CHILEAN DAIRY SECTOR

First Report

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1- Dairy Sector Features

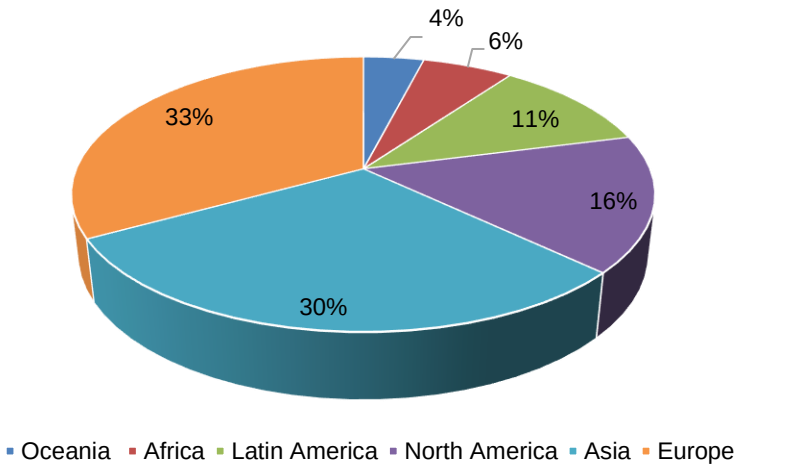
1.1- Introduction

This paper deals with milk production and the changes and trade in this sector, considering potential external investment opportunities as well. For such purpose, it is important to rely on trustworthy sources of information on dairy trade and investment. These sources are Oficina de Estudios y Políticas Agrarias (ODEPA), Instituto Nacional de Estadísticas (INE), Exporlac, Consorcio Lechero de Chile, Federación Nacional de Productores de Leche (Fedeleche), FAO, Consultoría en Economía de Lácteos de Italia (CLAL) y International Dairy Federation (IDF).

1.2- Milk production around the world

On a global scale, milk production has undergone stagnation during the last few years: 656,7 million of ton in 2014, 660 in 2016 and 700 in 2017.

On a global scale, Europe and Asia have been the top producers (Fig.1).



[1]

[1] Milk production. Source: FAOSTAT, 2017.

The United States, India and China have had the greatest production volumes, reaching 96,4; 77,4 and 36,8 million of tons/year, respectively; with a trend of growth, mainly in India and China (IFAMR, 2016).

In Latin America, the main cow milk producers in 2016 were Brazil, Mexico and Argentina, reaching 33,6; 11,6 and 9,9 million of ton/year, respectively; Chile's market share being 2,3 million of ton/year.

Growth in 2018

We have already mentioned the historic stagnation in milk production in the previous section. Now, considering recent data, we can see, for the chosen group of the main producers and importers (approximately 60% of cow milk world production), a growth of 1.46% for the first nine months of 2018, compared with the same period in 2017 (Fig. 2).

Countries/Blocs	Period	2018/2017
Argentina	Jan-Sep	6.0%
Australia	Jan-Sep	0.3%
Belarus	Jan-Sep	0.4%
Chile	Jan-Sep	8.3%
New Zealand	Jan-Sep	1.3%
Turkey	Jan-Sep	14.0%
Ukraine	Jan-Sep	-2.0%
European Union - 28 countries	Jan-Sep	1.3%
United States	Jan-Sep	1.1%
Uruguay	Jan-Sep	6.3%
Brazil	Jan-Sep	0.3%
Japan	Jan-Sep	0.4%
Mexico	Jan-Sep	1.7%
Russia	Jan-Sep	1.0%
Total of chosen countries -2018		**1.46%**
Yearly total of chosen countries -2017		1.49
Yearly total of chosen countries -2016		-0,02%
Yearly total of chosen countries -2015		1.28%
Yearly total of chosen countries -2014		3.39%

[2]

The average production in both hemispheres shows a better yield in the southern hemisphere, even when the southern hemisphere amounts to only 15% of the production of the chosen countries from the northern hemisphere. (Figure 3)

[2] Percentage of growth in 2018, compared to 2017. Analysis from OCLA, considering data from www.clal.it

NORTHERN HEMISPHERE	2018/2017
European Union - 28 countries	1.3%
United States	1.1%
Ukraine	-2.0%
Belarus	0.4%
Turkey	14.0%
Total	1.5%

SOUTHERN HEMISPHERE	2018/2017
New Zealand	1.3%
Australia	0.3%
Argentina	6.0%
Chile	8.3%
Uruguay	6.3%
Total	2.8%

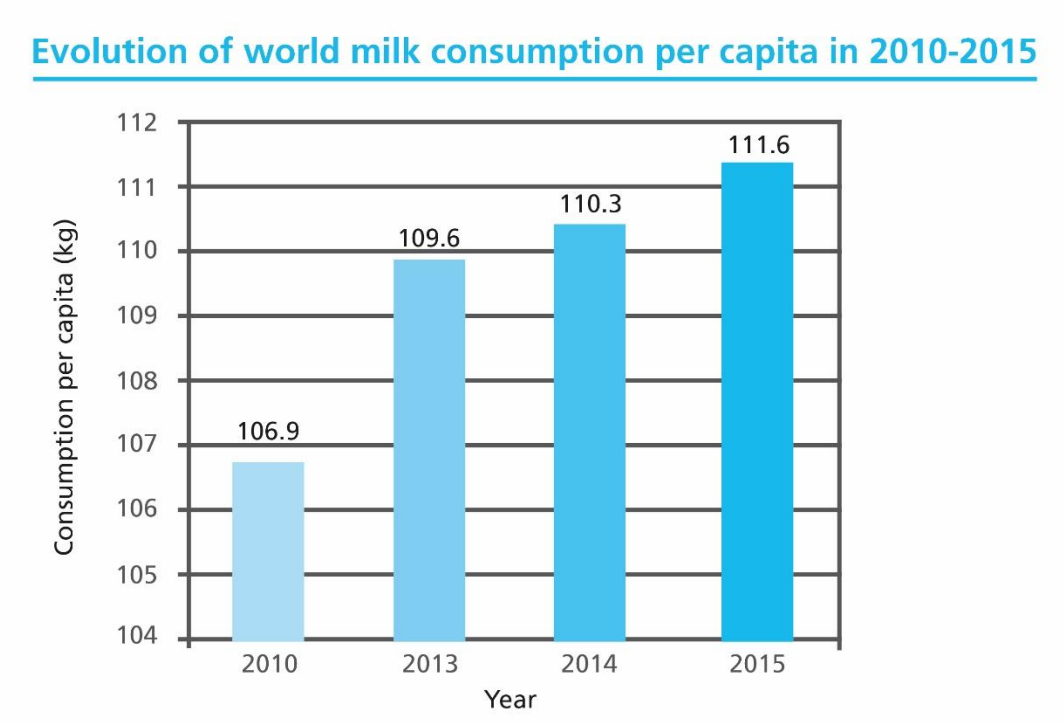
[3]

In 2018, milk reception percentages rose, both in Chile's big businesses (Industria Láctea Mayor, ILMa) and small businesses (Industria Láctea Menor, ILMe). The main causes are the recovery of the number of cows - which had decreased in the last few years - , better weather conditions and a significant growth in non-usual milk areas.

1.3- The consumption of milk around the world

The consumption of dairy products around the world has been increasingly growing in the last few years; as it can be seen in Figure 4, there is a world consumption of 111 kg per capita. This situation may vary in different countries: In some African countries there is a consumption of 50 kg, whereas some countries in Europe go beyond 270 kg. Currently, in Chile, there is a consumption of 160 kg per capita, which - even if exceeding the world average - , is still highly likely to grow.

[3] Percentage of growth in 2018, compared to 2017. Analysis from OCLA, considering data from www.clal.it



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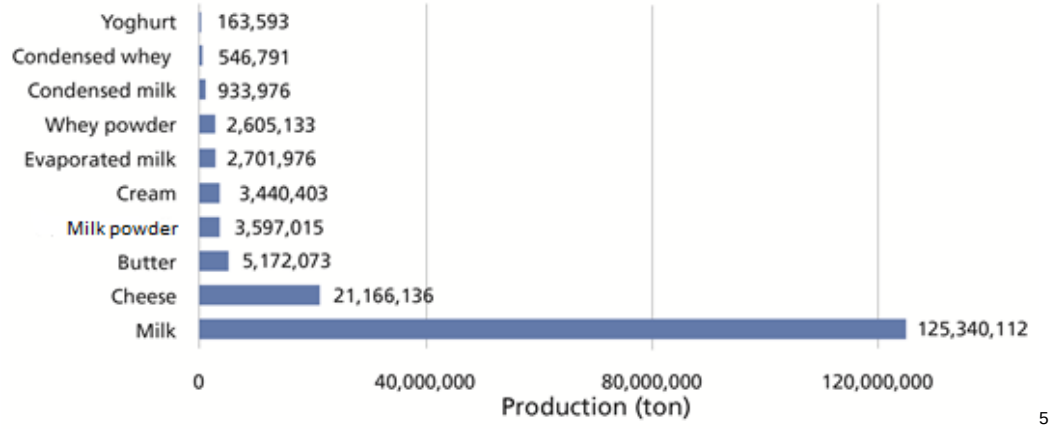
1.4- Production and trade of dairy products around the world

In Figure 5, we can see dairy production around the world in 2014.

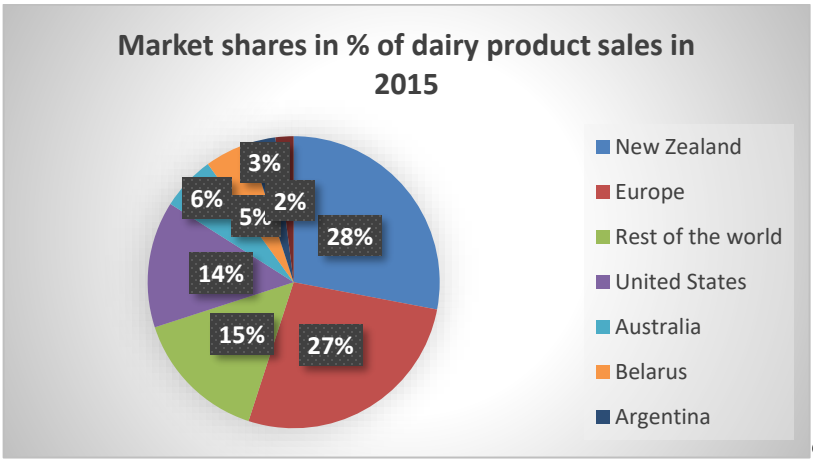


[5]

[4] Consumption per capita (kg). Source: The World Dairy Situation, 2016.

[5] Main milk by-products around the world, 2014. Source: FAOSTAT, 2017.

Market shares of top exporters can be seen in Fig. 6.



[6]

In Fig. 7 below, we can see the list of the top 20 processing companies around the world in 2018.

					2018
Rank	Company name	Origin & main operations countries	PRODUCTION in million of litres	Estimated turnover per litre of milk, in USD	Market share in % of world milk production
1	Dairy Farmers of America	USA	29,2	0,5	3,50%
2	Fonterra	New Zealand/others	23,7	0,6	2,80%
3	Groupe Lactalis	France/others	19,6	1,1	2,40%
4	Arla Foods	Denmark/Sweden	13,9	0,8	1,70%
5	Nestlé	Switzerland/others	13,7	1,8	1,60%
6	FrieslandCampina	Netherlands/others	13,6	1,0	1,60%
7	Saputo (Inc. Murray Golburn)	Canada/USA/others	9,8	1,1	1,20%
8	Dean Foods	USA	9,4	0,8	1,10%
9	Amul (GCMMF)	India	9,3	0,7	1,1.%
10	Danone	France/others	8,6	2,0	1,00%
11	DMK	Germany/Netherlands	8,1	0,9	1,00%
12	California Dairies	USA	7,7	0,5	0,90%
13	Yili Group	China	7,2	1,4	0,90%
14	Glanbia Group	Ireland/USA/others	6,5	0,6	0,80%
15	Mengniu	China	6,4	1,4	0,80%
16	Agropur	Canada/USA	6,3	0,8	0,80%
17	Groupe Sodiaal	France	4,9	1,2	0,60%
18	Müller	Germany/UK/others	4,6	1,1	0,60%
19	Schreiber Foods	USA	4,5	1,1	0,50%
20	Bongrain/Savencia	France/others	4,1	1,3	0,50%
	Total/Average/Share		**211**	**1,0**	**25,40%**

[7]

[6] Market shares of top exporters of dairy products sales. Source: The World Dairy Situation

[7] Dairy companies around the world. Source:IFCN.

1.5-Milk production in Chile

Chile is located in the southern hemisphere, in the southwest end of South America, within the region called Cono Sur (Southern Cone).

Continental Chile has a longitude of 4300 km whereas its latitude is much shorter, approximately 180 km.

The geography of Chile allows for the use of phytosanitary borders for food production. These borders are: in the north, the desert; in the east, the Andes, in the west, the Pacific Ocean and, in the South, the Antarctica.

In the north, one of the most important economic activities is mining.

In La Araucanía, Bio-Bío and Maule, the most important economic activities are farming and forestry, whereas, in the south, milk production is the most important activity.

We will analyse milk production in terms of the different regions in the country.

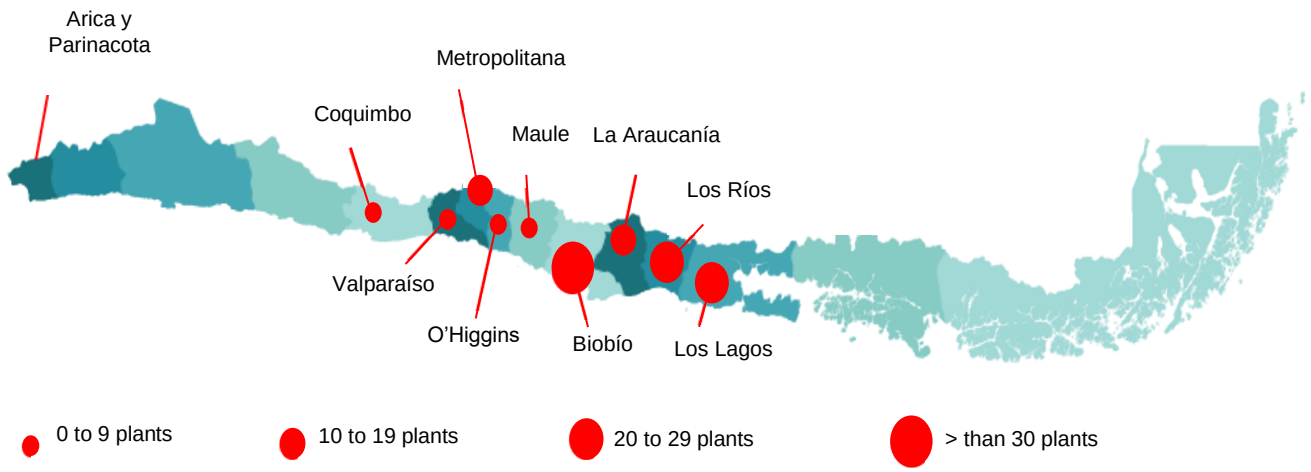
In 2018, the distribution of milk production in the different regions has been the following (litres per year) (8):

Metropolitan Region	Ñuble Region	Biobío Region	Araucanía Region	Los Ríos Region	Los Lagos Region	Country Total
206,279,154	21,931,080	105,358,287	147,160,597	669,779,062	1,033,902,133	2,174,410,313
9.5%	**1.0%**	**4.8%**	**6.8%**	**30.8%**	**47.5%**	**100 %**

8

On the following map, we can see the density of processing plants in the different regions:

[8] Milk production in the different regions (ODEPA).



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Los Ríos and Los Lagos regions produce the largest volume of milk, around 80%, and also have the largest processing plants.

In the figure below, we can see the evolution of milk reception in the last three years (10):

VOLUME OF RECEPTIONED MILK (MM litres) - Source ODEPA - ILMa

YEAR	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	TOTAL
2016	199	156	154	136	133	125	123	141	177	214	219	216	**1,991**
2017	211	169	177	166	153	128	127	147	176	218	216	227	**2,115**
2018	210	167	169	165	158	134	131	152	190	228	234	236	**2,174**

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The study made by ODEPA about milk production at the country level considers the reception in ILMa (large dairy companies) companies. ILMe (small dairy companies) companies produce around 200 MM l/year, according to a study made by INE.

Considering both sources, adding the reception in ILMa and ILMe, and an informal milk volume, which is low in Chile, we estimate the total milk reception is 2,500 MM l/year.

[9] Milk processing plants in the different regions.
[10] Volume of milk receptioned by ILMa (ODEPA).

In 2017, there were 436,000 milking cows and 4,600 farms.

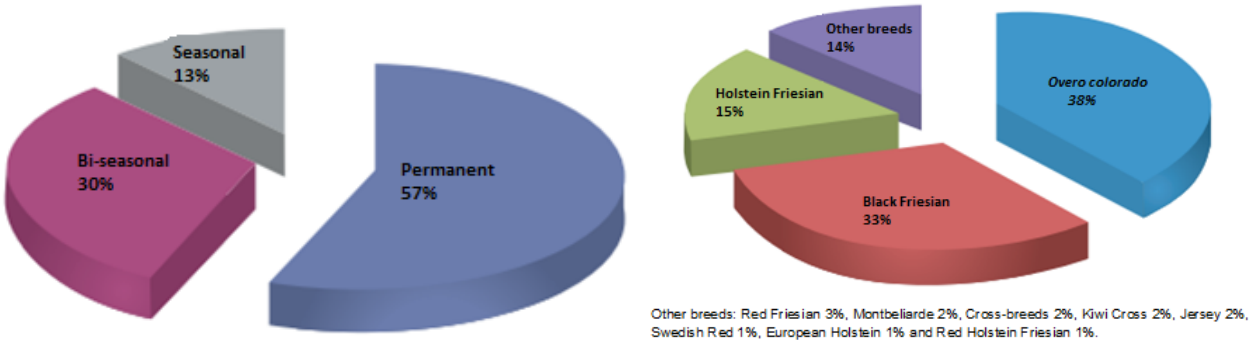
In 2016, the Consorcio Lechero (Milk Consortium) developed a Benchmarking system, with the study of certain indicators in over 183 milking facilities. In Figure 11, we can see a wide range of figures in the indicators of the surface of milking systems: number of cows, manpower, litres and kilograms of milk sent to plants. All these factors accurately represent different milk production contexts.

Indicators	No. of Facilities(*)	Average	Max.	Min
Milking systems surface	167	57	950	7
Number of cows	183	126	1975	11
Total No. of operators (*)	154	2 .5	40.4	1
Litres of milk to plant (**)	166	371,144	4,386,081	14,245
Kilograms of solids (***)	162	24,848	351,317	847
(*)Number of facilities considered for each indicator				
(**) Complete equivalent working day				
(***)Litres of milk and kg of solids delivered to plants the previous year (2015)				

[11]

[11] Main indicators of the Benchmarking System, 2016 (Consorcio Lechero)

As regards parturition systems, the Permanent is the most frequent and the main breed is Red Friesian, followed by Black Friesian and Holstein Friesian (Fig. 12).



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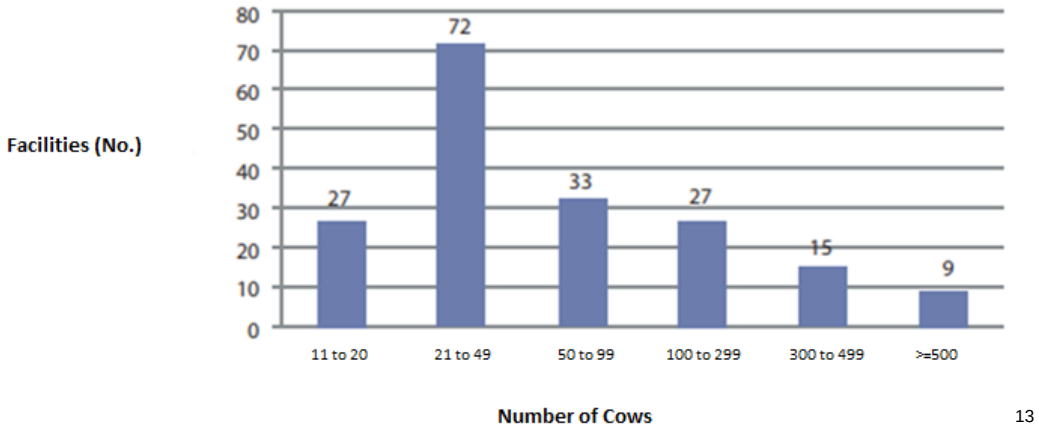
The largest group of milking facilities belong in the category of 21 to 49 (number of cows) (Fig. 13).



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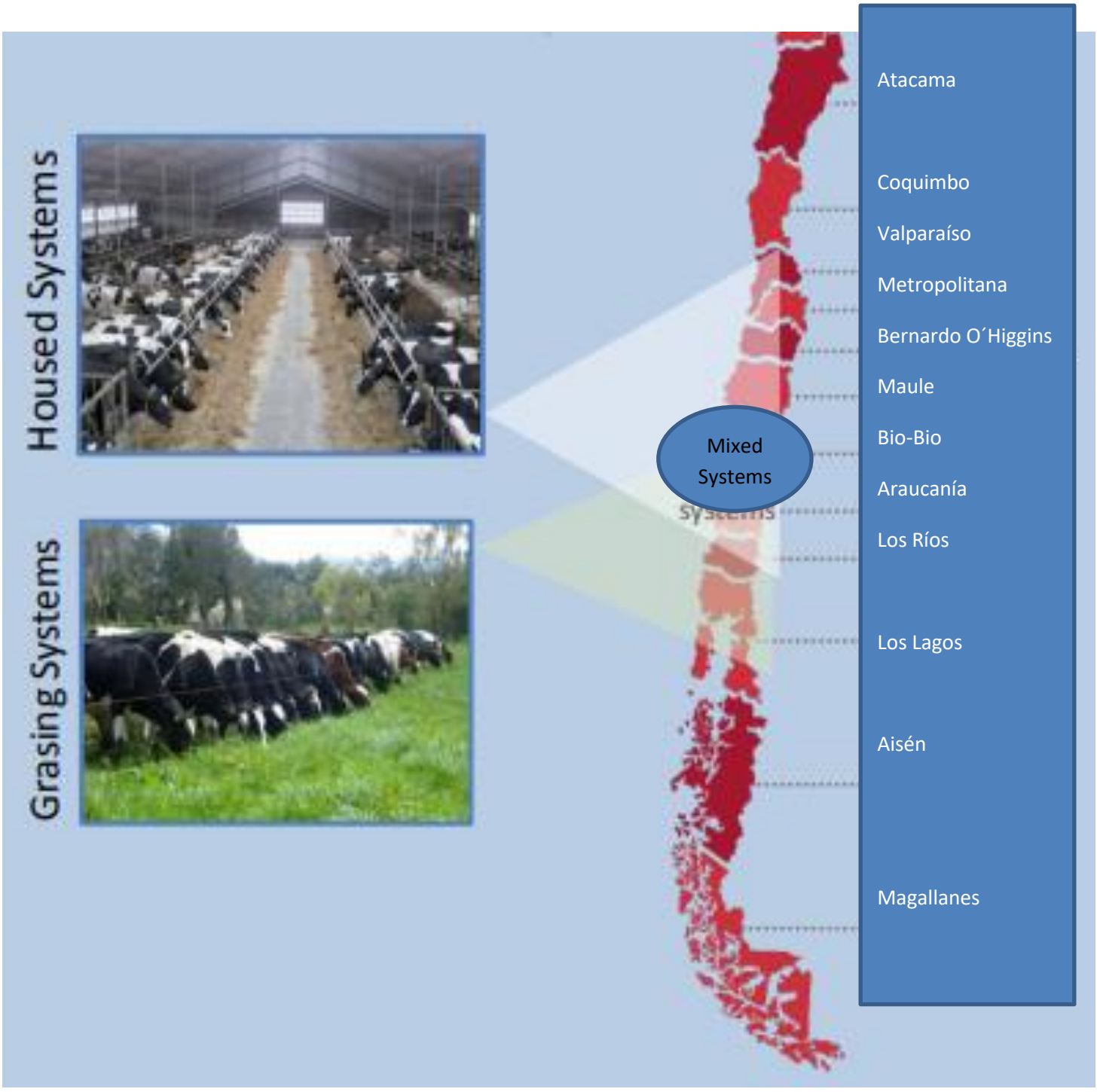
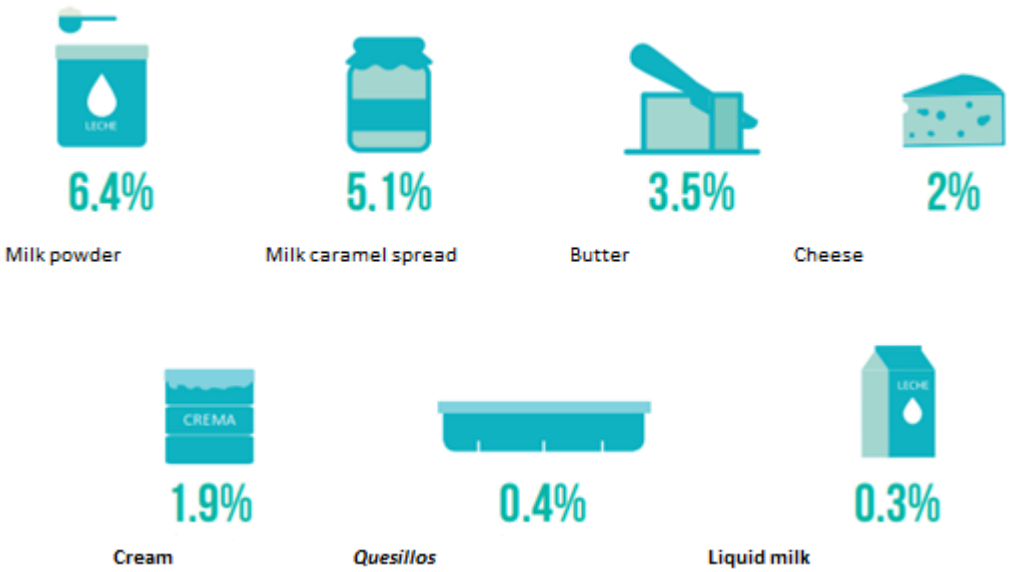
[12] Parturition systems and cattle breeds. Source: Consorcio Lechero.

As it can be seen in the chart below, the feeding system of dairy cattle ranges from housed and grazing to mixed, according to the weather and the territory in which milk is produced. In the central region, the system is housed and, in the south, it is grazing, whereas in Araucanía and Bio-Bío they are mixed.



1.6- Milk industry in Chile

As it can be seen in the picture below, during 2017, there have been interesting figures in this industry, which creating opportunities leading to dairy chain growth. The production of dairy products increased, mainly because of the local market's demand.



[14]

[14] Source: Consorcio Lechero.

The number of dairy companies in Chile is approximately 130, 13 being part of the ILMa and 117 of the ILMe. The dairy products produced by ILMa in the last three years can be seen in the following table:

Product	Unit	2014	2015	2016	2015/2016 variation %
Milk Reception	Litres	2,148,729,020	2,028,825,052	1,991,006,995	-1.9
Production of liquid milk	**Litres**	**423,141,311**	**426,686,752**	**429,134,058**	**0.6**
Pasteurised milk 3 % MG	Litres	16,784	150,955	1,719,062	1038.8
Pasteurised milk 2.5 % MG	Litres	2,012,388	12,275,780	22,650,420	84.5
Pasteurised skim milk	Litres	2,388,468	2,084,308	2,130,277	2.2
Sterilised flavoured milk	Litres	109,763,351	109,757,486	105,815,743	-3.6
Sterilised skim milk	Litres	88,786,487	82,086,868	78,238,251	-4.7
Sterilised milk	Litres	220,173,833	220,331,355	218,580,305	-0.8
Milk powder production	**Kg**	**103,509,748**	**87,301,932**	**76,900,490**	**11.9**
Milk powder 28 % MG	Kg	6,958,825	1,512,550	1,903,325	25.8
Milk powder 26 % MG	Kg	44,926,995	32,276,822	24,235,691	-24.9
Milk powder 18 % MG	Kg	4,424,874	5,273,232	2,869,234	-45.6
Milk powder 12 % MG	Kg	19,108,401	20,886,914	21,377,833	2.4
Skim milk powder	Kg	28,090,653	27,352,414	26,514,407	-3.1
Quesillos	Kg	9,133,439	9,196,877	9,855,863	7.2
Cheese	Kg	81,574,349	81,650,238	81,233,509	-0.5
Yogurt	Litres	227,460,422	229,894,525	244,234,055	6.2
Cultured or fermented milk	Litres	13,007,985	13,214,051	12,723,218	-3.7
Cream	Kg	31,414,487	29,872,288	30,006,444	0.4
Butter	Kg	21,874,057	22,373,937	22,591,441	1
Whey powder	Kg	21,479,508	21,559,053	24,716,067	14.6
Condensed milk	Kg	36,751,186	39,093,149	40,603,730	3.9
Milk caramel spread	Kg	30,474,515	31,788,327	33,708,617	6

[15]

In the ILMe group, we can see yearly production volumes and we can conclude that these small businesses focus on the production of cheese:

[15] ILMa manufactured dairy products, ODEPA.

Product (kilograms)	2014	2015	2016	2015/2016 variation %
Cheese	28,411,617	28,738,134	26,385,394	-8.2
Soft cheese and *quesillos*	14,493,411	15,383,803	16,465,016	7
Liquid milk	152,129	163,567	135,334	-17.3
Butter	840,153	1,071,875	989,048	-7.7
Fresh cream	82,323	96,502	15,800	-83.6
Milk caramel spread	351,280	331,681	348,572	5.1
Yogurt	4,562,028	2,807,716	2,789,154	-0.7
Others	3,419,192	4,058,787	4,350,767	7.2

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The main ILMa processing plants are listed in Figure 17 and some of them are subsidiaries of larger groups:

Dairy company	Total reception (MM l/year)	Group	%
Colun	541	Chilean cooperative	27.2
Nestlé Chile	389	Nestlé	19.5
Prolesur	313	Fonterra	2.9
Soprole	164		
Watts SA	237	Chilean holding (Larrain family)	14
Danone Chile	42		
Surlat	110	Emmi (Switzerland)	5.5
Valle Verde	65	Chilean holding (Ariztía family)	3.2
Lacteos del Sur	52	Lactalis	2.6
Quillayes	44	Chilean company	2.2
Chilolac	21	Chilean company	1.0
Bioleche Lácteos	14	Granarolo (Italy)	0.7
Total	**1992**		**100**

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[16] ILMe dairy products. Source: INE.

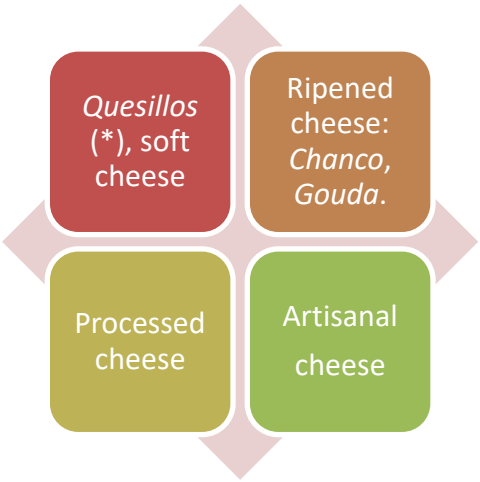
[17] Main dairy companies in Chile. Source: ODEPA and our own work.

2- Products and businesses of the dairy sector in Chile

2.1- Category analysis

CHEESE

The main categories in the local market are grouped into these:



(*) only rennet coagulated without starter cheese

The cheese with the greatest participation in the local market are gouda (texture without eyes), *mantecoso* and *chanco* cheese (texture with mechanically opened eyes); the latter having its own identity in Chile. In relation to its sales presentation, cheese comes in different forms: wheel cheese, pieces and slices; the latter being very important within Chile, followed by soft cheese and *quesillos*, in plastic bags and cups. These soft cheese have a higher level of humidity and have a short shelf life, that is, 25 days. Some *quesillos* are packaged under aseptic conditions and have a longer shelf life, that is, 60 days.

There is a very low production of hard cheese.

Processed cheese does not occupy a very important position, compared to the rest of the cheeses. It comes in flexible containers. On the other hand, artisanal cheese is associated with small cheese companies.

YOGURT

Within yogurt categories, we can find the regular yogurt or commodities, that is, stirred yogurt with flavours and colourants. Almost all dairy companies producing yogurt try to stand out, producing lactose-free yogurt, fruit on the bottom yogurt, high-protein yogurt and yogurt plus cereal mix. A very typical package for stirred yoghurt is thermoformed plastic cups.

Yogurt coming in 1 litre plastic bottles and in pouches does not occupy an important position. Yogurt coming in 100 ml mini bottles is associated with a health claim, mainly in terms of the immune system and, to a lesser extent, with cardiovascular issues. The target consumers of these yogurts or fermented drinks are children.

The trade of yogurt and/or fermented milk needs refrigeration. The product refrigeration as well as the shelf life are two factors heavily influencing marketing strategies. Refrigerated products have to enter into distribution centres of big retail markets with a shelf life lower than 25% of the shelf life. This has led to the development of an extended shelf life for these kinds of products, that is, beyond 60 days.

FLAN AND DAIRY DESSERT

This category is not widely developed; only three companies stand out: Nestlé, Soprole and Colun.

MILK POWDER

The dairy companies participating in this segment for the channel of retail market with fractionated products are Colun, Soprole, Nestlé and Watts. This shows a high concentration of production in the companies mentioned.

All milk powder is produced in 25 kg bags and then put on the shelves in flexible packages, being only Nestlé the company offering a milk powder can alternative.

Apart from regular products such as whole milk powder (26 % MG), semi-skimmed (12 % MG) and skim (0,5 % MG), milk powder producers have sought to make the product stand out, incorporating lactose-free milk powder. This has been possible by using a milk powder formula including maltodextrin, enzymes, minerals and a special drying process.

The milk powder formulae for children produced in Chile only cover the children segment as of the first year of life.

In Chile, the national government buys special infant powder formulae through the Ministry of Health to distribute it to the most vulnerable segment of the population for free: children, pregnant women and the elderly.

This government programme will be further explained in our second report. This programme operates with a Public Market and a main purchasing office, namely Cenabast (Central Nacional de Abastecimiento). In 2016, 18,000 ton of formulae powder were bid for in the Public Market, for 80 MM USD, to be delivered during 12 months.

The formulae depend on a set of technical conditions of the Plan Alimentario Nacional (National Food Plan) and are addressed at a target segment, for which the main formulae are:

- Leche Purita. (Children)
- Bebida Láctea Años Dorados. (The Elderly)
- Leche Purita Mamá. (Pregnant women)
- Leche Purita Cereal.

BUTTER

Fat for butter production is not readily available in Chile. Therefore, it is imported in 25 kg blocks.

On shelves, butter usually appears as butter sticks, most of the times with plastic packages.

Even though this category is full, there is still chance for growth, with the introduction of greater added value varieties, such as lactose-free products and low-fat options.

LIQUID MILK AND CREAM

Due to its territory and weather, Chile's largest dairy output is located in the south (approximately 80%), which is 900 km from the centre, where the greatest number of consumers lives. This has led to the fact that liquid milk for consumption is produced as a sterile product (UHT process), in multi-layered cardboard and plastic packages, and it is sold at a room-temperature.

Dairy companies produce sterile milk and flavoured liquid milk products with TetraPak technologies including specific processing equipment and packaging lines.

This sterilised milk (commodity) as other flavoured milk is put on shelves with dry products, at a room-temperature and has a shelf-life of no less than six months.

Cold chain pasteurised milk sales are very low, an example of this being Lácteos San Ignacio packing pasteurised milk in glass bottles in a plant 400 km from Santiago.

Cream is only sold in its UHT form, as it is the case of milk, with formulae with their own ingredients. There are only a few companies selling pasteurised cream keeping the cold chain.

CONDENSED MILK

This line is not very popular and it is only produced by Nestlé.

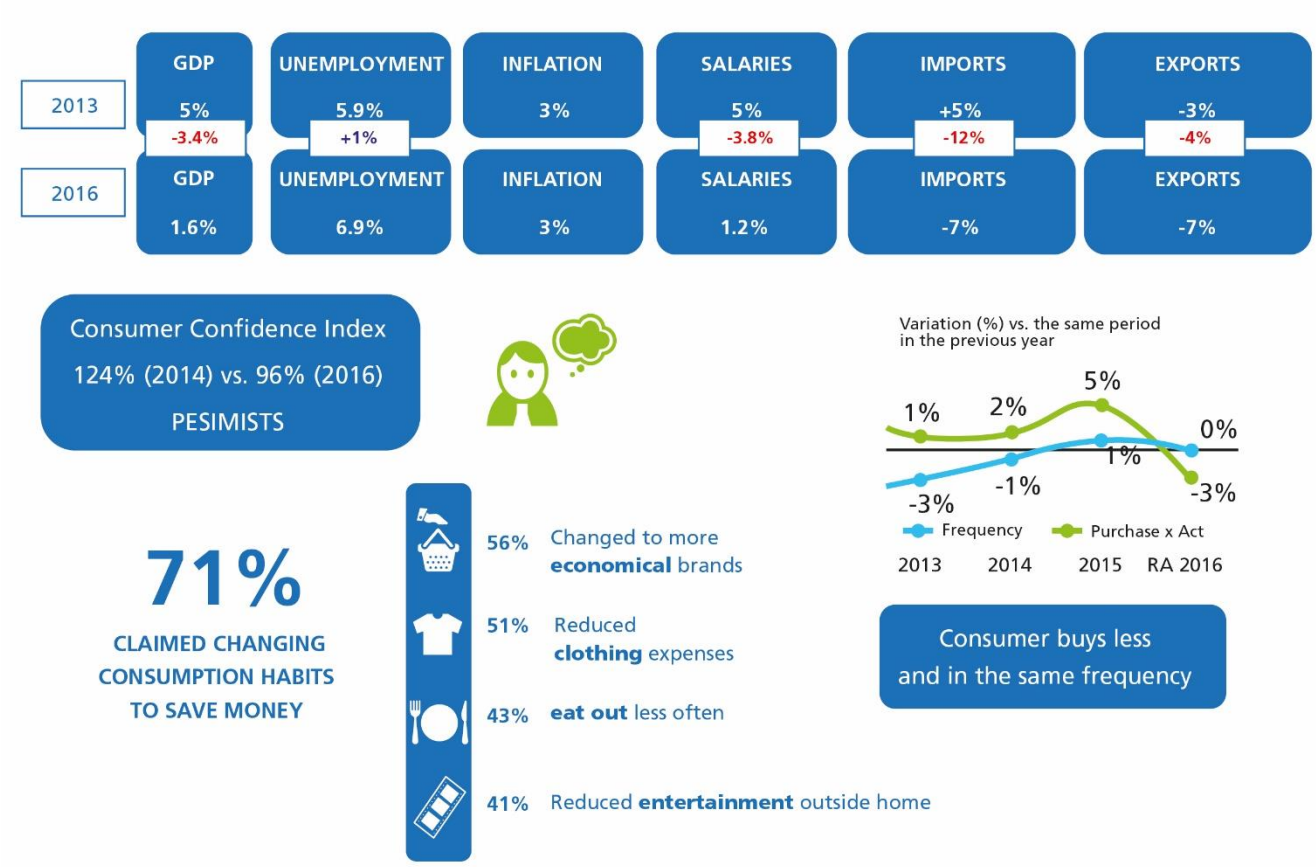
MILK CARAMEL SPREAD

This product occupies an important position within the food services channel, with a low-margin; however, in terms of the retail market, this product sale is less successful.

2.2- The consumer

It is important to analyze food consumer behaviour, especially dairy consumers.

Macroeconomic consumer data for both periods considered, 2013 and 2016, show that GDP decreases, unemployment rises and the consumer's confidence lowers, which has led to changes in consumption habits (Fig. 18).



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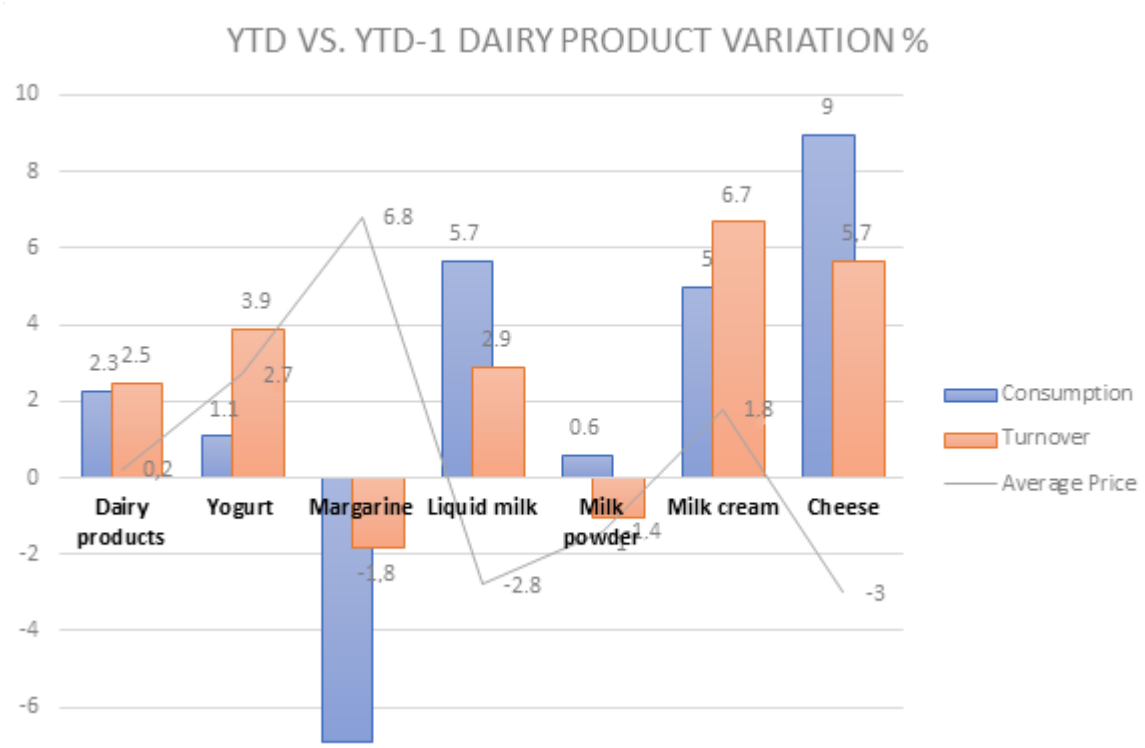
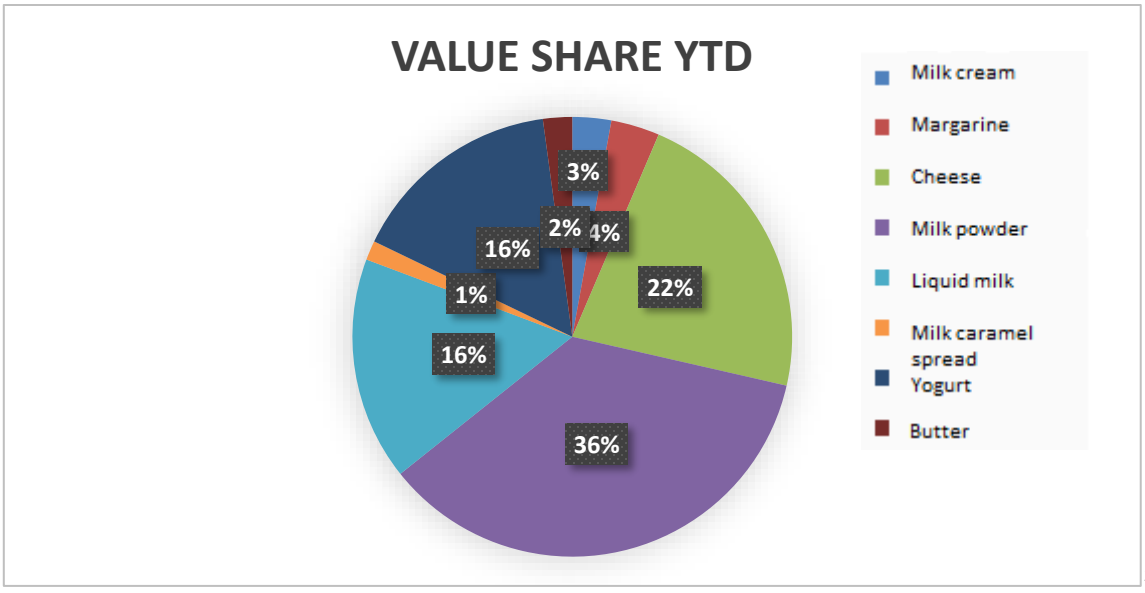
Now, when dairy categories are analyzed we can see growth, encouraged by liquid milk and cheese. At the same time, we can see that both categories grow, with the prices lowering by 3%:

[18] Macroeconomic consumer data. Source: Kantar World Panel, 2016

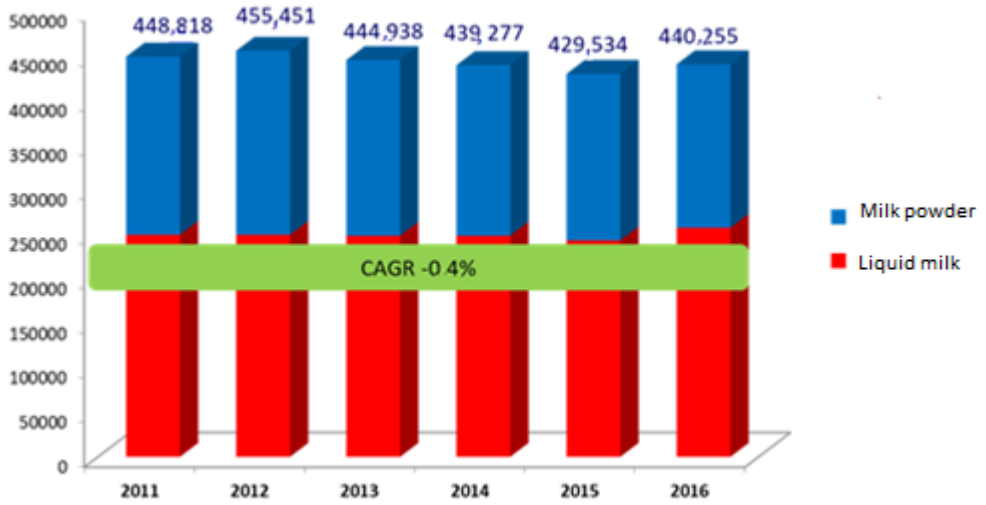




[19]

[19] Consumption, turnover, and average price of dairy categories in 2016. Source: Kantar World Panel

In the last few years, there has been stagnation in terms of milk consumption (Fig. 20), also considering a -0.4 % CAGR (Compound Annual Growth Report), which is the yearly average growth for the period 2011-2016.



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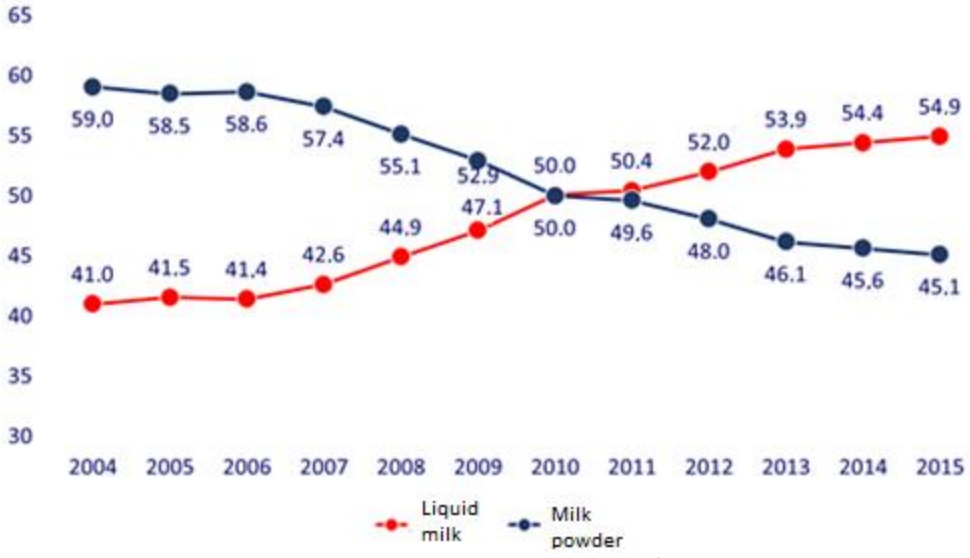
Through the years, liquid milk consumption percentage is rising, compared to milk powder consumption percentage:



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[20] CAGR (Compound Annual Growth Report). Source: Scantrack, 2016.

[21] Liquid milk and milk powder share. Source: Tetra Compass, 2015; Euromonitor and Nielsen.

2.3- Cheese sales

In Chile, the current consumption is 10.1 kg per capita, whereas European countries have a high consumption, between 20 and 30 kg per capita. This shows there is a likely high growth potential in terms of volume and diversity.

This cheese is sold in different sales channels:

- Supermarkets. This is one of the main sales channels and, in Chile, supermarket business is very important.
- HORECA (hotels, restaurants and catering services). In this channel, brands are not important, the main consideration is about prices.
- Gourmet stores: This channel is growing.

2.4- Butter and margarine

These are the main conclusions about the market:

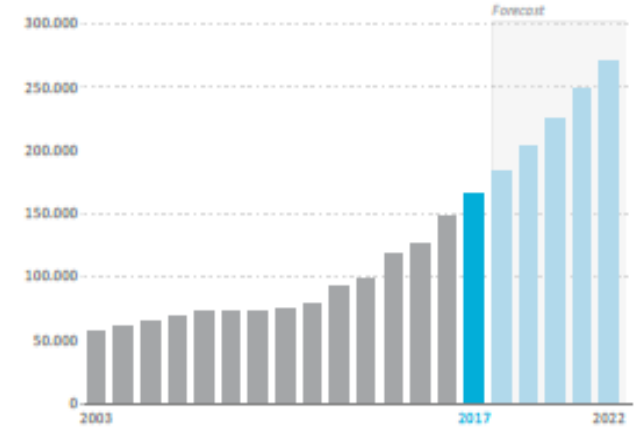
- Butter and margarine growth rates changed after the Ley de Etiquetado Nacional (National Labelling Act) came into force (2016). Butter has a strong yearly growth of 12% (Fig. 23), whereas margarine shows a 4% of growth (Fig. 24). Consumers were expecting to find “high-in” labels in the nutritionals facts for butter, but not for margarine, as the latter was considered healthy by consumers, this thus leading to a negative impact on this category.
- The price per unit of butter/margarine has risen by 6% in 2017.
- Soprole is the leading dairy company in butter sales with a share of 36.7% (Fig. 25).
- The butter/margarine category is expected to keep its 4% CAGR until 2022.
- Supermarkets and hypermarkets have spread distribution through its channels all around Chile, covering 77% of total sales, leaving only 18% of the sales for smaller companies.
- There have been no important innovations to date, but butter has had a significant change, changing from paper packages to plastic cup packages. Lowering the fat percentage made butter lose consistency; then choosing plastic cups as containers became more appropriate for the product.

DPC LATAM
Dairy Processing Consultant

Market Sizes

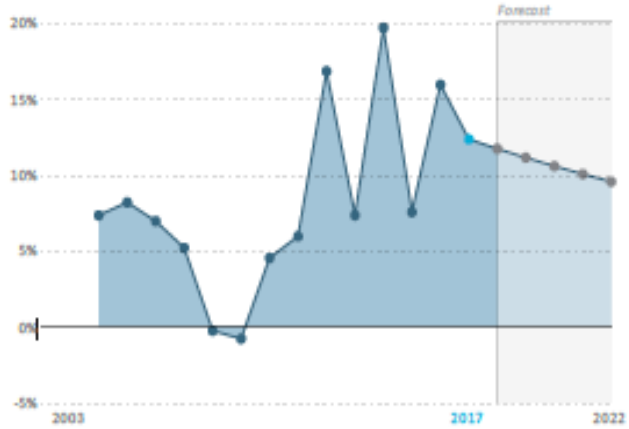
Sales of Butter
Retail Value RSP - CLP million - Current - 2003-2022

163.034



Sales Performance of Butter
% Y-O-Y Retail Value RSP Growth 2003-2022

12.3%



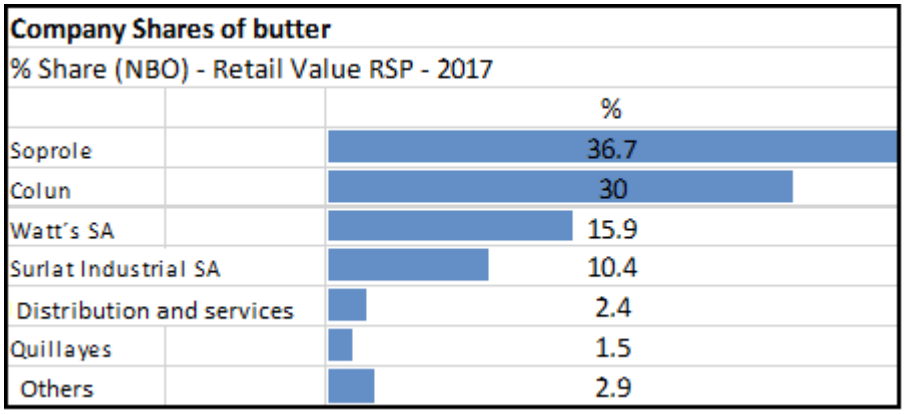
22

Sales of Butter and Margarine by Category

	Retail Value RSP - CLP million - Current - 2017	Growth Performance
Butter	163.034,0	
Cooking Fats	11.517,9	
Margarine and Spreads	131.890,7	
		-5% 0% 15%
BUTTER AND MARGARINE	306.442,6	CURRENT YEAR % GROWTH; % CAGR 2012-2017; % CAGR 2017-2022

23

[22] Yearly butter sales in Chilean pesos, and yearly growth percentage. Euromonitor International 2018.
[23] Margarine and butter sales per category. Source: Euromonitor International, 2018.



[24]

2.5- Whey by-products

Whey is the liquid residue remaining after milk is strained during cheese production, and it is considered a cheese by-product.

Having a yearly milk reception of 2115 MM l; 94,000 cheese tons and 848 MM liquid whey have been produced. The equivalent production of whey has been calculated, considering an output of 10 kg of cheese/100 l of milk.

Product	Metropolitan Region	Biobío Region	Araucanía Region	Los Ríos Region	Los Lagos Region	Country Total
Milk [l]*	174,782,714	133,733.665	120,430,117	641,748,640	1,044,354,799	2,115,049,935
Cheese [kg]	69,125	119,748	3,553,442	47,804,630	42,722,385	94,269,330
Whey [l]**	622,125	1,077,732	31,980,978	430,241,670	384,501,465	848,423,970
Whey powder [kg]	-	-	884,524	18,747,050	6,640,041	26,271,616

[25]

Big dairy companies turn whey into whey powder and WPC 35. The companies standing out in this group are: Colun, Grupo Lactalis, Soprole, Watts, Quillayes and Surlat with a total production of 26.3 thousand

[24] Company share in the butter market. Source: Euromonitor International, 2018.
[25] Production of milk, cheese, whey and whey powder per region. Source: ODEPA and our own work.

tonnes in 2016 (ODEPA, 2017a), Colun having the greatest production, with 15.8 thousand tonnes of whey powder in 2016 (Fig. 27). The products are mainly supplies for the domestic market and for the international market, as ingredient for milk-based products.

3.1.1. The company Schwager Lácteos & Energía works in the energy field and also processes whey into whey powder, WPC 35 and whey and milk based mixs.

Colun	*Lactalis Group*	*Prolesur*	*Watt´s*	*Quillayes*	*Surlat*	*Lechera del Lago*
15,834,850	4,882,326	3,254,200	1,415,715	882,325	2,200	N/A

[26]

For ILMe producers, whey allocation is 58.3% for animal feeding, 25.8% for sales (including milk plants), 8.3% for grasslands watering, and 16.7% of the whey is not used (ODEPA, 2017b).

The raise in the concern about the environmental impact caused by whey and the strictness in regulations have caused small and medium producers to adapt to new trends, both regulatory and consumption trends. However, due to the small-scale production, it has become difficult for these producers to be competitive with large companies. In this sense, using current food trends allows for a great potential for using whey to obtain products valued in the market.

2.6- International trade

a. Imports

In the first semester of 2018, according to Fedeleche's report, imports amounted to 414.2 million of equivalent litres and dropped by 12.6% compared to the same period in 2017. At the same time, import figures dropped by 0.5% and reached 173.2 million of dollars.

In the first semester of 2018, most imports came from New Zealand, USA and Argentina, together amounting to 62.9% of the total imports in this period. The top importers were Prolesur and Nestlé. The main imported products were *gouda* cheese, cream cheese, butter and whole milk powder, together amounting to 60.7% of the imported total.

As regards the evolution of imports, when comparing the value in the first semester of 2018 with the same period in 2017, we can see that the imports in Argentina rose by 23.6% and in the USA by 1.9%, whereas the imports in New Zealand dropped by 8.6%.

b. Exports

[26] Total kilograms of whey powder produced in 2016 by ILMa. Source: ODEPA, 2017.

From January to June 2018, the exports reached 167.2 million of equivalent litres and dropped by 7.3% when compared to the same period in 2017. These exports reached a total of 102.6 million of dollars and decreased by 6.8% when compared to the same period in 2017.
Considering the rank of exports, the top importers were the USA, Peru and Mexico, amounting to 45.6% of the total exports in the period. Among the top importers, we can find Nestlé, Colún, Inversiones Ramaja and Prolesur, amounting to 94.1% of the exported total. At the same time, the most exported products were preparations for children, followed by condensed milk and *gouda* cheese, amounting to 66.9% of the exported total in this period.

Upon comparing the value in the first semester of 2018 with the value in the same period of 2017, we can see that exports to the USA declined by 15.9% and to Mexico by 29.9%, whereas, in the case of Peru, exports rose by 18.1%. On the other hand, considering the top exported products, preparations for children increased by 5.0%, whereas *gouda* cheese and condensed milk exports declined by 22.6% and 0.8%, respectively.
As to top exporters, Nestlé's exports increased by 4.0%, whereas Colún and Prolesur's exported dropped by 10.4% and 67.3%, respectively. In the case of Inversiones Ramaja, in the first semester of 2017, there were no exports.

c. Trade balance

The trade balance shows that since February 2015 or in the last 40 months Chile has been a net importer, both in terms of value and volume.
Regards the first semester of 2018, Chile is still a net importer since 247.1 million of equivalent litres were imported, with a value of 70.6 million dollars, more than what was exported.

3- Main stakeholders

3.1 Dairy and food companies

Fonterra, Lactalis and Nestlé are dairy global companies with branches and plants in Chile. In Fig. 18 before, we can see the list of Chilean companies according to their incidence in the volume of processed milk, which is now referred to again to analyze each of the companies individually.

These are the main ILMa milk processing plants:

Dairy company	**Total reception (MM l/year)**	**Group**	**%**
Colun	541	Chilean Cooperative	27.2
Nestlé Chile	389	Nestle	19.5
Prolesur	313	Fonterra	23.9
Soprole	164		
Watts SA	237	Chilean holding (Larrain family)	14
Danone Chile	42		
Surlat	110	Emmi (Suiza)	5.5
Valle Verde	65	Chilean holding (Ariztía family)	3.2
Lacteos del Sur	52	Lactalis	2.6
Quillayes	44	Chilean company	2.2
Chilolac	21	Chilean company	1.0
Bioleche Lácteos	14	Granarolo (Italia)	0.7
Total	**1992**		**100**

27

Colun (www.colun.cl) is a dairy cooperative located in Los Ríos region, participating in all the dairy products categories and has three plants in that region.

Prolesur (www.prolesur.cl) is part of the Fonterra group and has plants for the production of cheese, milk powder and whey by-products in Los Ríos region and Los Lagos region. The other plant is Soprole (www.soprole.cl); it focuses on yoghurt, margarine, butter, flan, jelly and compote production and it is located in Metropolitana region.

[27] Main Chilean Dairy groups. Source: ODEPA and our of own work.

Nestlé (www.nestle.cl) has butter and milk powder production plants in Los Lagos region; milk caramel spread and condensed milk production plants in Biobío region, and yogurt, flan, and dessert production plants in Metropolitana region. All of the production of UHT milk, flavoured UHT milk and UHT cream is produced through a maquila in Surlat.

Watts (www.watts.cl) is a Chilean company, in fact, it is a food holding focusing on these three main businesses: Dairy products, oils, and fruit/jam/preserves. In the last few years, Watts bought fruit and vegetables companies such as Frutos del Maipo and Wassil, and, last year, it added the Danone plant in Chillan. Watts has a dairy plant in Osorno (Los Lagos region) for the production of milk caramel spread, whey by-products, milk powder, cheese and butter. Most of Watts' yogurt lines as well as Danone products are produced in DiWatts plant (Chillan). In the Metropolitana region, this company produces some yogurt lines, UHT milk, flavoured milk, cream and UHT icecream-base.

Surlat (www.surlat.cl) is a cooperative formed by producers from the region of Araucanía, associated with the Swiss group Emmi (main shareholder). It has two plants: one for milk powder, butter, yogurt and UHT products, and the other for cheese. It has three businesses: own-branded Surlat products, private label product development for supermarkets (Jumbo, Lider, Tottus, Unimarc) and UHT products for Nestlé.

The international group Lactalis (www.lavaquita.cl) arrived in Chile in 2017 and has bought five small cheese plants, such as Lácteos del Sur, La Vaquita and Codigua.

The global company Savencia (Bongrain) has a plant in Cerrillos (in the south of Santiago), only operating as a distribution centre. It imports cheese from countries such as Brazil, Argentina and some European countries. In this centre, cheese boards are made. The branches in Colombia and Perú (Alianza del Pacifico) are managed from Chile.

3.2 Ingredient companies

Arla is a global dairy company, but, in Chile, it sells functional ingredients through AFISA (Arla Food Ingredients SA), an Argentinian company with a branch in Chile. Milk and whey by-products come from plants in Argentina and some of them from Denmark.

Glanbia is another global group only participating in ingredient introduction, through a local representative.

The main dairy ingredient suppliers are represented in Chile by these national companies:

- Adiplus. Palsgaard (Mexico), production of emulsifiers and stabilizers, and Bel Industries, producing ingredients and dairy proteins for ice-cream and dairy products.
- Saporiti Chile. It sells flavourings, colourings and functional ingredients.
- Granotec. It develops and produces ingredient mixes for dairy formulae, yogurt and desserts, mineral and vitamin fortification, dairy substitutes and alternative food.
- Merck Chile. It produces mineral and vitamin pre-mixes.
- Blumos. It sells ingredients from Glanbia, FMC and Buddenheim.

3.3 Equipment suppliers for dairy companies

The processing equipment and the packaging lines, such as automated end-of-line systems and robots, for ILMa, mainly come from Europe (Italy, Spain, Sweden, Germany and France), and to a smaller extent USA. There are also equipment supplies produced in neighboring countries such as Argentina (Bisignano, IMAI, Primo) and Brazil (Dinieper, Bosch do Brasil, Masipack).

Some of the international companies with representative offices in Chile are:

- GEA. It has technical and sales offices in Santiago and the projects are connected to its I&D centres around the world.
- SPX . It only has one sales office.
- Tetra Pak. It has many technical and sales offices in Santiago, a training centre for operators of packaging and processing equipment, but it is not an equipment preparation or assembly centre. Tetrapak Southern Cone is included in this region, having a branch in Buenos Aires and I&D centres around the world.
- Gebo-Cermex. It is a Company with end-of-line packaging equipment. It has an assembly line in Santiago and it also assembles with parts coming from other countries.
- Multivac. It has technical and sales offices in Santiago and a new regional training centre.
- Plaspak. It sells food and dairy packaging machines, importing equipment from Asia.

Some other international companies have branches in Argentina and Brasil managing dairy companies.

3.4 National and regional government

On a governmental scale, we can mention the following official entities connected to milk production, transformation and trade:

- ODEPA (http://www.odepa.gob.cl). It is the Agrarian Research and Policies Office, operating under the Ministry of Agriculture. It offers free information services on the agropecuarian activity; it participates in the definition of criteria connected to encouraging Chile to occupy an important position within international trade; it makes contributions in the organization of technical assistance programmes and international cooperation programmes; it conducts studies on the current situation of forestry and farming; it spots problems and emergencies and it suggests solutions and it also advises the minister and the deputy secretary of agriculture.
- SAG (http://www.sag.gob.cl). It is Chile's government official organization, it supports agriculture, forestry, and farming development, through protecting and improving animal and plant health. It sets zoo-sanitary and phyto-sanitary border controls to avoid plagues. It participates in issuing the sanitary certificate when exporting animal and plant products. It ensures that food and medicine for animals are safe for their health.

- ProChile(http://www.prochile.cl). It is the institution fostering product and services exports, apart from disseminating information about foreign investment and fostering tourism. It operates under de Ministry of Foreign Affairs.
- Corfo(http://www.corfo.cl) The Corporación de Fomento de la Producción (Corporation encouraging production) is Chile's government agency operating under the Ministerio de Economía, Fomento y Turismo. It supports entrepeneurship, innovation and competitiveness. It is an organization promoting local production and regional economic growth. It has more than 50 programmes supporting 200,000 beneficiaries per year.
- Cenabast.(http://www.cenabast.cl) The Central de Abastecimiento del Sistema Nacional de Servicios de Salud is a public organization operating under the Ministry of Health, managing purchase processes to ensure medicine, food, supplies and equipment's availability for the health system.
- INE(http://www.ine.cl) The Instituto Nacional de Estadísticas provides public statistics as population and housing censuses and economic indicators as employment indicators and consumer price indexes.
- INTA(http://inta.cl) The Instituto de Nutrición y Tecnología de los Alimentos is an interdisciplinary organization from Universidad de Chile. It provides continuous technical support for government organizations as to the definition and application of nutrition and food programmes; it helps reformulating national policies, defining obesity and its consequences as a national priority, and it participates in developing nutrition guides.

On a regional scale, Polos Territoriales have been implemented. There is a public-private initiative called Alimentos con valor agregado Región Los Ríos (AVA Los Ríos), promoted by Corfo. AVA Los Ríos' goal is creating a favourable environment in Los Ríos to establish relations between associated entrepeneurs, public organizations and academia.

3.5 Universities

The universities working on dairy investigation and development are:

- Universidad de Chile. Santiago.
- Universidad Católica. Santiago and Valparaíso.
- Universidad de la Frontera. Temuco.
- Universidad Austral de Chile. Valdivia.
- Universidad de Santiago de Chile. Santiago.

3.6 Intermediary organizations

- Sofofa (http://www.sofofa.cl). The Sociedad de Fomento Fabril (Sofofa) is the union association of companies and unions of the Chilean industrial sector.
- Federación Productores de leche (Fedeleche) (http://fedeleche.cl) La Fedeleche gathers different milk producers' associations and it seeks to develop, encourage and protect Chile in terms of milk production.
- Consorcio Lechero (http://www.consorciolechero.cl) The Consorcio Lechero is a corporation formed by the most important dairy companies working in Chile, as well as by milk producers, important dairy technology organizations and service providers.
- Aproval (http://www.aproval.cl) It is the union association of milk producers in Los Ríos region.
- Aproleche (http://www.aproleche.cl). It is the association of mil producers in Osorno.
- Exporlac (http://www.exporlacchile.cl) It is a company association working towards encouraging exports. Its members are Nestlé, Valle Verde, Colun, Watts, Lácteos del Sur, Lácteos & Energía, La Vaquita, Soprole, Surlat, Comercial del Campo and Quillayes.
- ChileAlimentos (www.chilealimentos.com). It is Chile's food companies association, it is a private organization gathering processed food and food processing equipment companies.
- Franhoufer (https://www.fraunhofer.cl) The Centro de Biotecnología de Sistemas de Fraunhofer Chile Research works on scientific and applied technology development to cater for industry needs and it is the top second subsidiary of Fraunhofer outside Germany.
- CREAS (www.creas.cl) It is a non-profit private corporation creating prototypes in its pilot plants; it is connected to universities; it operates as a national and regional scientific and technological platform, specialized in healthy food and products. It encourages innovation and transmitting these innovative strategies to entrepreneurs, small, medium-sized and large companies.
- CENEM (https://www.cenem.cl). It is the Centro de Envases y Embalajes de Chile, a private technical corporation seeking to add value to the associated packaging companies. It focuses on human capital, sustainability, innovation and digital packaging.

3.7 Technological platforms

Transforma Alimentos (www.transformaalimentos.cl) is a strategical food programme, included in the pro-growth agenda promoted by the Ministry of Economy. It is a collaborative development model considering the different perspectives of the stakeholders, representing Chile's needs. It encourages communication between public and private stakeholders and academia and research areas.

Transforma Alimentos has developed the following initiatives:

- Centro Tecnológico para la Innovación en Alimentos (CETA). This organization provides services for companies and entrepreneurs, in terms of the implementation of pilot plants concerned with ingredient, processed food and packaging development.
- Company I&D innovation programme.

- Programa Tecnológico para el desarrollo de Ingredientes Funcionales y Aditivos Naturales (IFAN). Technology programme for the development of functional ingredients and natural additives.
- Programa Tecnológico de Envases y Nuevos Materiales de Embalaje (CO-Inventa). It is a platform formed by several Chilean universities associated with ASIPLA y AG Chile Alimentos to develop new technologies in terms of active materials and smart packaging.
- Polos territoriales de Desarrollo Estratégico. This initiative seeks to establish five poles promoting cooperative networks to enhance relations and productive networks between transforming agrarian companies.