms, compared with only 600 litres per cow on household farms. Although dekhan and state farms account for only 13% of total milk production, 36% of total marketed milk comes from these farms. Most of their production is sold to larger processors.

Two groups of dairy processing plants can be distinguished. The first group consists of relatively large (processing capacities of 1,500 to 10,000 litres per day) usually state- or privately-owned factories. Processing equipment usually dates back to Soviet times. These processing plants do not buy the milk from household farms, but instead contract with bigger dehkans and state farms for defined quantities of milk per day, sending their vehicles to collect the milk.

The second group of dairy processors consists of semi-industrial plants with smaller capacities. These companies have been established in recent years, mostly in urban centres. Collecting 200 to 500 litres of milk per day, either directly from producers or from traders, they produce ice cream, cheese or traditional

products such as curd and sour cream. These plants often operate only during the summer months, when the availability of milk and electrical power is greater.

On household farms, an important share of milk production is used for the feeding of calves and home consumption. The remaining milk is processed by the household into sour cream, yoghurt and other products. During the summer months, when milk production is high, households sometimes sell raw milk to local traders, consumers or processors.

4.3 Consumption and trade in the WBCs

4.3.1 Albania

The country is a deficit area for production of milk and dairy products, and imports about 6,000 tons of liquid milk and cream and 1,200 tons of UHT milk each year. In addition, Albania imports cheese, butter, yogurt and powered milk. Until 2007, these quantities were gradually increasing, but the sharp rise in world dairy product prices resulted in a cutback in volumes in 2008.

Table 24: Trade in dairy products, Albania (tons)

Dairy products	2005	2006	2007	2008
Imports				
Liquid milk & cream	2,855	5,507	7,464	6,319
UHT milk	981	1,140	1,060	1,223
Fermented milk	4,079	3,090	5,369	1,729
Whey	184	342	360	290
Butter & butterfat	982	925	1,323	581
Cheese	1,549	1,621	1,405	1,331

Source: UN

There are no significant exports of dairy products from Albania. None of the factories meet health and hygiene standards to enable shipments to the EU.

4.3.2 Bosnia and Herzegovina

Dairy product consumption levels are low in comparison with Western European levels, but significantly higher than those in some other WBCs. In 2007, per capita consumption levels was 44 kg of liquid milk, 7.7 kg of yogurt, 2.7 kg of cream, 0.55 kg of butter and 3.1 kg of cheese. The country is not self-sufficient in dairy products, importing significant quantities of fermented

milk and yogurt, butter and cheese. The main export is liquid milk, of which the quantities shipped rose to 33,000 tons in 2007. Croatia is the main destination for this milk, which is shipped in bulk for processing in Croatian dairies. Bosnia and Herzegovina imported 27,000 tons of liquid in 2007, and also 17,700 tons of yogurt, 7,300 tons of cheese and 2,600 tons of butter and butter fat products.

Table 25: Trade in dairy products, Bosnia Herzegovina (tons)

Dairy products	2005	2006	2007
Imports			
Liquid milk & cream	29,097	24,501	27,074
UHT milk	340	170	408
Fermented milk	17,575	16,433	17,762
Whey	698	889	1,312
Butter & butterfat	2,934	2,855	2,605
Cheese	8,985	7,154	7,275
Exports			
Liquid milk & cream	18,706	22,727	32,965
UHT milk	18	52	482
Fermented milk	288	498	487
Butter & butterfat	1	50	113
Cheese	706	984	1,071

Source: UN

4.3.3 The former Yugoslav Republic of Macedonia

Consumption of milk and dairy products in the former Yugoslav Republic of Macedonia centres on cheese, milk and yogurt. Consumption of cheese is reportedly very high, at more than 30 kg/capita, not dissimilar to consumption in neighbouring Greece. Imports of liquid milk, yogurt, cheese and butter come from Croatia, Serbia, Germany and Slovenia for the main part. There are few exports of dairy products, although some cheese is traded to Greece and Montenegro. The former Yugoslav Republic of Macedonia is a signatory to the World Trade Organization (WTO), and its import duties have been reduced accordingly. However, imported quantities of dairy products have increased only modestly over the last few years. In 2008, imported volumes were generally lower, perhaps as a result of higher prices on world markets. Domestic milk production boosted significantly in 2007.

Table 26: Trade in dairy products, Macedonia (tons)

Dairy products	2005	2006	2007	2008
Imports				
Liquid milk & cream	9,714	12,714	15,545	10,892
UHT milk	727	619	424	562
Fermented milk	2,249	3,041	3,400	3,274
Whey	429	471	689	730
Butter & butterfat	1,700	1,461	1,014	1,037
Cheese	2,345	2,661	2,075	2,456
Exports				
Liquid milk & cream	11,035	6,739	2,711	n/a
Cheese	62	187	405	n/a

Source: UN

4.3.4 Serbia

As the largest milk producing country in the region, Serbia has become a net exporter of dairy products in recent years. Consumption of dairy products is relatively low, with liquid milk at 80 kg/capita, and cheese at 8 kg/capita. Prices for dairy products are quite high, and the market is protected by import tariffs. Exports receive a subsidy and go mainly to Montenegro, the former Republic of Macedonia and Bosnia and Herzegovina. Imports are mainly of liquid milk, cheese and powdered milk, and the main supplying countries are in the EU, particularly Germany and Slovenia, along with Croatia.

Table 27: Trade in dairy products, Serbia (tons)

Dairy products	2005	2006	2007	2008
Imports				
Liquid milk & cream	1,324	869	2,682	3,555
UHT milk	854	97	1,252	3,445
Fermented milk	2,185	1,730	1,893	1,593
Whey	1,842	2,435	2,813	2,567
Butter & butterfat	182	182	155	572
Cheese	568	547	785	1,042
Exports				
Liquid milk & cream	9,072	30,083	32,942	30,019
UHT milk	238	929	262	45
Fermented milk	835	3,803	5,117	6,266
Whey	7	39	7	158
Butter & butterfat	424	933	753	835
Cheese	950	3,550	3,724	3,909

Source: UN

4.4 Consumption and trade in the ETCs

4.4.1 Armenia

Total consumption of milk and dairy products in Armenia is some 150 kg/head. Imports of yogurt, milk powder, cheese and butter supplement domestic production. The majority of imports are from Ukraine. The only product that is exported in any quantity is cheese, and even here exports have fallen, to less than 500 tons in 2008.

Table 28: Trade in dairy products, Armenia (tons)

Dairy products	2005	2006	2007	2008
Imports				
Liquid milk & cream	182	262	278	282
UHT milk	3,277	3,178	4,926	3,210
Fermented milk	728	673	643	753
Whey	55		21	25
Butter & butterfat	3,561	2,644	1,992	4,581
Cheese	540	694	877	760
Exports				
Cheese	2,273	936	567	473

Source: UN

4.4.2 Azerbaijan

Milk product consumption levels in Azerbaijan are slightly higher than in neighbouring Armenia, at 170 kg/head. Exports of dairy products are nonetheless almost non-existent, and fell to very low levels in 2008. Imports are more significant, and liquid milk, yogurt, cheese, butter and milk powder are all traded.

Table 29: Trade in dairy products, Azerbaijan (tons)

Dairy products	2005	2006	2007	2008
Imports				
Liquid milk & cream	1,753	2,488	4,079	4,849
UHT milk	5,545	5,862	5,582	6,738
Fermented milk	2,761	4,253	6,672	8,189
Whey	4	68	30	15
Butter & butterfat	9,513	7,206	9,009	7,108
Cheese	1,036	2,615	3,619	3,976
Exports				
Liquid milk & cream	155	171	220	13
UHT milk	n/a	15	6	54
Cheese	16	36	483	59

Source: UN

4.4.3 The Republic of Moldova

Overall consumption of dairy products in the Republic of Moldova is low at 130 kg/capita. Despite this, there are exports of milk powder, both whole and skim. Imports are mainly powered milk, but also include increasing quantities of cheese. Butter and liquid milk are also imported.

Table 30: Trade in dairy products, the Republic of Moldova (tons)

Dairy products	2005	2006	2007
Imports			
Liquid milk & cream	161	352	625
UHT milk	615	637	1,999
Fermented milk	1,114	1,543	2,644
Whey	16	93	36
Butter & butterfat	463	1,404	1,613
Cheese	259	494	687
Exports			
Liquid milk & cream	15,932	28,955	24,021
UHT milk	777	1,742	1,350
Fermented milk	2,856	4,773	5,771
Butter & butterfat	250	243	296
Cheese	2,465	2,555	2,664

Source: UN

4.4.4 Mongolia

Table 31: Trade in dairy products, Mongolia (tons)

Dairy products	2005	2006	2007
Imports			
Liquid milk & cream	4,051	3,741	3,320
UHT milk	1,293	1,109	1,092
Fermented milk	104	502	557
Whey	27	10	31
Butter & butterfat	8	104	115
Cheese	155	253	333

Source: UN

Consumption of milk and milk products in Mongolia is about 140 kg/capita. There are no exports. Imports are made to satisfy the consumption requirements of the urban population, and include liquid milk, powered milk, yogurt and small quantities of butter and cheese.

4.4.5 Georgia

Consumption of milk and dairy products in Georgia is low at 130 kg/capita. There are no export. Imports of liquid milk, condensed milk, powdered milk, butter, yogurt and some cheese supplement domestic production.

Table 32: Trade in dairy products, Georgia (tons)

Dairy products	2005	2006	2007
Imports			
Liquid milk & cream	1,123	1,282	1,212
UHT milk	7,353	6,755	6,222
Fermented milk	1,592	1,540	1,721
Whey	199	296	267
Butter & butterfat	5,698	3,043	1,626
Cheese	676	789	746
Exports			
UHT milk	370	215	20
Butter & butterfat	11	20	118

Source: UN

4.4.6 Kyrgyzstan

Kyrgyzstan is a rugged Central Asian republic with a population of 5 million people. Consumption of dairy products are relatively high at 230 kg/capita.

Table 33: Trade in dairy products, Kyrgyzstan (tons)

Dairy products	2005	2006	2007
Imports			
Liquid milk & cream	161	352	625
UHT milk	615	637	1,999
Fermented milk	1,114	1,543	2,644
Whey	16	93	36
Butter & butterfat	463	1,404	1,613
Cheese	259	494	687
Exports			
Liquid milk & cream	15,932	28,955	24,021
UHT milk	777	1,742	1,350
Fermented milk	2,856	4,773	5,771
Butter & butterfat	250	243	296
Cheese	2,465	2,555	2,664

Source: UN

Imports of dairy products centre on condensed and fermented products, although imports of both butter and cheese are increasing. There is a strong export trade in liquid milk, yogurt and cheese. Almost all of the liquid milk is sent to Kazakhstan.

4.4.7 Tajikistan

Consumption of milk and milk products in Tajikistan is low at 90 kg/capita. There are no significant exports. Imports are mainly of condensed milk, and some butter.

Table 34: Trade in dairy products, Tajikistan (tons)

Dairy products	2005	2006	2007
Imports			
Liquid milk & cream	1,600	1,900	448
UHT milk	393	1,125	1,328
Butter & butterfat	414	606	762
Cheese	146	125	182

Source: FAO

4.4.8 Uzbekistan

Uzbekistan has by far the largest dairy industry of the ETCs, and a population of more than 20 million people. Consumption is on a par with that in Kyrgyzstan, its neighbour, at 230 kg/capita. Import levels are relatively low, consisting mainly of condensed milk and powdered milk

Table 35: Trade in dairy products, Uzbekistan (tons)

Dairy products	2005	2006	2007
Imports			
Liquid milk & cream	5	619	601
UHT milk	1,720	1,747	1,527
Butter & butterfat	6,154	6,310	4,927
Cheese	259	126	83

Source: FAO

4.5 Key priorities

All of the WBCs are aspiring to be members of the EU. They suffer many disadvantages, which will need attention in the years ahead. Farms are small,

and the farm structure is fragmented. The age structure of the farming population is not favourable. Husbandry is poor due to low education standards, poor cattle genetics and limited knowledge. Yields are, therefore, low. Labour costs are low, but transportation costs are high and typically involve small volumes of milk. Hygienic milk quality is poor, and there are typically few cooling facilities for raw milk. Health and hygiene standards on farms and in dairies are well below EU norms. With a few exceptions, the level of foreign inward investment in the WBCs has been low; as a result, the current processing infrastructures are small-scale, and technological improvement is needed. Some countries in the region have been more open to foreign investment than others. Domestic industries suffer from import competition from both within and outside the region and, without restructuring of and investment in these industries, this competition will increase over time.

The ETCs suffer from the same problems as do those in the WBCs. Some countries have better infrastructure, as a legacy from the days of the Soviet regime, but all countries lack investment in transport, processing infrastructures and the rural environment. Consumption levels are generally low. Without new investment in farming and processing infrastructures, the dependence on dairy imports will grow as consumers expand their buying habits and diets.



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