CHILEAN DAIRY SECTOR

Second Report

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INDEX

1- Innovation of dairy products in Chile

1.1 Summary

Within the field of food innovation in Chile, 57% of the innovations in Food correspond to companies related to this industry, and the remaining 43% to Universities and National Research Centers. Within companies, 60% employ less than 49 workers, and 50% invoice less than 1 MM USD per year. Of the total projects, only 7.4% reach the market.

This Second Report will focus on new dairy products launched in recent years, and will analyse each category in detail. Later, we present an analysis of the opportunities for new businesses.

The national market is characterized by the entry of imported food and dairy products, which will be partially analysed.

First, it is important to discuss the innovation trends in connection with dairy products globally, which are the following:

When it comes to food, the main global trends can be translated into three market drivers: a) high-quality products with medium price, b) demand for the natural and c) health benefits: "free of" and functional.

These trends express the following values:

- *Health.* People are striving for healthier food options that are simpler and easier to integrate into their daily lives.
- *Security.* Food safety is now part of the acquired knowledge because of the growing demand for transparency and trust.
- *Taste.* Taste does not only have to comply with the established "key points", but it also has to provide more unique and real taste experiences.
- *Comfort.* Convenient food is shifting from being guilty commitments to facilitators for eating better food on a day-to-day basis.
- *Authenticity.* Processed foods are no longer "one size fits all"; they address diverse emotional and cultural needs.

The products listed below follow the trends previously mentioned:

- Yogurts used as snacks, and in the case of premium products, as indulgence products.
- Yogurts with low percentage of sugar. Yogurt has a prominent place in people's lives, but its halo of "healthy" product may be threatened by sugar.
- Dairy products with probiotics for digestive health. Dairy products are the most successful group in the case of probiotics.
- Yogurts with high protein content are reaching the mass market worldwide.

In this context, the latest developments in Chile were oriented to Pleasure/Indulgence, sugar, fat and sodium reduction, and to products that incorporate higher protein content. Moreover, and because of a genetic condition of the population that has a certain lactose intolerance, there is a very powerful driver for "lactose-free" or "lactose-reduced" products. This driver is present in all dairy product categories, even in products that are already "lactose-free", like cheese and butter.

Cheeses made in Chile have little diversification, and most of them are mature cheeses. Chile has its typical cheese, the *chanco* cheese, and there is little presence of hard cheeses, processed cheeses, mozzarella and cheeses with texture with eyes. In supermarkets, other cheeses from Europe and USA have a strong presence, as for example Edam, Ementhal, Colby, and grated cheese from different origins. At the retail level, the consumption of sliced cheese in different packaging formats prevails.

In the milk powder category, a few companies have managed to innovate with lactose-free milk. The development of infant milk powder for the segment of children over one year in recent years has also stood out.

Within the yogurt category there is a wide variety of formats and packagings. Most companies of this segment have innovated with "Greek" yogurts, with high solids content. Other companies have incorporated "high-protein" products.

The Ley de Etiquetado Nacional (National Food Labelling Act) has made it compulsory for countless food formulae to undergo innovation, and this has allowed consumers to become aware of which foods have high-calorie content, saturated fat, sodium and sugar.

Regarding packaging innovation, we can mention the advent of technologies such as "the Internet of Things", thinner packaging structures supporting sustainability and the influence of eCommerce that is transforming distribution chains.

1.2 Refrigerated products

YOGURT

- Yogurts in the market are stirred, with a technology that responds to the following process scheme: vat fermentation, and the addition of essences, colourants and fruit before packaging. In the market, there are practically no "firm" or coagulated in the cup yogurts.

- The segment of yogurts that differ and provide added value is the "lactose-free" segment, as discussed in the First Report. All large dairy companies participate in this category and the products are presented in cups, bag and bottle formats. In general, they use a processing technology that enzymatically reduces lactose content.

- Recently, Greek and "light" Greek yogurts were launched, and certain dairy companies such as Soprole, Danone, Quillayes and Colun produce them:

- There is a tendency towards producing light yogurts. Flavoured yogurts and/or with typical Chilean fruits such as blackberry and raspberry stand out in this category.

- A recent trend is to develop high-protein yogurts. In some cases, the % of proteins is raised up to 6-8% with the addition of milk proteins and whey. They are sold in 1 litre bottles, shot mini-bottles, and in plastic 150 g cups.

- Yogurts with probiotics. The target of this product are children, and they are used for snacking, as "one shot" yogurts. They are sold in 90 ml plastic bottles, and recently Soprole launched a Tetrabrik format. Soprole, Watts/ Danone, Nestlé and Surlat participate in this category.

- The mixed Yogurt category combines yogurt with cereals, rocklets, oreo cookies and choco krispies, and it is not very developed. Only companies like Nestlé, Colun and Soprole produce them. They are sold in a unique packaging presentation that separates the products.

- Only Quillayes sells yogurt in family size plastic cups of 400 and 900 g. While there are formats of 900 and 1000 g in pouch-type flexible packaging, there attractive prospects for developing new presentations in bottles and in carton packs.

- There is a very marked trend of selling certain types of yogurts in sale units as packs, grouped in packs of 8, 12 and 16. These packs contain stirred yogurt of different flavours and packagings have different product codes.

- There is also soy yogurt. Its correct denomination is soy-based food. It is produced by Watts, and it is made from isolated soy protein powder. It has the same manufacturing line as fermented dairy products.

FLANS AND DESSERTS

- This category includes jelly and compote, and dairy desserts.

Only a few dairy companies participate in the category: Colun, Soprole and Nestlé. This line includes desserts, flan, roasted milk and semolina with milk. The desserts are presented as "indulgence" products and there are varieties with panna cotta, creme caramel, pistachio dolce, and cheesecake and lemon pie flavour.

- A new "airy" product stands out, such as Nestle's Nube de leche. The concept of aerated is interesting because it is one of the only aerated dairy products in the market, it being a mixture of yogurt, cream and fruit.

- The most innovative product in the category is Soprole's cinnamon flavored rice with milk, a product concept that evokes the dessert that is usually prepared at home.

1.3 <u>Cheese</u>

RIPENED CHEESE

According to the definition of the RSA (Ref.1) "ripened cheese is the product that requires a period of ripening with such temperature and conditions that the biochemical and physical changes necessary to obtain the organoleptic characteristics that typify cheeses are produced".

In the country, different types of cheese are commercialized, and the *gauda* types or those belonging to Gauda or *Gouda* family (texture without eyes) prevail, occupying a central position in the market. They are followed by the so-called *chanco* cheese, which correspond to the product that has been consumed traditionally in Chile and that has great colour, composition and humidity variations. Unlike *gauda*, *chanco* cheese has a texture with mechanically opened eyes and a coat of paint protecting them from the outside. One of the variations of the so-called chanco cheese is *mantecoso* cheese, made by both large and small companies. It is a semi-soft cheese, cooked at a lower temperature and with a higher humidity level (unctuous cheese), easily squeezed or deformed unlike *chanco* cheese, which usually has a firmer and more solid texture, it cannot be sliced. Generally, *mantecoso* cheese is very popular with certain consumers and is sold at a higher price than "ordinary" chanco cheese.

Besides *gouda* and *chanco* cheese, other varieties with a small market share are produced, such as reggianito and parmesan hard cheese, *Edam*, and delicatessen cheese such as *Camembert*, *Gruyere* and *Brie*.

Gouda and *Chanco* cheese are presented in piece format (3 kg bar and 10 kg wheel cheese), in pieces and slices.

The innovation of the *Gouda* and *Chanco* cheese is the "slice" presentation, in a container that can be later reclosed and reused.

QUESILLOS AND SOFT CHEESE

According to the RSA (Ref.1) "are those cheeses of recent production that have not undergone any transformation or fermentation, except lactic acid fermentation and are prepared with pasteurised milk...". These cheeses have high moisture levels, short shelf life, and some technologies obtain it by the action of the rennet on milk that has been subjected to the ultrafiltration process.

These products are adequate for preparing salads and can be categorized as refrigerated products with short shelf life. Innovation regarding this product is the technological conditions of the packaging line, which takes shelf life from 15 days to 60 days. This is possible in a more hygienic packaging environment, with an aseptic filler.

CHEESE BOARDS

There is a growing trend in some companies towards manually preparing a combination of pieces of special cheeses, some of them with spices, and other cheeses that are not made with cow milk, like goat cheese. They are also sold as a snack, with a combination of sausages, olives and nuts.

One of the most outstanding cheese platters is the produced by Savencia (Bongrain), company which participates in Chile with a centre for the assembly of cheese boards including different varieties of cheese that it imports from its subsidiaries.

PIZZA CHEESE

The production of mozzarella cheese at the country level is very low. However, there are other alternative products too, called *queso pizzería* (pizzeria cheese), which are obtained by chopping up *gouda* cheese, and this final product is perfectly adequate for the functionality of mass market pizza such as Telepizza or Domino.

1.4 Milk powder

Dehydrated products sold in the retail channel barely stand out, and they are the traditional products: whole, skim and semi-skimmed milk powder. Almost all of them are sold in flexible bags of 400 and 900 g; Nestlé stands out in this category by being the only company offering the can option.

Few companies, Nestlé and Watts, have included the "lactose-free" category in the milk powder category. This product is obtained by the hydrolysis of lactose in milk, with lactase enzymes, and to facilitate the drying process, an ingredient such as maltodextrin is added.

There are other milk powder formulae that have been introduced, with other whey proteins and vegetable fats, such as the Nestlé Buen Día and Super Calo brands from Watts.

Infant formulae appearing in the last period only correspond to the segments of children of +1 year, +3 years, and +5 years. Instead, infant formulae for premature babies, Formula 1 (between 0 and 6 months) and Formula 2 (between 6 and 12 months) continue to be imported.

1.5 Liquid milk

The category of liquid milk and flavoured liquid milk is massively produced in Tetrabrik containers.

The products that have innovated the most in the category of "chocolate" liquid milk have incorporated coffee and other presentations such as dark chocolate, cappuccino, hazelnut and caramel. Colun and Watts companies have a different new Tetra packaging, such as the 330 cc Tetraprisma.

There is a massive presence of lactose-free liquid milk and all companies compete in the liquid milk segment. Currently, this product line can be considered already commoditized.

Supporting the trend of "high-protein" products, there are only two references in the market: Soprole's protein shake of and Watts's whole milk.

1.6 Butter

In retail markets, butter is presented in 125 and 250 g paper-wrapped sticks and consumers prefer salted butter. There are some imported butters as Kerrygold, which is from Ireland.

Butters being spreadable and having a plastic container stand out as products with higher added value, giving greater functionality to the product.

Surlat's butter with Merken is an innovation product, with dry smoked chilli and other ingredients from the typical seasoning of Chilean Mapuche cuisine.

Formulated butters have stood out because of their mixture with other fats, canola oil (75% butter and 25% canola oil), butter with 80% cholesterol reduction, and butter having total fat reduced by 30% (with skim milk powder and buttermilk).

1.7 Milk caramel spread and condensed milk

In the retail channel there are plastic cups and pouch type bags of milk caramel spread, as being homemade or having a countryside recipe. There has recently appeared a new presentation in doypack with a cap on the side, produced by Watts.

In the industrial channel, there are different types of milk caramel spread designed considering the functionality of the final product, in 5 and 6 kg formats: milk caramel spread for pastry, the Chilean mill spread and the stuffed milk caramel spread, for other uses in pastry and bakery. All of these products have dairy milk formulae with whey and stabilizers.

Nestlé is the only company commercialising Condensed milk, having its own production plant in Los Angeles and producing sweetened condensed milk and evaporated milk in cans.

1.8 Cream

The cream market in retail is dominated by products with UHT treatment technology, rather than pasteurised cream, category in which Soprole's 1-litre pouch is the only reference.

All UHT creams are products that are formulated taking into consideration the functionality of the product, for which there are two subcategories: whipping cream (35% fat) and thick cream for culinary use (between 13 and 25% fat).

The category of chantilly creams in cans is low in terms of volume, and there are no national manufacturers. The products present are from Soprole and Quilayes, both imported under their own brand, from New Zealand and Germany, respectively.

1.9 Dairy beverages

This category is made up of dairy-based or fermented dairy-based UHT beverages or foods. They are based in a mixture of milk, whey and milk protein concentrate.

Fermented dairy beverages are produced at an initial stage as yogurt (thermal and fermentation treatments similar to those of yogurt), but then have a subsequent thermal treatment of the UHT type and are packaged and stored at room temperature, and the product as such is a pasteurised yogurt. Watts is the only company that produces this product.

1.10 PBB = Plant Based Beverages

The segment has considerably grown last year in supermarkets with new presentations of beverages based on soy, rice, almonds and oats. Watts is the only company producing the soy-based beverage locally, and two national companies, Quillayes and Watts, import this product through a system of *maquila*.

On the other hand, there are companies from other countries that sell their products in supermarkets.

2- Commercialisation channels

Dairy companies use different channels for marketing strategies, and some of them will be later analysed in detail.

2.1 Retail channel

It is the channel of traditional commerce in large cities and small neighborhoods, grocery stores and convenience stores.

As buyers have become more used to the convenience of having everything readily available to them via the internet, retailers now have to offer them the experience they expect in multiple shopping channels.

Retailers are investing in the IoT (Internet of Things) technologies, personalized coupons, radio-frequency identification signals that track inventories. The aim is simplifying, encouraging and personalising the shopping experience, generating income and reducing costs.

2.2 Food service

It is a channel of greater specialization, aimed at the needs of hotels, restaurants, catering services, schools, factories, companies, coffee houses, bakeries and pastry shops, which use the products as an input for the preparation of food as well as for the delivery of a personalised service

This channel operates with avant-garde logistics. Within only a few hours, they react to the requirements of customers. Some companies have an advantageous supply system, storage and dispatch, with delivery of orders sent directly to sellers. Companies working with this channel have logistics systems such as state-of-the-art ERP to prepare orders and dispatch products in short periods, and also have spare stock to avoid stock shortage, and monitor their fleet (tracking dispatches) via GPS.

2.3 Sales Rooms

Certain dairy companies have their own facilities, near their plant, which are open to the public, and the company's products and latest releases are displayed. It is a self-service type format.

In some cases, they combine the sale of dairy products with a restaurant.

2.4 Supermarket chains

There are large supermarket chains throughout Chile: Walmart, Cencosud, Unimarc and Tottus, this thus being one of the most important businesses of Chilean economy. Chile is the leader in supermarkets in the Latin American region.

In Chile, people go to these supermarkets every 5.3 days and spent, on average, about USD 1,166 per year, according to a study by Kantar Worldpanel, and considering a period of analysis considering the period from July 2016 to July 2017. Argentinian people are ranked in the second place with USD 796. Similarly, countries such as Colombia, Mexico and Peru also recorded an annual expenditure significantly lower than that of Chile in supermarkets, with a total USD 455, USD 394 and USD 260, respectively.

However, local consumers lead not only the rank of expenditure in these commercial venues, but also appear as those who most go to supermarkets on a yearly-basis, with an average of 67 visits per year.

As mentioned above, Chileans go to the supermarket every 5.3 days, while in countries like Argentina that period is approximately 10 days. The study revealed that Peruvians go to the supermarket every 15 days (only 24 times per year), Colombians every 7.5 days (48 times per year) and Mexicans every 8.3 days (43 times per year).

Quick purchase. The greater frequency with which Chileans go to supermarkets would be directly related to a change in habits that the industry has witnessed in recent times: the preference for quick purchase and replacement.

The report by Kantar Worldpanel shows that Chile leads replacement purchase over proximity purchase and immediate consumption, among others.

The report shows that, in recent times, Chilean consumers tend to go to supermarkets more frequently, but to buy fewer units per purchase.

Such has been the preference shown by Chileans for the quick purchase that, in the past months, the main firms in the sector have promoted their smaller formats, which facilitate this type of purchases.

Units. Another trend shown in the report is that Chilean consumers tend to attend supermarkets more frequently, but in order to buy fewer units per occasion.

Brands of their own. The main supermarket companies comment that brands of their own have become one of the pillars of their business, considering the higher margins they obtain and the greater loyalty from customers.

These brands of food and consumables represent between 20% (and in some cases up to 50%) of the sales. The market share varies depending on the category - in those more commoditized it reaches up to 50% of the sales. On the other hand, supermarkets are selling premium style white-label products.

2.5 Digital channel

While worldwide trends indicate that users increasingly prefer to do supermarket shopping in online stores, in Chile this preference does not prevail yet, as evidenced by the study **Observatorio Shopper Experience** (OSE) 2017, which analyzed the evolution of purchasing trends of Chileans in physical and virtual stores.

Among the results of the research, it is worth mentioning that despite the global progress of online shopping, and its increase from 19% to 27% among Chileans during the last year, **91% of the surveyed continue to choose physical supermarkets to make their purchases**. Of the total sample, 27% buy in online and physical supermarkets, and only 9% declare to buy only online. In addition, more than 80% of shoppers spend at least 1 hour per week in the supermarket.
Each time more retailers add a new and technological virtual store to their branches. However, in light of the results of the study, shoppers continue to prefer them in their physical version because they consider that they can make a better selection of products (67%), review their details (66%), and access a greater variety of options (49%) and unique offers, which are not available in other sites (47%). In addition to this, 43% say they entertain themselves when shopping, considering it a recreational activity within their daily routine.

2.6 Industrial and institutional channel

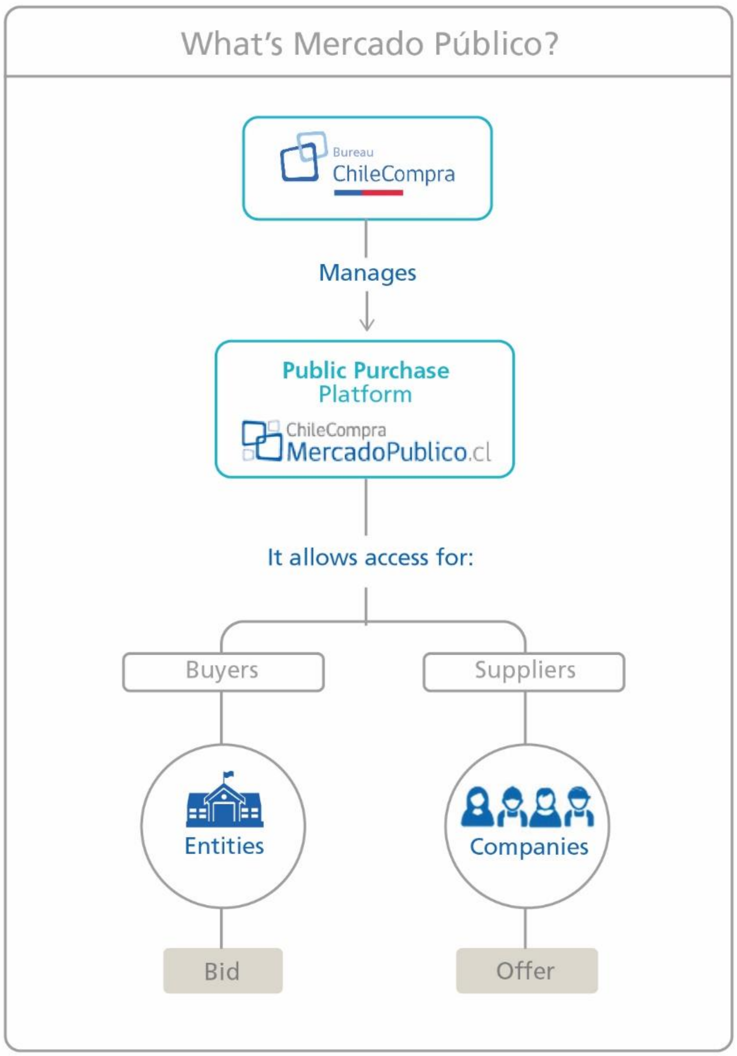
The industrial channel supplies dairy products to other dairy companies, bakeries, pastry shops, biscuit and chocolate factories.

The institutional channel operates through the Public Market. The National Government in Chile buys special powdered food formulae through the Ministry of Health for its free distribution to people from vulnerable groups, which are children, pregnant women and the elderly.

Mercado Público is the electronic platform in which the 850 public organizations of Chile carry out their purchasing processes, and suppliers offer their products and services: it is a space for supplying and demanding with common rules and tools administered by the ChileCompra Bureau. The system allows publishing a purchase, searching for business opportunities and make bids, among others.

Among the electronic functionalities we can find the following:

- Market consultations.
- Preparation and publication of terms of reference or bidding rules.
- Questions and clarifications.
- Preparation, management and delivery of offers.
- Adjudication.
- Issuance and acceptance of purchase orders.
- Contract subscription.
- Qualifications and claims.



The State purchases scheme is represented as follows:

In MercadoPublico.cl, products and services required by public organizations are traded, and it is the platform where state suppliers can bid for the different tenders that are available.

Some dairy companies offer their powdered products to the National Government, to CENABAST (Ref.2), which is the one that carries out the purchase bids.

Cenabast is a public service, functionally decentralized, with legal capacity and its own patrimony, whose function is to provide medicines, instruments and other supplies for the acquisition of PACAM products (Ref.3) and PNAC (Ref.4). PACAM is the complementary feeding programme for the elderly and applies to elderly beneficiaries of FONASA (Ref.5). PNAC is a national complementary feeding programme for children under 6 years of age, premature babies of less than 1500 g at birth and/or 32 weeks of gestation, pregnant women and mothers who breastfeed until the 6th month.

The products included in these feeding programs are the following:

Años Dorados Dairy Beverage

Lactose-reduced, low-fat, low-sodium milk-based powdered product with cereal, fortified with vitamins and minerals.

Años Dorados Cream

Cereal, legumes or milk-based instant food, fortified with vitamins and minerals.

Continuation Milk Formula

Infantile milk formula specially developed for the oral feeding of infants as of the sixth month of life.

Milk Formula for Premature Babies

Infantile milk formula specially designed for the feeding of premature infants with very low birth weight.

Fortified Milk Purita

26% fat instant powdered cow milk, fortified with vitamin C, Iron, Zinc and Copper. Gluten free.

Mi Sopita

Cereal and legume-based powdered food for preparing an instant infant cream soup. Fortified with vitamins and minerals.

Purita Cereal

Powdered food for preparing an instant dairy beverage with semi-skim milk and cereal. Fortified in vitamins and minerals. Reduced in fat, high in calcium and vitamin C and E.

Purita Mamá

Powdered food for preparing an instant dairy beverage with milk, dairy solids and cereal, fortified with vitamins and minerals, omega 3 fatty acids (docosahexaenoic acid, DHA), low in sodium and fat.

Special Formulae (EIM)

Products free of the amino acids committed in the altered metabolic pathway, fortified with vitamins, minerals and other essential nutrients.

Initiation Formulae

Special Formulae (Cow's milk protein allergy)

This is a public market of 18,000 tons of powdered formulas, for a period of one year. There are technical and administrative specifications in order to access to apply for tenders.

2.7 Exports

Export products that stand out are the following:

EXPORT		2014	2015	2016	2017
Condensed milk (HS 040291 e HS 040299)	TOP importers	28	28	29	29
Whey (HS 0404)	TOP importers	12	9,6	15	15
Infant milk formula (HS 190110)	TOP importers	22	20	24	24
Liquid milk		5,3	0,6	1,0	1,2
SMP		2,0	0,6	1,7	1,0
WMP		21	6,3	6,8	4,1
Yogurt		0,4	0,3	0,4	0,3
Cheese		8,4	5,5	5,0	9,4
Dulche de leche		4,6	4,9	5,4	5,7

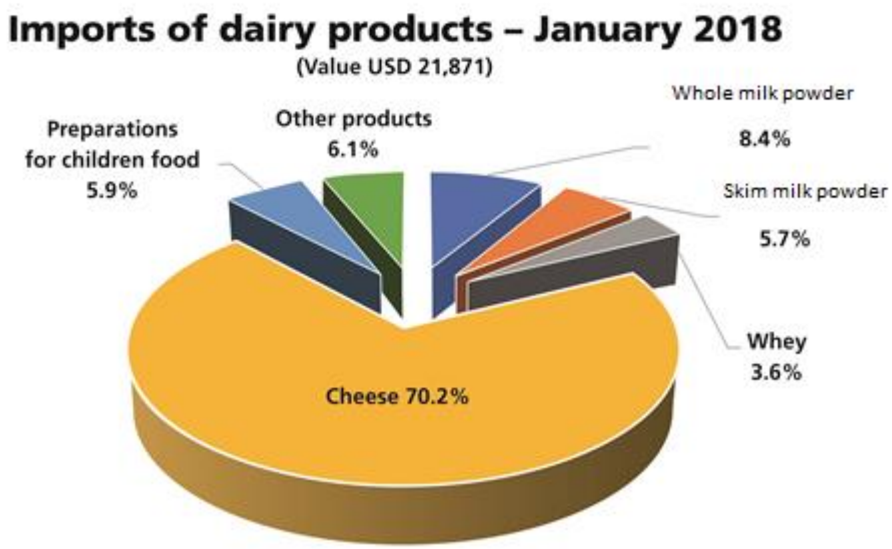
[1]

50% of condensed milk goes to the USA and the other 50% to LATAM countries.
Exports of infant formulae correspond mainly to LATAM countries.
For whey products (mostly whey powder), the main destination is China, then Korea and Peru.

2.8 Imports

Cheeses lead imports according to a report of the Oficina de Estudios y Políticas Agrarias (ODEPA) dated January 2018.
With 70.2% of the total, cheeses lead by a wide margin the imports of dairy products in the first month of 2018, which is equivalent to a volume of 3,945 tons.
Further back, the import of Whole Milk Powder (WMP) appears in a second position with a participation in imports of 8.4%, equivalent to 576 tons and USD 1.8 million CIF.
In the third place is the Skim Milk Powder (SMP) with a share of 5.7% in the total imports, reaching 626 tons and, in terms of value, of USD 1.2 million CIF. In the fourth and fifth place, we find infant formulae and whey, reaching 5.9% and 3.6% of the shares, respectively. This is equivalent to 230 tons for a value of USD 1.2 million CIF for the case of children preparations, and 373 tons for whey.

[1] Export products (thousands of tons) Source: CLAL.IT



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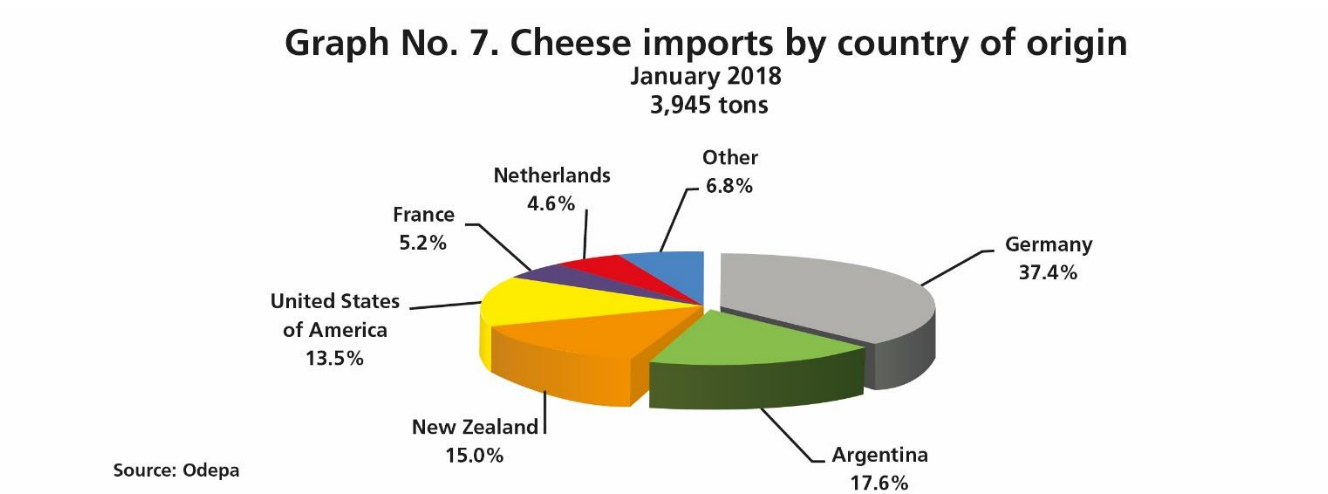
Regarding the origin of cheese imports, Germany leads the list with a market share of 36.4%.

The second country of origin of major cheese imports is Argentina, whose market position in January 2018 reaches 17.1%, totaling 676 tons.

New Zealand is in the third position, whose volume represents 14.6% of the market in the first month of the year and reaches 575 tons. This figure implies a fall of 31.8% compared to 2017.

Imports from other countries and their share:



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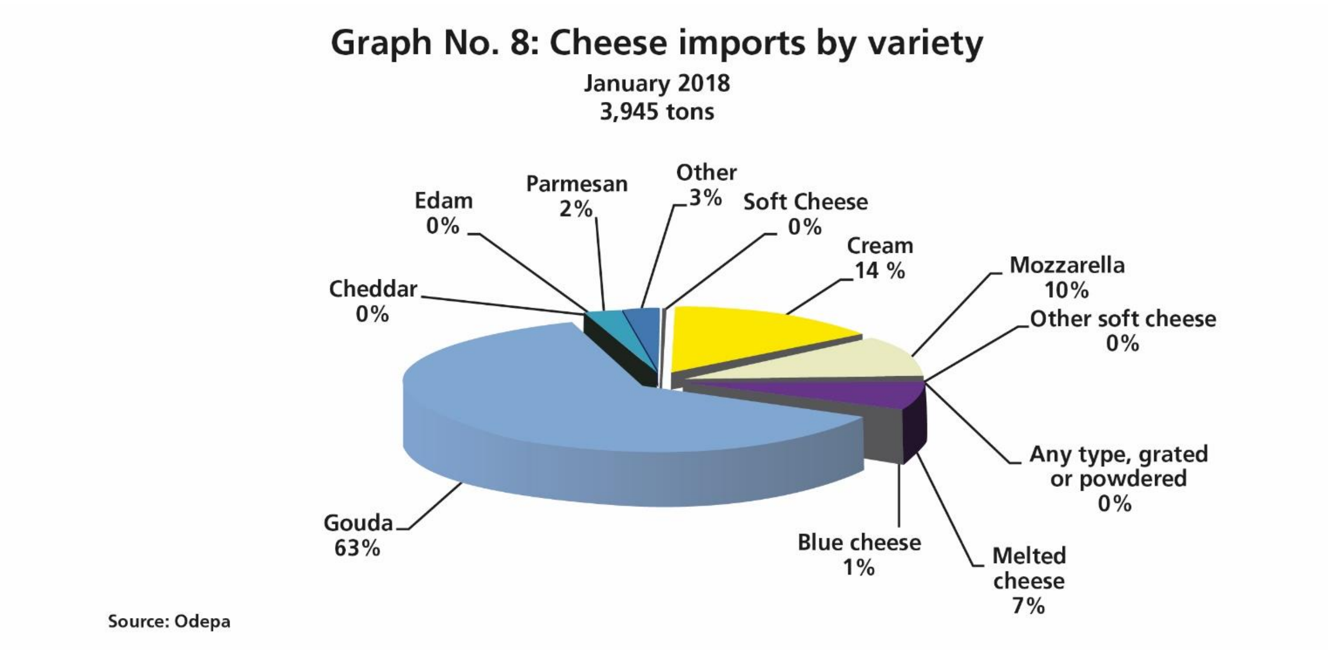
[2] Import of dairy products. Source: ODEPA

Regarding cheese imports by variety, *gouda* has the greatest share with 63%, followed by cream cheese with 14% and mozzarella with 10%. Together, these three products account for 87% of imported cheese in the first month of 2018.



Graph No. 8: Cheese imports by variety

Source: Odepa

DPC LATAM
Dairy Processing Consultant

3- **Dairy business development opportunities**

3.1 Strategic analysis

For a South American country, with excellent sanitary barriers for food production, and with a geographical distribution concentrating the production of milk in the south of Chile, interesting opportunities for developing business with current companies and new projects arise. The political and economic context is broadly favourable, since there is a relationship between institutional stability and continuity in the state policies of the current governments, with a legal certainty on a long-term horizon. Chile has 27 Trade Agreements with 64 markets, which represent 63% of the world population and 86.3% of the global GDP. Currently, it is part of the Pacific Alliance, together with Peru, Colombia and Mexico, and, as a block, it seeks to have a positive impact on the dynamism and international trade rules of the 21st century. In the multilateral context, it represents and defends interests in international organizations: APEC, OECD, WTO, WIPO. These free trade agreements have favoured the export sector with significant tariff reductions and the elimination of tariff barriers in the markets of trading, and it has also been possible to reduce the transaction costs with more agile customs, greater business mobility and the boosting of investments.

This is why the possibility of developing business in dairy projects requires a strategic analysis that analyses the competition, the market, certain regulations, competitiveness, the origin of the raw material, new projects of dairy plants and technology transfer.

Competition analysis

In the domestic market, only three groups of global companies such as Fonterra, Lactalis and Nestlé operate through their subsidiaries, and this is an important aspect of the international presence.

It is worth mentioning that in the last Investment Forum held in Santiago, which took place last month, Saputo company was devoted to studying the competitive advantages that Chile has for dairy production.

Emmi, an European company (the largest milk producer in Switzerland), is part of the Kaiku group in Spain, and through this alliance, in 2012, it entered Chile to take over Surlat, a cooperative of dairy producers.

Competitiveness analysis

The hypothesis to be developed is if the dairy companies are facing a "competitiveness problem". In this sense, we have to evaluate two links that are critical: primary production and the dairy industry. One sign may be that a significant percentage of dairies or milk production units do not have the minimum size to operate profitably under the national and international competitive conditions. There has been a stagnation of production in the last eight years, and production was affected in certain conditions by payment prices to the producer with little or no profitability. The Chilean dairy industry is a heterogeneous sector, with many companies of different sizes and productive orientation and only some with an exporter profile.

Competitiveness is the ability of an industry to gain and maintain market shares in a profitable way, both in the domestic and international markets. We must also bear in mind that there are companies more oriented to commodities and others to added-value products. In general, there are measures that define competitiveness in terms of cost, profitability, productivity and efficiency advantages, and other variables linked to the quality and different origins of the raw material.

In the external market, the dairy industry offers some products without any differentiation ("commodities") such as *gouda* cheese, condensed milk, whey powder and milk powder in high volumes. In the domestic market, the situation is different. In general, the unit volumes are much lower, and the degree of differentiation is greater (although there is a large presence of scarcely differentiated products, particularly in the cheese segment). The prices of the external market affect the domestic market, and this is what eventually determines the price of the raw material for producers.

The main variables that determine the cost of processing in the dairy industry are the scale, the use of installed capacity, technology, the cost of inputs and factors such as manpower/energy, logistic costs and certain costs of the institutional environment (taxes, regulations).

Regarding the scale, one of the relevant characteristics, especially in comparison with the global competitors of Oceania, Europe and North America, is the low scale of the plants, not only regarding the small cheese industry but also in the export sector. The cost of manpower is generally high, and the logistics and export costs are favourable and competitive.

National market analysis

In items 3.2 Development of New Products and 3.3 Transversal Opportunities, the opportunities that are envisioned in the national market have been analyzed.

The national market is also very open and very receptive to imported packaged-at-source products.

Chile is ready for entrepreneurship and it appears as the most innovative country in the region. There are many initiatives with government and university support to establish new businesses.

The integration of the geography north/south and south/north is very well developed because the logistics of transporting processed products from production centres to consumption centres is linear, efficient and competitive.

Regulatory analysis

The national market, through consumers and government authorities, is following the changes introduced in the food and dairy product formulae. In a recent study, conducted by a group of universities (Ref.6), it was concluded that Ley de Etiquetado Nacional is changing the consumption habits of Chilean mothers. This act, launched in June 2016, was the first of its kind in the world, and is being closely followed by international organizations. In the study, several Focus Groups realized many mothers perceive a cultural change into a healthier diet, since they received messages from the media and schools; and mothers are the ones who making purchase decisions at home.

Last year, following the growing influx of imported cheese and skimmed milk powder, a group of Fedeleche producers asked the government to apply safeguard measures at 30% for milk powder and 27% for cheese, but the request was not accepted. The government argued that this was due to an unforeseen cause of events, and the injury to the national milk industry was rather caused by internal factors such as the market power of the industry and weather conditions such as drought.

Certification of Origin

One strategy that is beginning to be appreciated by consumers is producing fresh, double-certified milk for grazing and animal welfare. In Chile, this concept already exists for eggs in "free chicken eggs" (Ref.7), which indicates the preference for eggs from non-housed, naturally fed chicken and large and healthy eggs.

This strategy is proposed for milk, following the Spanish model of Milbona Milk. This kind of milk is only sold by one chain on a national level. It comes from cows grazing regularly in the open air and having higher standards of animal welfare. It is also a challenge to develop hormone-free livestock.

At an official level, the concept is advancing within the Consorcio Lechero, by means of a protocol offered to the associated firms as well as a project of standards for farms.

New dairy plant project

It is possible to consider the acquisition and/or integration with local medium-size companies within the dairy industry, according to the board of companies of the ILMa, and preferably located at Los Ríos Region and Los Lagos Region, where milk production is concentrated.

Another possibility for integration is with a company of regional scope, in order to exploit together functional ingredients from dairy raw materials.

The national government is favouring the development of cooperative enterprises and the association between dairy producers. This strategy begins to take shape and two recent examples will be presented.

"Campos Australes" case. As a reaction of the local dairy producers to certain industries that have preferred importing rather than buying the raw materials locally, the Agricultural and Livestock Society of Osorno (Sago) (Ref.8) and Manuka (Ref.9) formed Campos Australes, an ambitious project. created in 2017.

With the idea of imitating the successful model of vertical integration of Colun and ensuring the course of the future of dairy entrepreneurs in the field, this cooperative was formed that is aimed at becoming a new processing plant by 2020.

The model is an industry that works for farmers, according to their needs, targeting a primary sector, very interconnected with industry; considering the possibilities to develop a long-term business model.

"Futurocoop" case. In the midst of the Government's purpose to enhance the associativity in different productive activities, the company Chilterra decided to follow the cooperative model of Colun in the regions of Los Ríos and Los Lagos. For such purpose, since 2018 they have been meeting with 200 milk producers in the area and decided to set up a new cooperative, which is called Futurocoop.

Farmers connected to this project - whose property is controlled by Chilean people - are not starting from scratch in the field. Together, the members of this entity have about 16,540 hectares, 23,100 milking cows and around 20 thousand calves. In terms of dairy production, Futurocoop members produce an approximate total of 115 million litres per year.

In order to boost growth, in Futurocoop, they have already decided to take another big step. The company plans to make an initial investment of 12 million USD in a modern automated plant. Chilterra is among the most important members of the cooperative.

Technology transfer

The existence of certain technological platforms, mentioned in Stakeholders of the First Report may be receptive in the presentation of innovative technologies in certain areas such as: industry wastewater re-use, packaging with highly recyclable materials, emerging process technologies with membranes.

3.2 New product development

In the first part of this report, we have analyzed the different products innovating in their categories. In this chapter, we confirm those trends that are currently most relevant in Chile, and we focus on dairy products or dairy businesses that could be of interest for dairy companies and for companies producing functional ingredients as well as opportunities that are transversal for all dairy categories. Within the products presented as innovation, there exists a possibility of developing other categories or expanding their portfolio with other products that add value.

CHEESE

- Finlandia style cream cheese. These cheeses sold in plastic cups are produced from protein concentration processes and centrifugation and are snack products. Two Argentinian products are used as an example:

- Processed cheese in plastic cups. This type of product is melted cheese from cheese pieces from the extremes of wheel cheese and is mixed with melting salts, and butter. This line of products makes the category of cheese as complement very profitable. Only one company produces this cheese in Chile, and it has an important potential market.
- Diversifying the presence of ripened cheese with other varieties: cheese with eyes, *Edam* and *Gruyere*.
- Soft cheese, in pieces, cuartirolo and Port Salut cheese, which is a product with a humidity percentage between 50 and 53. This cheese is used for pizza, at home, and for all prepared meals in general. It is a cheese of short shelf life, less than 60 days, of low technological requirement in its preparation, and it is highly profitable.
- Cheese mousse, petit-suisse style. It is an aerated product, also used for desserts.
- Hard cheese. Cheese boards are appearing in the market, which apart from incorporating an assortment of cheeses and nuts, suit certain wines. Since wine is one of the most significant products of the national market, and it is a widely exported product, it is very attractive to develop an offer of hard cheese that accompany wine. Starting with that cheese, the manufacture of grated cheese can then be developed.
- Cheese for pizza of the "analogue" type.

  There is a strong demand for cheese for pizza, omelette, pasta, sauce (dip), chicken, hamburgers, sandwiches and tacos.

  These analogue cheeses are "cheese-like" products made with: casein, vegetable fat, water and other ingredients such as skim milk powder, flavouring, colouring and emulsifiers. These cheeses, compared to the traditional ones, can achieve lower production costs, longer shelf life, greater technical resistance to the cold chain, higher profitability because they do not lose whey, possibility of adding vitamins and minerals, and greater control over colour, taste, texture and spreadability.

- Developing cheese boards with a wider selection of cheeses, with ham, nuts and vegetables (carrots).

- Cheeses are used as snacks. Developing a pack of *gauda* cheese bars to compete in the category of healthy snacks for children, and enter the "ready to eat" world. New technologies are necessary for cutting and preparing the snacks, and then need special packaging machines.

- Cracker cut cheese. This product is sold in US supermarkets and is of interest since crackers of this size are sold in Chile, and because local consumers are followers of the American market products.

UHT PRODUCTS

- Vegetable creams.

Since creams are consumed in UHT format, the production of UHT products can be continued but also manufacturers can make a foray into other products such as Vegetable Creams. This is a UHT cream made with vegetable oils, sweetened with sugar, with a touch of vanilla, and it is recommended to be used in pastry and ice cream shops. It has a good dairy flavour and very good over-run.

- Milk with soluble fiber

By means of the addition of polydextrose, beta glucan, this milk helps reduce the content of sugar and fat. The Dairy category is key to the growth of fibre products.

- Milk and whey beverages

Whey is produced in large quantities and can be used with low added value, such as whey powder. Properly “preparing” this raw material of high biological and nutritional quality for "taking the whey" and developing milk and whey beverages is very interesting.

- High-protein beverages

This driver is already installed as a significant trend, and therefore it highly likely to keep developing:

- PBB (Plant Based Beverages).

While some dairy companies such as Chobani and Danone have incorporated plant-based beverages in their product portfolio, it can be seen that companies are following the position of FIL-IDF. The messages that FIL-IDF gives are that milk (cow's milk) is a natural product, and plant-based beverages are formulated products. Milk (cow's milk) is a product with minimal processing: standardization, homogenization, thermal treatments and no extra ingredients. Plant-based beverages are produced with many processes: liquefaction, deodorization, addition of different ingredients and additives and thermal treatments.

- UHT process pasteurized yogurts for the Chinese market. This market is supplied by European and Chinese companies. There is a great possibility for exporting from Chile since this export route is very developed. The products referred to that have been taken from China are the following:

REFRIGERATED PRODUCTS

- Production of pasteurised fresh cream in cups, in cold chain, with higher fat content 40-45%, to compete with UHT creams with 35% MG and with many formulation ingredients. This is a proposal that reaffirms the "Clean Label" trend.
- Firm yogurts, produced with set technology, which are coagulated in a pot. This product contains a smaller amount of additives/thickeners, but requires special manufacturing conditions, and logistics with greater care in handling the product.
- Yogurts plus cereal mix. There is a great potential for producing yogurt and cereal/candies based products.

- Pack assembly lines of yogurts with different flavours. It is a presentation required by retail market and generates an important volume of purchase; the challenge here is to lower the costs of manual activity by means of more automated lines.

- Two-layer desserts, as Nestle's Chandelle

INFANT MILK FORMULA

The Infant Milk Formula segment for 0-6 months, Continuation for children of 6-12 months, and for children over 1 year old, in liquid and powdered formats, are all imported. Therefore, there is a possibility of transferring technology to a dairy company to allow for access to this category, or carry out a *maquila* with its own brand from abroad, or also enter into this market with an external product. There have been proposals for technology transfer for formulae in the segment Children +1 and Children +4, but this entails a higher technological requirement for a dairy company and, in some cases, they have to qualify as a "pharma" industry. In any case, it is a trend to develop milk with high added value.

This segment should supply the national market, but should also be strongly oriented to the international market, such as China.

The volume of "infant milk formulae" that enter Chile and the suppliers are shown in the following table:

Country	Annual					Jan-Nov		
	2013	2014	2015	2016	2017	2017	2018	± % su 2017 *
Mexico	2.025	1.889	2.395	1.464	1.940	1.797	2.035	+13,25%
Ireland	341	478	515	552	619	574	444	-22,62%
Brazil	383	483	486	442	573	496	41	-91,71%
Canada	50	425	475	275	375	350	324	-7,48%
Netherlands	186	214	110	152	240	226	93	-59,07%
Argentina	150	193	290	144	139	114	102	-10,80%
United States	55	24	15	42	32	32	15	-54,20%
Spain	9	14	10	10	15	15	42	+173%
Germany	0	3	0	1	7	7	9	+33,91%
Switzerland	-	-	0	0	6	6	12	+92,94%

IMPORT CHILE: Main 10 suppliers of Infant milk formula in year 2017 (Tons)

Source: **Processed by Clal based on IHS data**
* Change from the same period of previous year.

WHEY

In this report, we analyse how cheese companies and dairy companies in general could be interested in changing the use of whey. It seems appropriate to understand that an innovation in this subject must be considered as a new and systemic solution, or non-trivial change to some of its components, which addresses a need and produces results that make it sustainable. But the key is in the need, not in the idea. Chile's game should be upgraded. Thinking about innovation as generating new ideas can be somewhat limited. How could this be handled? By increasing the process requirements to access innovation funds, and showing interest from technology suppliers.

The imported whey market is reflected in the following table:

DPC LATAM
Dairy Processing Consultant

IMPORT CHILE: Main 10 suppliers of Whey in year 2017 (Tons)								
Country	Annual					Jan-Nov		
	2013	2014	2015	2016	2017	2017	2018	± % su 2017 *
United States	1.227	957	1.343	1.425	2.864	2.478	3.338	+34,72%
Argentina	2.308	2.211	2.835	1.965	2.271	2.077	2.516	+21,16%
New Zealand	305	230	205	229	409	384	386	+0,64%
Netherlands	5	0	-	-	384	288	-	-100,00%
Poland	301	241	242	307	220	220	329	+49,32%
Canada	29	2	0	1	77	77	701	+812%
Denmark	70	78	79	72	68	68	228	+234%
France	30	32	31	29	23	23	23	-2,15%
Spain	0	-	-	-	0	0	53	-

Source: **Processed by Clal based on IHS data**
* Change from the same period of previous year.

In order to be more precise, regarding certain products that can create opportunities for the change mentioned in, the following topics of interest are presented:

- Tagatose

Chilean nutritionists confirmed that tagatose has an effect on dietary therapies and that it helps maintain sugar and insulin levels in blood. In more than 10 years of research, scholars showed the effects of this sweetener, made from whey; it has considerable advantages: it is 90% sweeter than sucrose and has a glycemic index close to zero, both in animals as in humans. The challenge is to develop this technology on an industrial scale, as currently the main issue is its high price.

- Galacto-oligosaccharides (GOS)

There exists a possibility of developing a system for the production of galacto-oligosaccharides (GOS) by using immobilized enzymes. This alternative makes it possible to revalue the use of lactose by considering it as the raw material for GOS. The immobilized enzymes process makes it possible to manufacture a product that is economically attractive in terms of production, since it is currently expensive for the dairy industry to prepare this prebiotic, used for Infant Formulae.

Globally, in 2013, the prebiotics market had a production of 581 tons, and it is estimated that by 2020 this figure will increase to 1,084.7 tons. In addition, the prebiotics market includes different types of ingredients, among which three segments stand out: inulin, galacto-oligosaccharides (GOS) and fructo-oligosaccharides (FOS). Of these, inulin is the one that has the highest share in the prebiotics market with 42.63%, followed by the GOS with a 16% share.

As regards the galacto-oligosaccharides market, it is worth mentioning that it reached a commercialization volume of 94.1 tons and it is estimated that by 2020 this figure will increase to 175.7 tons, which would be equal to 1.01 billion dollars, that is, a compound annual growth rate of 9.3% from 2014 to 2020.

- Hydrolysed whey proteins (HWP, HWPI and HWPC)

These proteins are of interest as supplements for athletes to be consumed before, during and after training, when rapidity in the absorption of proteins into the blood flow is sought.
After separating whey proteins from casein, a whey protein concentrate is obtained. The hydrolysing of these proteins is manufactured through a hydrolysis process, in which the long-chain amino acids are pre-digested by enzymes, which then favour their digestion in the human body, reducing the risk of gastro-intestinal disorders.
What limits the production of these proteins is their high cost.

- Yeast biomass

There exists a possibility of taking advantage of a by-product such as the whey permeate (obtained from the ultrafiltration process), and generate, through fermentation reactors and crops of the Saccharomyces type, a biomass of yeast. The final product is a food grade based inactive yeast, as an intermediate product, which can be supplemented in another stage with vitamins and minerals.

This nutritional yeast has the following benefits: quality digestible protein, no cholesterol, and contains vitamin B, minerals, and dietary fibre.

3.3 <u>Transversal opportunities</u>

- Products for the elderly

In Chile, the adult population increases to the same percentage as the 15-year-old group, so adult foods should be also considered. Chile's life expectancy is similar to that of developed countries, which is why there are great opportunities in the diet of the elderly.
At this age, there is a loss of muscle mass and it is necessary to develop soft and easy to swallow foods.
The age group of the elderly in Chile is rapidly increasing. Clear data indicates that in 2015, 15% of the population were elderly people; while in 2050, this number is expected to double for 30% of the population, according to INE studies. This market for products for the elderly has not taken off yet, and mostly imported products such as Ensure are consumed. Thus, there is a great opportunity for the development of new products.

- Butters made with other oils.

- Products for cow’s milk protein allergies for children.

A commercial product has been developed in Chile: donkey's milk. The use of donkey’s milk has shown excellent results in several clinical studies of infants with cow’s milk allergy, obtaining an excellent response in infants who had not responded to other formulae and with similar nutritional content and palatability to that of breast milk.

- High Pressure Processing (HPP)

One of the emerging technologies that has arrived in Chile is HPP, now used for the production of juice and smoothies. This technology drastically reduces the contaminating microbial flora, inactivates pathogenic microorganisms, does not generate waste and is very well accepted among consumers.
The following possibilities are presented in Dairy products:
Cheese The high pressure processing of fresh cheese can improve ripening (slowing it down or accelerating it), eliminate pathogenic bacteria and considerably improve the shelf life of the product. It can be a great option also for the cold pasteurisation of cheese made with fresh milk.
Yogurt The different barosensibility of microorganisms can be used to select the most suitable ones using High Pressure Processing technologies. A post-packaging intervention could offer the following advantages to the dairy sector:

- ✓ Inactivation of mold and yeast and conservation of the product of up to 3 months.
- ✓ Reduction of the presence of lactobacilli, significantly reducing the acidification of the product.
- ✓ Inactivation of all unwanted bacteria and survival of the preselected probiotic strain.

- Refrigerated channel. Companies are seeking to reduce the release time of refrigerated dairy products such as yogurt, for delivering them to distribution chains, since the period to receive these short life cycle products is, in some cases, 25% of their shelf life. This will be feasible in some cases with cooling tunnels.

- On-line market. Supermarkets are migrating to this market, and this will be possible with packaged products.

3.4 Packaging development

Potential opportunities for the Packaging area are those related with the concept of Circular Economy and with developments oriented towards the recyclability and biodegradability of the material structure of containers & packaging.

The new legislation in force, called REP act (Ref.10) for Packs & Packaging, establishes regulations for generators-consumers of how they must deliver their waste, and for those who handle waste, of how to do it in an eco-friendly manner.

It is interesting to present the following study analysing the trends and attitudes of Chilean consumers towards recycling and composting:

According to the survey "Trends and attitudes of Chilean people towards recycling and composting" made by Cadem, 80% of Chilean people believe the main problem of pollution is the amount of waste generated.

The study also showed that 64% of the surveyed agreed or totally agreed that "most products that you buy are not recyclable or compostable."

In relation to recyclability, the PET structure (polyester terephthalate) of beverage containers is highly recyclable, but PET oil containers are not recyclable because of the product remains and the difficulty of cleaning them. Although BOPP (polypropylene) containers are recyclable, recycling companies for this product have not yet been created.

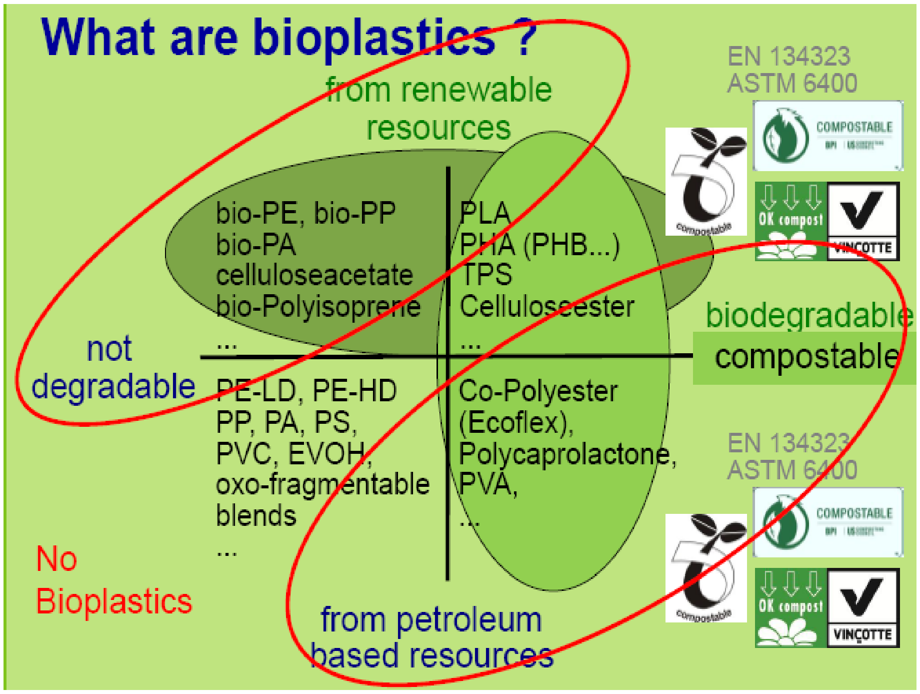
There is a case in Chile of PET bottles recycling, and the companies that participate are Recipet and Typack. The containers collected at a clean point can go through a recycling process that transforms them into other types of packaging. In this case, Recipet recovers and recycles the containers and Typack converts them into fruit containers.

The size of the Containers and Packaging market presents the following growth:

Type of Packaging	Growth Rate (%)	2010 *ton/year*	2016 *ton/year*	2021 *ton/year*
All	4.3%	355,934	458,222	565,584
Film and bags	3.6%	147,055	181,819	216,989
PET	10.7%	50,451	92,845	154,346

According to this study, most of the companies are developing the following changes in packaging: reducing the thickness of materials, looking for new materials such as compostable plastics, evaluating the bilaminates and trilaminates of a single material, changing the type of plastic material of containers and migrating to polypropylene and PET, and lower the thickness and weight of corrugated boxes.

A project being worked on is the development of bioplastics from whey. There is a possibility of obtaining the PHB (polyhydroxybutyrate) on an experimental scale, and it is still necessary to take it to an industrial scale. This is a biodegradable and compostable plastic, produced by bacteria from reasonable resources, as shown in the following scheme:



3.5 Sustainability

The agricultural sector has great development opportunities at the national and international level: the growing demand for food; preferential access, derived from trade agreements, for a great part of the world's consumers; and the favourable production, health and phytosanitary conditions that Chile has constitute a favourable environment for developing Chile's productive and business potential. However, it faces a series of challenges for making this development sustainable in the long term. On the one hand, it must increase its productivity in order to be more efficient in the use of natural resources, to adapt to the new weather patterns, and increase its environment protection and, on the other hand, it must comply with consumers' high demands of compliance with ethical and quality standards, including working conditions and the relationship with their territorial environment, that is, ensuring that both the product and the production process protect the development of society. The dairy sector, in particular, will also have to face these challenges to stay competitive over time.
Additionally, in the international agenda, sustainability is increasingly positioned as a strategic axis of development. This is how, in 2015, the Sustainable Development Goals of the United Nations were agreed on. Countries committed themselves to work towards the achievement of 17 goals, which consider, among others, the eradication of poverty and hunger, the fostering of sustainable consumption and production patterns, the protection of terrestrial environments and the efficient management of water. Chile executed the commitment to meet these goals by 2030, for which the participation of the productive sector is essential. Within this framework, the Ministry of Agriculture has set the goal of "Encouraging a competitive agro-food and forestry sectors based on environmental and social sustainability".

The Consorcio Lechero has presented a Sustainable Development Agenda to 2021, to increase its contribution to society through a program of balanced, nutritious and healthy diets, to contribute to the economy through the generation of income, work and local development, and by avoiding pollution, making efficient use of natural resources and promoting the biodiversity of their grazing systems.

Worldwide, with the relative support of social networks, consumers have become increasingly inquisitive and demanding with the food they eat. While there may be an intention to challenge the soundness and accuracy of the messages that are shared, the reality is that consumers are more influenced by those with whom they relate as opposed to the science behind their statements. In addition to the nutritional aspects of food, consumers now want to know that products were produced responsibly.

A Sustainable Development Agenda is a statement that provides an intention, a strategic direction and a framework for action to systematically address the multiple challenges of the sector. It includes the priorities that facilitate the integration of sustainable development within policies, programmes and operations. It is an initiative in which the three pillars of sustainability (economic, social and environmental) support decisions on the present and future development of the sector.

Of the categories proposed by the "Dairy Sustainability Framework" at the global level, a priority analysis was made and 13 opportunities were set that represent the axes that will guide the path to sustainable development of the national dairy sector by 2021, which are presented in the attached table:

ECONOMIC PILLAR	Market development	**Opportunity 1.** An environment with higher trust within the dairy chain.
ECONOMIC PILLAR	Market development	**Opportunity 2 and 3.** The foreign and local markets booth growth of the sector.
ECONOMIC PILLAR	Rural economy	**Opportunity 4.** Urban and rural communities value the socio-economic impact of the sector.
SOCIAL PILLAR	Labor conditions	**Opportunity 5.** Compatibility of labor legislation with the workday of dairy companies.
SOCIAL PILLAR	Labor conditions	**Opportunity 6.** Availability of people to work in dairy companies.
SOCIAL PILLAR	Animal wellbeing	**Opportunity 7.** Animal wellbeing makes dairy herd stand out.
SOCIAL PILLAR	Safety and innocuousness	**Opportunity 8.** Quality, safety and innocuousness in the entire dairy product offer.
ENVIRONMENTAL PILLAR	Water	**Opportunity 9.** Water resources available for dairy industry.
ENVIRONMENTAL PILLAR	Waste	**Opportunity 10.** Adequate management of purine at the farm level.
ENVIRONMENTAL PILLAR	Waste	**Opportunity 11.** Proper management of liquid waste in processing industries.
ENVIRONMENTAL PILLAR	Waste	**Opportunity 12.** Reduction, recovery and recycling of solid waste in the dairy chain.
ENVIRONMENTAL PILLAR	Greenhouse effect gases	**Opportunity 13.** Reduction of GEG emissions nationwide.

Source: Chile’s Sustainable Development Agenda for 2021– Consorcio Lechero

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(6) Joint work of the Diego Portales University (UDP), University of Chile and University of North Carolina (USA), based on nine focus groups with groups of 7 to 10 mothers of pre-school children and adolescents from different economic sectors of Santiago, held in 2017, one year after the enactment of the Food Labeling Law.
(7) Free chicken eggs: http://www.huevosdegallinasfelices.cl
(8) SAGO: Agricultural and Livestock Society of Osorno AG. http://www.sago.cl
(9) Manuka: Dairy company with New Zealand shareholders. http://www.manuka.cl
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