IMPROVING DAIRYING IN CHILE: A COMPARATIVE STUDY WITH DAIRYING IN AUSTRALIA

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ABSTRACT

The Chilean Dairy Sector is currently experiencing a period of productive growth which enables it to take advantage of a market opportunity from increasing demand from developed economies. Consequently, most members of the Chilean dairy value chain are searching for production improvements in order to transform the sector and create productive and economically efficient industrial conditions to meet global demand. Nevertheless, expectations about the potential competitiveness of the Chilean dairy industry in global markets are divergent, not only because it is an industry in an early stage of development but also because of some key characteristics of the domestic market and the structure of the economy.

In order to assess the competitive position of the Chilean dairy production in international markets, the core aim of this thesis is to compare the performance between the Chilean and the Australian dairy industries. Formulated research objectives and questions are answered by the application of three selected business theories regarding strategic analysis (competitive advantages, competitive forces and the value chain).

Based on the diagnosis of the Australian dairy industry this investigation leads to a group of recommendations for the Chilean Dairy Industry oriented to boost production systems, reduce costs of production, improve information flows and contemplate environmental aspects. This is also a broad, mixed research inquiry because it attempts to integrate some macroeconomic and social variables impacting on industry development.
DECLARATION

This is to certify that

i. the thesis comprises only my original work towards the MPhil except where indicated in the preface,

ii. due acknowledgement has been made in the text to all other material used,

iii. the thesis is less than 50,000 words in length, exclusive of tables, maps, bibliographies and appendices.

__________________________________________

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CHAPTER ONE: INTRODUCTION

1.1 BACKGROUND

Cow’s milk consumption comprises 84 per cent of the world milk production. Fresh milk is transformed into several dairy products, such as fluid milk, powder milk, cheese and butter, which are sold under different brands according to manufacturers.

Milk and other dairy products are highly nutritious, providing energy, carbohydrates, proteins, vitamins and minerals. Highly recommended after breast milk as a rich source of calcium, milk plays an important role in diets for both children and adults (Latham, 1997).

Some countries produce more milk than domestic needs while other countries cannot produce enough to meet demand. Milk products are exported by those nations that can cover their domestic consumption while maintaining an exportable surplus. Exporters need to be price competitive.

Global milk production can be characterised by:

1) Very few countries being self-sufficient in milk production;

2) The main milk surplus-countries are the United States (US), the Europe Union (EU), Eastern Europe, New Zealand, Australia, Argentina and Uruguay;

3) The main milk-deficit countries are Middle Eastern countries, Algeria, China, Japan, Mexico, the Philippines and Russia; and

4) Highly regulated domestic markets arrangements (such as subsidies, quotas and trade barriers) are present mainly in the United States and the Union Europe.

In general, dairy products are valuable and their demand is likely to increase in line with population and income growth (Organisation for Economic Co-operation and Development OECD - Food and Agriculture Organization FAO, 2011). However, dairy products supply is not assured because of factors impacting on production, especially variable climate conditions.
Nevertheless, market globalisation offers developing countries the opportunity to integrate into world trade (United Nations Economic Commission for Latin America and the Caribbean ECLAC, 2002). As a result, new suppliers are expected to emerge in the international dairy market.

In 2005 the Food and Agricultural Organization (FAO), stated that as a result of a stable economic growth and revalued currencies, countries in South America had improved its competitive positions and should sustain an increasing production and trade of milk (OCDE - FAO, 2005). Argentina, Brazil and Uruguay have shown themselves to be competitive compared with other low cost dairy producers based on large pasture production systems, such as New Zealand and Australia (OCDE-FAO, 2005). Moreover, the FAO has since stated that countries such as Colombia, Peru and Chile might increase their dairy production above the world average growth rate (OECD-FAO, 2010).

An important gap of information was identified in Chile before venturing in this study. Therefore, the aim of this thesis is to collect, organise and analyse a wide range of data to assess possible future development and competitiveness of the Chilean dairy industry. The Chilean dairy industry’s competitive position can be assessed by a comparison with another global dairy supplier, such as Australian dairy industry. Such a comparison can be made by systematically assessing the whole industry.

In the rest of this section an overview of world milk production and trade are presented to motivate the development of the research questions and proposal for this thesis.

1.1.1 World Milk Production

In 2009 annual milk production growth was forecasted to be 0.6%, below the 2% average growth of the previous decade. Milk production has maintained a steady increase since 1994, reaching a peak of 583 million tonnes in 2009 (International Dairy Federation IDF, 2010).

Despite the global increase, dry conditions in some important suppliers such as the EU and Australia saw their production decrease during 2009. On the other hand, some countries such as Denmark, Belgium, the Netherlands, Germany, Pakistan, Turkey, and Iran expanded their
production. In particular Belarus achieved 5.7% annual growth to become a new global supplier of butter and cheese. New Zealand, the largest world exporter increased sharply by 8% while India, the largest milk producer, increased its production by 3.3%.

Milk deliveries to processing plants rose by 0.3% in 2009, a lower rate compared to the 2.1% annual rate from 2000 to 2007. An important decrease was observed in the EU, the US, Japan, Australia, South Africa, Korea, Norway and Ukraine (IDF, 2010). However in some countries, milk deliveries increased despite a decrease in production - such as China - or a lower rate of increase in production, such as Russia (IDF, 2010).

1.1.2 Dairy Products

Manufactured products from milk mostly include: whole milk powder (WMP), skim milk powder (SMP), butter and cheese.

In general, production of all dairy products, except WMP, rose during 2009 and the FAO predicted that production and consumption of dairy products will follow the same trend until 2014. Production of WMP, cheese and butter will be consumed in quasi-equilibrium, but SMP will reach a deficit of 183,000 tons in 2013 (OCDE-FAO, 2005).

If these predictions are correct, a market opportunity might arise for SMP. The FAO also projects that only Brazil and Argentina in South America will show an increase in the next three years and “other Latin America countries” will maintain a deficit between production and consumption of SMP which is even acuter for WMP (OCDE-FAO, 2005).

1.1.3 Dairy Consumption

Global milk consumption is almost equal to world milk production, including human consumption, milk used for feed purposes and for technical applications (IDF, 2010).

In 2009 milk consumption was 703 million tonnes milk, an increase of 21% compared to 2000, but also a decrease of 0.4% compared to 2008. The FAO estimated that global per capita
consumption of milk in 2009 was 103.0 kg for a global population of 6.83 billion people (IDF, 2010).

Milk and dairy product consumption is influenced by population growth, income increase, prices and the amount of milk that each person is willing to consume (International Farm Comparison Network IFCN, 2010) and more recently by the escalating popularity of dairy products (OECD-FAO, 2011).

1.1.4 Global Dairy Trade

The major importing markets for dairy products are the Middle East, Central and South America, North Africa and South East Asia. However, various categories of dairy products present variations in their trade flows.

While the US and the EU are major consumers of dairy products, only a small share of local demand is met through international trade, because they are important milk producers.

The main dairy product exporters are New Zealand, the EU (as a block) and Australia.

The main world dairy manufacturers by international presence (dairy leaders in different countries) are Fonterra, Nestle, Parmalat and Danone. According with companies’ turnover during 2009, Nestle, Danone, Lactalis and Friendsland Campina (Western Europe) lead the ranking (International Dairy Federation IDF, 2010).

1.1.5 World Dairy Prices

Recent trend in milk product prices are in Figure 1. International prices remained at relatively high levels in 2010 (OECD-FAO, 2011) while projections are that prices will fluctuate in the medium term.

Dairy prices respond to supply and demand conditions. When prices increase consumption is reduced, particularly for poorer consumers. However, other factors such as grain prices, drought conditions (i.e. El Niño and La Niña phenomena) and domestic political situations in
main exporters markets (i.e. a voluntary constrained supply) also affect supply of milk. The International Farm Comparison Network (IFCN) claimed that milk was a more volatile agricultural commodity, than coffee, cocoa and bovine meat (IFCN, 2010).

![Graph showing international prices of main dairy products 1996-2013 (US$/ton)](source: Australian Bureau of Agricultural and Resource Economics and Sciences, ABARE, 2008)

**Figure 1. International prices of main dairy products 1996 - 2013 (US$/ton)**

**1.1.6  Grain Prices**

The main feed supply for dairy cattle is green fodder (natural pastures, alfalfa or lucerne, corn, wheat, barley and sorghum), oats and alfalfa hay and silage. In many places dairy cows eat a mix of natural pastures and grains, so the prices of these feed impacts directly on production costs and the profit margin. This is particularly important for countries that do not produce these products. Figure 2 shows information about grain exporting and importing countries.
Historically, the US, the EU and Canada are the largest exporters of grain. Grain prices are affected by the fact that grains are used for food, feed and biofuels (particularly maize for ethanol) (ABARES, 2011).

Grains prices also exhibit high levels of volatility. Since 2008 corn and wheat prices increased dramatically, because of unfavourable weather conditions in Russia, the EU, Canada and Australia and for strong domestic and foreign demand competed for tightening supplies in the USA, Argentina and Brazil. These factors kept prices high during 2010 as well and according to FAO and the United States Department of Agriculture (USDA), these would remain elevated in 2011 and 2012 due to declining grain stocks and modest increases in production. Wheat and corn prices increased by 94% and 64% respectively between June and December 2010.
1.1.7 Subsidies

The EU and the US dairy policies are important in international trade. Both nations use policy mechanisms to support agricultural prices and incomes of domestic producers. Production and exports of goods are directly and indirectly promoted through complex and expensive programs.

1.1.7.1 The Farm Bill:

The US supports its agricultural sector by a variety of programs. The primary legal framework for agricultural policy is set through a legislative process that occurs every 5 years. The Food, Conservation, and Energy Act of 2008, remains in force through 2012. This law succeeded the 2002 Farm Bill. The US Farm Bill was operated since the Great Depression, being the heart of U.S. farm policy. There have been seven omnibus farm bills since the 1970s (2008, 2002, 1996, 1990, 1985, 1981, and 1977). Prior farm legislation was in 1973, 1970, 1965, 1956, 1954, 1949, 1948, 1938, and 1933. The 2008 Farm Bill contains 15 titles encompassing commodity price and income supports, farm credit, trade, agricultural conservation, research, rural development, energy, and foreign and domestic food programs such as food stamps and other nutrition programs (Figure 3).

When the 2008 Farm Bill was enacted, the US Congressional Budget Office (CBO) estimated the total cost of the farm bill at $284 billion over five years (Fiscal Year 2008-Fiscal Year 2012) and $604 billion over ten years (FY2008-FY2017), including existing programs and changes ratified. On the other hand, the total estimated six-year (FY2002-FY2007) cost of the major provision 2002 Farm Bill was US$271.1 billion dollars (Chite Ralph M., 2007).
1.1.7.2 The EU Common Agricultural Policy (CAP)

The CAP was established after World War II. This policy sought to increase agricultural productivity in the EU in order to secure availability of food supplies during the Cold War. The CAP was created in 1957 under the Treaty of Rome and started operating in 1962. The CAP is determined at EU level by the governments of Member States and operated by the Member States.

The five objectives pursued by the CAP were detailed in the article number 39.2 of the Treaty of Rome (Ackrill, 2000) and include issues such as productivity, resource optimisation, fair standard of living for the agricultural community, market stabilisation, availability of supplies and reasonable prices. Currently the CAP’s main purpose is helping European farmers to be competitive and promote development in rural areas, particularly in the least-favoured regions. Since the mid-nineties the EU changed its focus, concentrating efforts on rural development (agriculture and forestry), environmental protection and quality, rather than quantity of production (European Commission of Agriculture and Rural Development, 2011).
The CAP operates under four mechanisms (United States Department of Agriculture, 2011):

- Domestic price support;
- Direct payments;
- Supply control and
- Border measures

For milk production, the CAP policy is dominated by a quota system; production over the quota is subjected to a levy. Fresh, concentrated, and powdered milk; cream; butter; cheese; and curd are included into the policy. Tariffs are also imposed on imports while subsidies are offered to promote exports (as well as purchase of milk surplus production) (USDA, 2011).

The CAP is the most expensive EU policy (Ackrill, 2000). Its budget for 2010 was €43.8bn, 31% of the EU budget and 6.4% more than in 2009 (Figure 4). The CAP is also an extremely complex and extensive law.

![Figure 4. Agriculture in percentage of EU Total Budget](image)

Source: European Commission of Agriculture and Rural Development, 2011

These policies, considered as forms of protectionism, are extremely controversial and are currently rejected by many countries in the world because (Ackrill, 2000):
This kind of policy affects farmers, environment, wholesalers, retailers, and the agriculture as a whole, not only in the country where is carried out, but globally;

Subsidies stimulate the overproduction, depress world prices and large distortions in world markets and

They encourage other countries to increase their subsidies and/or to establish barriers to protect their producers

It is likely that the US and the EU are unable to sustain their domestic and foreign food supply without subsidies. The elimination of these subsidies might change the worldwide food exchange scenario because by removing markets restrictions, freer trade will increase.

1.2 JUSTIFICATION OF THE STUDY

Population growth and income increases influence worldwide demand for items such as dairy products. Even though the global dairy market is dominated by large producers, volatile prices, customs barriers and environmental issues impacting production, a market opportunity exists.

In South America, the largest milk producers are Argentina and Brazil. However, another country with potential is Chile. Chilean dairy production has increased since 2001 and currently exports and imports are almost balanced. In general, Chilean dairy products are exported in small quantities to great number of markets and in large quantities to considerable small number of markets. A successful dairy export venture will not be possible if the country does not have a strong internal production structure, lower competitive costs of production along with the support of a steady increase in milk volume that would enable more competition and trade. In 2001, an FAO study stated that ‘Chile has very low work efficiency and it is aware of this problem however it is trying to implement and improve this situation. If it manages to improve production at lower cost in the areas mentioned it will be able to increase the productivity per cow, lowering marginal cost to income’ (Ostrowski and Claus, 2001, p. 99).

In 2005 an organisation named “El Consorcio Lechero” (The Dairy Consortium) was founded with the purpose of concerted work to improve the Chilean dairy industry competitiveness. In this corporation milk producers, processors, dairy related services, universities and
technological centres are actively participating and promoting collaboration (Consorcio Lechero [The Dairy Consortium] TDC, 2011). The Dairy Consortium conducted and published an investigation called “Competitive Strategy Development for Chilean Dairy Sector 2010-2020” (TDC, 2010). The report contains seventeen objectives and thirty four goals to be addressed with the purpose of improving Chilean dairy productivity and efficiency to compete more actively in the world dairy market. The Dairy Consortium’s members claim that Chile is currently a competitive dairy supplier. Nevertheless, expectations about the potential competitiveness of the Chilean dairy industry in global markets are divergent, not only because it is an industry in an early stage of development but also because of some key characteristics of the domestic market and the structure of the economy (Dirven, 2001). These divergent positions resulted in the motivation to conduct this thesis.

In order to assess the competitive position of Chile and learn more about the milk production value chain, the core aim of this thesis is to compare the performance between the Chilean and the Australian dairy industries and to develop some recommendations for the Chilean industry. This is a broad, mixed research inquiry which integrates some macroeconomic and social variables impacting on industry development. These factors were seemingly not considered by the Dairy Consortium in the strategic document.

The expected outcomes include the identification of milk production enhancing factors. Australia was chosen as reference because is a renowned dairy exporter with 10% of the world trade in 2009/10 (Dairy Australia, 2010) and it has considerable experience. The Australian dairy industry is considered a dynamic industry, served by a set of public and privates agencies (including dairy processors) who are constantly striving to improve productivity indicators. Strategically, the Australian dairy industry is an exciting and relevant case to study and an appropriate model for the Chilean dairy value chain to target in the medium term.

Ostrowski and Claus (2001) provide some agreement with this focus when they concluded: ‘For the latitude and handling characteristics, fertilization and species used in pastures, Chile has a strong resemblance to New Zealand and Southern Australia’ (Ostrowski and Claus, 2001, p. 45). Hence some information from New Zealand will be included for comparison, but it is not the main comparison in this study.
1.3 RESEARCH OBJECTIVE AND QUESTIONS

The research objectives are

1. To evaluate the prospective competitiveness of the Chilean dairy industry in the international dairy market

2. To compare the Chilean dairying with the Australia dairying, with some reference to New Zealand dairying information.

The research questions developed to address the previous objective are:

A. What are the macroeconomic factors promoting or constraining the development of industries in Australia and Chile?

B. What are the current situation and most important features of the Chilean and Australian dairy industries, particularly related to their production system and productive structure?

C. Is the Chilean dairy industry locally profitable and strategically prepared to successfully address the international dairy trade?

D. Which of the Australian dairy and New Zealand industry's elements or attributes might be taken into consideration to enhance and boost the Chilean dairy production and trading system?

1.4 METHOD AND APPROACH OF THE STUDY

This research is a descriptive study that will be undertaken using the case study approach. The case study is a common and important method to conduct agribusiness research because it allows researchers to collect and analyse data in order to test or design new theories around particular subject (Sterns et al., 1998). The settings of research questions constitute the core of the case study approach.
Chapter two, the most relevant part of the method, describes the framework to be used and their application. In addition in next sections two important issues for this study are discussed.

1.4.1 Literature review and data collection:

The greater part of the study to be undertaken is a review of secondary literature, namely, ‘sources of data and other information collected by others and archived in some form. These sources include government reports, industry studies, archived data sets, and syndicated information services as well as the traditional books and journals found in libraries’ (Steward and Kamins, 1993, p. 1). In general, secondary research constitutes a departure point for new research allowing comparison of existing data in order to identify similarities, differences and trends. Use of secondary literature is also less expensive than primary data collection. The distance with Chile prevents primary research and the availability of secondary data in Australia favours this way of literature collection.

The literature review in the next chapters is based on a wide range of information sources such as books, industry publications, and specific journals. Most of the information from Chile has
been collected online. In the case of Australia, multiple sources were examined due to the large amount of accessible data. Both public and private agencies have been consulted for material.

Chapters three and four relating to Australia and Chile respectively, offer a synopsis and a review of important factors affecting milk production, processing and commercialisation. Data collection, namely, qualitative and quantitative indicators, assists in building an interpretation of both dairy industries from historic and recent time periods.

The basic information items are presented summarised and includes:

1. Macroeconomics figures of each country;
2. General background of both industries; and
3. Detailed information about the milk producers, processors and trade.

The Chilean and Australian description chapters provide a chain of evidence constituting literature reviews in themselves. Each section includes a general analysis, which contributes to the final assessment.

1.4.2 Comparison and data analysis:

The comparison of two countries’ industries was used to fill certain information gaps. The cross-country comparison was conducted using a number of approaches.

After reviewing the two industries in chapters three and four, chapter five provides a diagnosis of the business environment of Chile and Australia by considering macroeconomic figures and additional socio-economic information. After this, a macroeconomic profile and trend for each country was developed. This chapter is supported by the Determinants of National Advantages model (Porter, 1990) which provided the context of production factors or factor conditions used to conduct the comparison. As Porter clearly states, ‘the basic unit of analysis for understanding competition is the industry’ (Porter, 1990, p. 34).

Subsequently the selected business models, The Value Chain and the Five Forces Analysis (Porter, 1980, 1985) were applied to assess the Chilean dairy industry’s competitive situation.
and its characteristics as a dairy cluster. A cluster is defined by Porter as ‘geographic concentrations of interconnected companies, specialized suppliers, service providers, firms in related industries, and associated institutions (e.g. universities, standards agencies, trade associations) in a particular field that compete but also cooperate’ (Porter, 1998, p. 197). Porter’s theories are complemented by literature of Professor Andrew Fearne (2004, 2009; Fearne and Duffy, 2006; Fearne et al., 2007), who provides a comprehensive and current standpoint about food supply value chains by different industries analyses. Fearne offers a closer approach to the Chilean experience because he incorporates Central and Latin America case studies, in terms of relationships between small-scale producers and agri-food markets restructuring, led by large supermarket chains (Fearne et al., 2007).

In addition an economic exploration of industry comparative cost structure was developed.

With the aid of these analyses, information was developed for different sources of competitiveness and ways to address identified deficiencies in the Chilean situation. Australia’s experience was considered both strategically and operationally.

This investigation is considered to be an intensive case study due to the research strategy focusing on one or a few unique case with the aim of producing a contextualised and holistic description, interpretation, and explanation. Therefore, the explanatory power of the intensive case study research does not rely on statistical generalisation but, instead, on understanding and analytic generalisation (Eriksson and Anne, 2007).

1.5 IMPORTANT ISSUES

In the conduct of this two particular constraints were encountered:

a) Firstly, the shortage of relevant information from Chile. The Chilean dairy industry, particularly for dairy farmers and the private and/or public agencies supporting its development, does not have a permanent and efficient system of information collection and delivery (including indicators records) which leads towards a paucity of repetitive data, unreliable statistics and extremely complex technical documents. This condition has greatly
hampered this thesis but at the same time it was a further motivation for conducting a thought-provoking analysis.

b) Secondly, this thesis incorporates a preliminary social approach in both the dairying background chapters and the final analysis. This approach derives from the need of tackling a productive sector’s development from different points of view because, in general, developing countries must cope with industry growth in the presence of high degrees of social inequities. It is desirable that profitable industries contribute to balanced economic growth without overlooking social disparities. Companies, as drivers of local and national economic progress, are called to operate under business models for sustainable development that aims to deliver economic, social and environmental benefits (Fearne et al., 2007). Supported by governmental policies, regulatory framework and civil society commitment, companies’ economic power should favourably impact all sectors of population (Porter M. E. and Kramer M. R., 2011). Environmental protection, quality products and wages consistent with productivity levels are clear examples of how industries commit to comprehensive development.

1.6 OUTLINE OF THESIS

This thesis is structured in six chapters. Chapter one presents the background and justification of the thesis including the research objectives, research questions and method. In chapter two the conceptual framework that supports the analysis is presented. Chapter three contains a comprehensive description of the dairying in Australia, including data in a domestic and international context and a detailed overview of the industry. Chapter four provides information about central elements of the Chilean economy and its dairy sector. Chapter five contains the comparative industry analysis and application of business models to establish Chile’s competitive position along the comparative cost approach to assess relative profitability. Finally, in chapter six recommendations and conclusions for the Chilean Dairy industry are presented including suggestions for further studies to achieve production improvements.
CHAPTER TWO: FRAMEWORK FOR COMPARISON

2.1 INTRODUCTION

The aim of chapter two is to set out the theoretical foundation for the comparative analysis of dairying in Chile and Australia. Firstly, an overview is given of the impacts of international trade and competition on industrial development. Subsequently the concept of business activities in regions and countries is introduced. Several theories related to competitiveness and strategic analyses are outlined, particularly models of competitive advantage proposed by Michael Porter (1980; 1985; 1990) and the food supply chain postulates of Andrew Fearne (2004, 2009; Fearne and Duffy, 2006; Fearne et al., 2007). In addition a cost analysis approach is briefly described. Finally, the role of information within organisations is emphasised. In general information from a global standpoint is related to the performance of Latin American countries, particularly on milk production in Chile.

2.2 THE GLOBAL ECONOMY

Globalisation is ‘the advance of cooperation across national boundaries’ (Boudreaux, 2008, p. 1). Globalisation began in the late 1800s and underwent a significant period of expansion after the Second World War attributable to the growth of industrialised countries. The process of globalisation has been fostered by liberalisation of markets, mainly capital transactions and mobility of capital flows (ECLAC, 2002). In this process economies are led towards unintentional cooperation, specialisation and the pursuit of knowledge (Boudreaux, 2008). Globalisation is an ongoing process.

The phenomenon of globalisation has worldwide effects. Globalisation is also multidimensional and impacts on financial, economic, political, environmental, social and cultural matters. The degree to which each economy is affected by globalisation depends on numerous variables. However, slower growth economies exhibit minor potential to join globalisation, due to their unequal footing in relation to developed economies. The political and economic stability of developing countries, in turn, opens many opportunities to participate more actively in
international trade. Latin American countries participated in the first stages of globalisation until 1973, showing periods of reasonable growth. However, it did not allow them to really approach of levels of progress achieved in developed countries (ECLAC, 2002). The detail of Latin America exports reveals a high reliance on a small number of natural resources along with a lower level of processing. Most Latin American economies were undermined by protectionist policies until early thirties, that thereafter gave way to trade openness (Coatsworth and Williamson, 2004). A second phase of exporting has been suggested to Latin America in terms of diversification and value added; both should impact positively on growth and equity (ECLAC, 2006).

Globalisation has led to an increase of global average income but not to a substantial reduction in poverty rates (ECLAC, 2002, World Trade Organization WTO, 2008). For milk production the global economy resulted in a sustained increase in dairy product’s demand (due to the income increase) which also gradually compels industries, especially big companies, to be active parts of this dynamic process. The market of dairy processors in many countries is visibly headed by multinationals, whereas the strategic purchasing of smaller companies has become a frequent practice; only some co-operatives (or alternatively companies that operate under co-operative principles) have outlived, grown and they currently keep trading in local and global markets. Examples of local business survivors include Sodiaal in France and Murray Goulburn in Australia (IDF, 2010). Milk producers are key players of the industry but in developing countries many of them are extremely small so that they still form part of rural programs to overcome poverty. As stated by Porter, capitalism and large business companies (mainly corporations) have been pointed out as responsible of social and environmental disturbs, since prospering at expenses of natural resources and unequal community development (Porter M. E. and Kramer M. R., 2011). A disconnection between firm’s searches for economic success regardless social progress will be a first explanation under the neoliberal point of view. Porter suggests the principle of ‘value shared’ to re-legitimize business operation (Porter M. E. and Kramer M. R., 2011). Shared value is accomplished by operating actions that create societal value in a positive cycle where firms and society prosper more equally and simultaneously. This is materialised by new practices, such as rethinking on products and markets, adopting new ways of productivity and by industrial clusters that support community. This idea alters the classical mindset and reframes the scope of capitalism (Porter M. E. and Kramer M. R., 2011)
According to the FAO around 750 to 900 million people (12-14% of global population) rely on dairy farming to some extent, and most of them are part of small-scale dairy production and are vulnerable population (FAO, 2010b).

2.3 INTERNATIONAL TRADE

For industries, globalisation opens opportunities of accessing new markets and promotes international trade. Global exchange of products and services was initially caused by the search of specialisation and currently, moreover, by production efficiency. For consumers this has become the way to find a wide range of products at lower prices. External trade not only includes goods and service interchange but also movements of factors of production (WTO, 2008).

International trade increases the level of competition of industries, bringing demands or global standards that were likely not considered earlier as well as new costs to afford. A large number of potential buyers arise and the uncertainty of the future becomes a permanent challenge for shareholders and managers. Industries committed to global markets need to improve productivity in order to achieve an economic expansion and sustained levels of profitability, namely, being competitive. Competitiveness is defined as ‘the ability of a firm to compete in global markets with a global strategy’ (Porter, 1990, preface p. xxiv). Advances in transport, technology and information flows trigger the fall of market barriers and along with policies that underpin sustainable growth, are pivotal factors for industries to establish competitiveness.

Macroeconomic policies of governments act as enablers or barriers to international trade. Economic stability and openness act as stimulus for the establishment of competitive industries and attracts foreign investment (as well as infrastructure enabling, for instance). On the other hand, in a world advancing towards trade liberalisation, protectionist measures used by some countries, directly affect the proper functioning of global markets. The eighteen century trade economist Ricardo, for instance, demonstrated that protectionism causes economic stagnation (Carbaugh, 2010). Most Latin American countries, that form part of the middle-income group, attempt to compete in markets with subsidies, tariff barriers and market quotas, for
instance the US and the EU. The World Trade Organisation (WTO) is committed to the free, fair and non-discriminatory trade and is constantly encouraging countries to promote policies for liberalisation of markets (WTO, 2011).

Agriculture is a sector in which resources allocations is highly distorted around the world as a result of protectionism, and it is specially treated under the WTO’s agreements. Within the 1986-1994 Uruguay Round negotiations, agreements urging to modify conditions of agribusiness trade inequity emerged. Agricultural trade barriers are generally imposed based on the food security concept (population growth has raised the challenge of providing larger quantities of food). These circumstances have promoted the maintenance of protectionist policies in developed countries at the expense of poorest countries while the goal of ending hunger is diluted, intensifying the gap (as well as the right) of proper nutrition for the world’s population.

2.4 COMPETITIVE ADVANTAGE OF COUNTRIES

The Business School of the International Institute for Management Development (IMD) conducts annually the International Ranking of Nation Competitiveness that develops a competitive scoreboard of fifty nine countries. In this analysis, four factors are taken into consideration; economic performance, government efficiency, business efficiency and infrastructure. Then, each factor is divided in sub-factors or parameters allowing the quantification of variables. Subsequently, factors are ranked and a table of weaknesses and strengths built. A survey is also carried out about some key attractiveness indicators tightly related to defined factors. Finally, every factor is represented by a trend of competitiveness in the previous five years. In 2011 Australia was in 9th position, while Chile in 25th (IMD, 2011).

Each country has attributes that influence the performance of industries in global trade; many of them are measurable as shown by the aforementioned analysis. These particular conditions have been termed the competitive advantage by Michael Porter (Porter, 1990), albeit some authors refers to them as competitiveness of countries such as the IMD. Several studies have highlighted the difficulties of generalizing about elements of an economy that enhance
success or failure of an industry (Porter, 1990). Industries and the business in them are not isolated from their environment.

Porter suggests that every country has determinants of its national advantage (Porter, 1990). The model, also known as Porters’ diamond, describes four central features, one of them related to countries performance as shown in Figure 5. Porter refers to economically titled *factors of production* as factor conditions¹. He claims that these are divided into basic (natural resources, climate, location, labour and capital) and advanced factors (communication, information, formally trained workforce, research and innovation). This theory is strongly connected to Smith’s and Ricardo’s principles who stated that every country has a production possibility schedule (Ricardo, 1817, Smith, 1904). Hence when input factors such as labour, capital, land and entrepreneurship are combined in different ways the most efficient manner of production may be identified (Carbaugh, 2010). As a result, as each nation is dotted with different stocks of production factors, diverse outputs, productive vocation and production patterns are established.

![Figure 5. The Determinants of National Advantages, Porter’s diamond](image)

Source: Porter, 1990

¹ The three remaining factors of Porter’s diamond are considered in section 2.4.1 as part of the competitiveness of industries in Porter’s Five Forces Model given similarities in variables of both models.
Identifying similarities and differences in nations’ natural endowments of countries is necessary to make comparisons. Economic indicators have been standardised over time, becoming popular to compare the development of countries, particularly when globalisation impacts mainly on the economy (ECLAC, 2002). Most common indicators are Gross Domestic Product (GDP), interest rates, inflation rate, unemployment rate, exchange rate, and levels of exports and imports.

Despite the widespread use of economic indicators, data provided might be insufficient or calculated differently. An example is GDP per capita. The GDP is the value of all final goods and services produced within a nation in a given period, generally one year (Carbaugh, 2010). To calculate GDP per capita, GDP is divided by population, resulting in an average of income per person. Both indicators are widely accepted as estimations of growth over time, productivity and living standards. However these measures provide insufficient information to detect differences in income distribution, showing therefore, a partial reality. This gap must be bridged by the deeper analysis, including other parameters about the behaviour of a particular economy. For the purpose of obtaining a complete overview, the total analysis about the competitive advantage should be based on qualitative and quantitative variables, with explanation about their performance associated with a country’s background and history. In this case, the analysis will be based on the description and indicators of Australia and Chile.

For agriculture production, including dairying, climatic and environmental conditions play an important role as competitive advantages of a country. If ideal conditions for pasture growth exist, it is a chance to be more competitive in trade. Generally in tropical, subtropical or extremely cold climates more effort is required to run a dairy farm particularly for production and animal care (Moran, 2005). However, this is not the only determinant of efficient milk production. Farm management, processing efficiency, distribution network, phytosanitary threats, among others, can help or hinder attempts to become a global dairy supplier because they all influence costs.
2.5 COMPETITIVENESS

The competitiveness of an industry or company is affected by two groups of variables. First is the business landscape that offers opportunities and threats and second is the company’s internal performance that defines strengths and weaknesses. Fearne also identifies some climatic less tangible factors (trust, commitment, motivation) influencing trade partnerships performance and competitiveness (Fearne and Duffy, 2006).

Companies and industries can become competitive by being proactive and formulating strategies. According to Fearne, ‘the base ingredient for success in any organisation is strategy’ (Fearne, 2009, p. 24). The formulation of a strategy is conducted by the strategic analysis, described as a continuous cycle whose main purpose is to understand how an organisation operates in its interaction with the external environment (Dyson, 1990) in order to maximise resources efficiently.

Porter states companies compete by one of three strategies. First, cost leadership consists in permanent costs reduction below the company’s competitors. Second, differentiation that involves the search for a unique attribute, valuable for consumers, that locates a company in a distinctive market position. Finally, the focus that consist on the choice of a determined market segment with the purpose of competing based on costs or differentiation (Porter, 1985).

Overall, Porter creates a significant relationship between strategy and differentiation. Companies or industries using a competitive strategy ‘deliberately choose a different set of activities to deliver a unique mix of value’ (Porter, 1996, p. 64).

Despite Porter’s conservative view about issues as internet (Porter, 2001) and companies’ emulation (Porter, 1996), his analyses are focused on the competitive position improvement and profitability increase. This seems to be important to the Chilean dairy industry, which at first glance is lacking of strategy and partially taking advantage of manifest competitive advantages. A similar situation is explained by Fearne, who exemplifies with the South Australia wine production case study, all improvements necessary to conduct to build effective relationships within a value chain thinking approach (Fearne, 2009). Strategy and strategic vision are described as base ingredients for economic success and presence in target markets.
Conducting a strategic comparative analysis requires significant flows of high quality information and analytical skills including intuition. Several analytical methods have been developed to conduct such strategic analyses, and the use of a mixture of those has become common. Even though there are several tools that can be used, it is the combination of techniques that ensures a balanced approach to the strategy formulation.

An overview of two strategic analysis methods to be used is provided below.

### 2.5.1 The Five Competitive Forces

Introduced in 1980 by Michael Porter this model states that five forces drive the industry competition affecting performance and profitability (Porter, 1980). The five forces model is a situational analysis whose main outcome is the organisation’s competitive position. Porter’s model is illustrated in Figure 6.

![The Five Competitive Forces Diagram](image_url)

**Figure 6. The Five Competitive Forces Diagram**

Source: Porter, 1980
This widely used model is based on the intensity of competition by different external forces which comprise the competitive environment. If businesses in industry know the strength of these drivers, the operators can design strategies to modify its performance, thus improving competitive position. Based on the information derived from this analysis, management can decide how to influence or to exploit particular features of its industry, namely, the industry will know how to react in a manner that improves their situation.

2.5.2 The Value Chain

Michael Porter published this model in 1985 stating that firms have two categories of activities in terms of their production contribution, technology requirements and strategic influence (Porter, 1985). He suggested that these activities are split into primary (vital) and secondary (supportive) activities. From this perspective a business is a system of interdependencies that may be broken into activities. Even though this model was developed for a firm’s analysis it is also suitable for analysing industries. Figure 8 shows the generic value chain.

![Figure 7. The Value Chain Model](Source: Porter, 1985)
The value chain encompasses activities that support the production of a firm. The activities differ from one company to another. Activities within an organisation that add net value to goods or services produced are a source of competitive advantage. When all these activities are optimally conducted the organisation gains a competitive advantage. Porter suggests that the usefulness of this model is in terms of linkages within the value chain. Fearne, on the other hand, stresses mistakes that firms make when passing on production costs to their trade partners. Although there is not enough research to conclude about cost and benefits of different trade members relationships, Fearnes states that the more collaborative linkages a supply chain has, the more efficient and profitable are their members (Fearne and Duffy, 2006, Porter M. E. and Kramer M. R., 2011).

The most recent approaches of a new value chain have been offered by Porter and Fearne. Both authors refers to a new value chain model moving from the ‘pushing from producers’ to ‘pulling from consumers’. This new paradigm attempts to avoid a value chain fragmentation. Due to the trade-off, a value chain can be enhanced by keeping those activities that add net value, adapting those which contribute and removed all that hinder comprehensive performance (Fearne, 2009, Porter M. E. and Kramer M. R., 2011).

For the purpose of this thesis the value chain model will be adapted to industry analysis, updates with current approaches and the average cost analysis conducted, as described in section 2.6.1.

2.6 ECONOMIC ANALYSIS

2.6.1 Cost analysis

The main purpose of running a business is maximising profit, which should be strengthened by the chosen strategy after planning. Economic profit is defined as ‘the difference between a firm's total revenue from sales and its economic costs, that is, explicit costs plus an allowance for implicit costs’ (Tisdell, 1982, p. 147). The value chain model, meanwhile, requires cost estimation.
Milk production encompasses several on-farm activities. In an industry dependant on natural resources with a significant level of productive uncertainty and market volatility each of these activities should be managed carefully to reduce losses and to achieve viable levels of profitability. The concept of economic efficiency is relevant. A unit of good is an economically efficient output when it is produced at the lowest possible cost (Bade and Parkin, 2011). Technical efficiency, namely the situation when it is not possible to increase outputs without increasing inputs, is also desirable but related to engineering and so it will partially tackled in this study. Nevertheless something that is technologically efficient may not be economically efficient. However, something that is economically efficient is always technologically efficient.

Overall cost leadership is one of the three generic strategies suggested by Porter (Porter, 1980). Costs are a source of global competitive advantage for industries if well conducted and, if costs are excessive, they are an economic impediment to trade. An illustrative example is milk production in New Zealand, currently the largest exporter with of 27% of world dairy trade (IDF, 2010); 95% of milk produced in New Zealand is exported (Armentano et al., 2004). The main item of cost in dairy farms is feed and the New Zealand production is supported by a low-cost grazing system with limited use of supplement and concentrates only when pasture is unable to cover livestock demand (Moot et al., 2009). The average cost of milk production in New Zealand is situated between 28-37 US$ per 100 litre (IDF, 2010). New Zealand dairying has experienced significant productivity improvements per head and per hectare, while costs have been contained (Robertson, 2010).

2.7 THE ROLE OF INFORMATION IN INDUSTRY DEVELOPMENT

Information is a driver of globalisation and competitiveness and it is strongly linked to technology and knowledge. All described analyses will be inefficiently conducted if information flows are not available, insufficient or containing low quality data. From 1980 the concept of competitive Intelligence emerged, referring to the process of producing and gathering valuable environmental information that contributes to the strategy formulation of an organisation (Fleisher and Bensoussan, 2003).
In general, four stages have been described to plan and organise the information flows (Vriens, 2004). The first step is to define the strategic information requirements, namely, what does the organisation need to collect. Secondly, the sources of information should be outlined, for instance, Internet, intranet, databases, consultants, competitors or government; the use of one or more sources is an individual decision. Thirdly, it is indispensable to effectively analyse data collected to really determine their strategic usefulness. Finally, but extremely relevant, is the dissemination or communication of information especially towards decision-makers. Furthermore, strategic decisions will be meaningless unless they are rightly interpreted at tactical and operational levels.

All these phases of information collection require supportive infrastructure which in most organisations is solved using technologic platforms or “intelligence infrastructure” (Vriens, 2004). By technology adoption, the information management allows systematisation, centralisation and agility to the gathering process and data spread. Even though the cost of implementing technology systems might be substantial, the cost of having defective, incomplete or insufficient information flows might be far outweighed. Technology plays a significant role in achieving a competitive position (Porter, 1985) because it may reduce costs. However companies should not entrust the responsibility of the appropriate use of information to technological tools. Human resources continue being one of the most important sources of capital and their participation on technology adoption processes is indispensable to assure the success of a company.

Fearne highlights the role of effective and dynamic information flows as boosters of any value chain (Fearne and Duffy, 2006). Besides strong relationships, Fearns defines information as a key enabler of sustainable value chains and suggest companies to move from the standpoint of information as a cost toward information as a critical success factor able to improve efficiency (Fearne, 2009). He also stresses the relevance of leadership on improving the value chain thinking. Fearne also claims that the most important barriers for sustainable and feasible value chains is the lack of vision and collaborative innovation as well as some negative cultural attributes rooted in business managers, chief executives and policy makers (Fearne, 2009).

Globalisation has been described as the age of knowledge and technological advances. Successful organisations understand that information is not knowledge in itself but a facilitator
of the trade integration process. Nevertheless, the ability to transform standard information flows into competitive intelligence requires skills, experience and competences; all those parts of the particular knowledge of a firm or industry possess and permanently develop.

2.8 CONCLUSION

Several business theories are available to use in assessing the competitive position of firms and industries. Porter's models provide a sound, comprehensive framework for comparative analysis. However, Porter’s ideas were selected due to his influence on strategic management and because they are compatible with investigating the comparable factors between the dairy industries of Chile and Australia allowing the research questions to be answered. Fearne’s ideas, on the other hand, provide and update an expert standpoint on food supply chains. His position about trade-partner relationships complement Porter’s model by incorporating closer approaches to Latin American markets and supplier-retails effective linkages.

A part of the comparative analysis of dairying in Chile and Australia is a comparison of average milk production cost analysis. Available data allows the comparison of different items of costs in the respective countries. Linking costs to the relevant business theories will result in sound conclusions.

The role of information has been stressed because it is a significant input in the decision making process, not only quantitatively but qualitatively. Information is also a source of competitive advantage and knowledge when it is efficiently managed, and therefore it is a key factor in the process of becoming competitive and maintaining competitiveness under globalisation processes.
CHAPTER THREE: THE AUSTRALIAN DAIRY INDUSTRY

3.1 INTRODUCTION

This chapter provides information about dairy production in Australia particularly in Victoria and Tasmania. Some key factors about production and commercialisation are covered. The first section refers to the political, economic, social and geographical environment that affects the operation and performance of agricultural industries in Australia. The second section describes features that fully characterise the Australian dairy industry.

3.2 GENERAL OVERVIEW

Australia is a low elevation island, the world's sixth largest country (7,682,300 sq. km). Located in Oceania between latitude 10° 41' south and 43° 38' south and longitude 113° 09' east and 153° 38' east, Australia is completely surrounded by water. With a coastline of 36,735 km, the country comprises continental areas, a southern island State (Tasmania), and 12,000 near-coastal islands (Australian Bureau of Statistics, 2010b).

Australia is a Constitutional Democracy and has a Federal system of Government, divided in four tiers: Commonwealth, states, territory and local. The powers of the Australian Government are divided into executive, legislative and judicial.

Australia is organised under six states: New South Wales (NSW), Queensland, South Australia (SA), Tasmania, Victoria and Western Australia (WA) and two territories: Australian Capital Territory (ACT) and Northern Territory (NT) as shown in Figure 9. This structure allows an independent budget per State/Territory. Resources allocation is based on the productive profile and detected needs.

Australia's population is estimated to be nearly 22 million people (Australian Government, 2011). Sydney and Melbourne are the largest cities, capitals of NSW and Victoria respectively.
Canberra is Australia’s capital city, located in the ACT has a population of approximately 346,000 people in 2008 (ABS, 2010b).

Australia's population has consistently grown over the last five decades for a natural birth rate and the net overseas migration (ABS, 2010b). People are mainly concentrated along the coastal region from Adelaide to Cairns while the centre of Australia, land mainly classified as dessert, is slightly populated (Australian Government, 2011a).

![Figure 8. Australian States and Territories](image)

Source: Encyclopædia Britannica Online, 2011
3.3 AUSTRALIA’S ECONOMY

From 1992 to 2009, Australia registered a sustained economic growth averaging 3.3 per cent per year, resulting from a stable and productive economic environment that allows the consolidation of business in primary and service sectors. Australia is typical of rich industrial countries such as the United States (McTaggart et al., 2007).

In 2006, the OECD referred to Australia as an impressive economic performance country, especially boosted by the commodity price boom, the proximity to dynamic Asian markets and a robust macroeconomic framework. With a strong fiscal position, a healthy government balance sheet and flexible labour and finance markets, Australia was one of the most resilient OECD countries in 2010. In 2011 the International Institute for Management Development (IMD) World Competitiveness Yearbook, ranked Australia in 9th place of 59 countries, losing its 5th position in 2010, but still within the “Top Ten” of the most competitive nations (International Institute for Management Development IMD, 2011). Likewise, in 2010 Australia showed a self-reported life satisfaction above the OECD countries average (OECD, 2010a).

Over the 20th century Australia has boosted its economic development based on natural resources: agriculture (renewable) and minerals (non-renewable). The Australian economy is currently considered to be urbanised and services-based, even though agriculture and mining are still central sectors supporting exports (Figure 10). In the 19th century, farm production accounted for around one-third of output. However, in the 20th century manufacturing and service industries have expanded (Connolly and Lewis, 2010). Figure 9 shows the structural change in the Australian economy by the employment trend and the evolution of exports by productive sector.
3.3.1 Inflation

The Reserve Bank of Australia (RBA) is an independent central bank responsible for monetary policy, and also for keeping a low consumer price inflation over business cycles. The inflation rate remained high from the mid-1970s to the 1980s and decreased over the 1990s. The Goods and Services tax (GST) established in 2000 that is levied at 10% helps to reduce the inflation rate. Since 2001-02, the annual rate of inflation in Australia, as measured by the Consumer Price Index, has remained reasonably stable at 3%.

In 2008-09 the annual rate of inflation in Australia was 2.4%. By an internationally comparable definition of the Consumer Price Index (CPI), this was below New Zealand and the United Kingdom (3.2% and 3.8% respectively) but higher than Japan and the US whose annual rates do not exceed 1.5%. (ABS, 2010a).

3.3.2 Gross Domestic Product and Per Capita Income

Australia has varied in ranking with respect to per capita income. In the 1930s Australia was 4th. By 1960, it was 11th, then 15th in 1993 (RBA, 1995). Real Gross Domestic Product (GDP) per capita grew at an average rate of 1.7% per annum over the last century (McTaggart et al., 2007). During the past decade Australia experienced a significant real increase in per capita income of...
$10,000, reaching $45,300 in 2009 (in 2007-08 Australian prices). Australia presents a Gini Coefficient\(^2\) (United Nations Development Program UNDP, 2011) of 0.331 and it is located in the middle of the incomes inequalities table of OECD countries (OECD, 2011).

Figure 10 shows that Australian real GDP has recently increased over time compared to other developed countries.

![Figure 10. Level of real GDP Australia and selected advanced economies, 2007-2010](image)

Source: Australian Government, 2011d

### 3.3.3 Employment

The Australian unemployment rate fluctuates over the business cycle. Usually it increases during recessions, 1982/83 and 1990/91 for example, and decreases during expansions. This rate, which has markedly decreased between 1997-2001, has been similar to United Kingdom, for instance, lower than the EU as a whole, and higher than the USA and Japan, as shown in Figure 11 (McTaggart et al., 2007).

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\(^2\)A measure of the deviation of the distribution of income (or consumption) among individuals or households within a country from a perfectly equal distribution. A value of 0 represents absolute equality, a value of 100 absolute inequalities\(^2\).
In June 2011 the Australian rate of unemployment reached 4.9%. After 2009, the general unemployment rate in Australia bordered 5.0%. Labour underutilisation is an important matter to be considered by policy makers. This indicator is higher in Australia than in the rest of OECD countries (OECD, 2010a) and impacts directly on the population well-being. The labour market is permanently adapting to be an inclusive market, considering the elevated migration rate in Australia (OECD, 2010a).

3.3.4 Exchange Rate

In relation to the US dollar, the Australian dollar has constantly changed after its price was fixed at 112 US cents until 1970 (McTaggart et al., 2007). After the last fall in 2008, the Australian currency has become robust. This indicator has implications on trading industries of export dependant countries, such as Australia, New Zealand or Chile.
3.4 AUSTRALIA’S CLIMATE CONDITIONS

Australia, as the second driest continent after Antarctica, has an average rainfall below 600 millimetres (mm). Australian weather is predominantly temperate and variable. The northern areas are mostly warm and humid throughout the year, whereas southern weather is cooler particularly in winter; nevertheless, sub-zero temperatures are not common. Australia has four types of climate: (i) Mediterranean, (ii) Temperate, (iii) Sub-tropical (wet and dry) and (iv) Tropical. These climate types are defined mainly by temperatures and periodicity and occurrence of rain (Malcolm et al., 2009).

In winter a significant difference in temperatures between northern and southern areas is observed. While in Alice Spring day temperatures fluctuate between 21–27°C, the highlands of NSW, Victoria and Tasmania register average day temperatures of 3–9°C (Malcolm et al., 2009).

Australia’s rainfall pattern is seasonal; in the southern areas it is persistent in winter while the northern region side has a rainy summer (ABS, 2007). Areas with 800-1,200 mm rainfall are suited for dairying particularly to implement grazing feeding systems, like some areas in Victoria and Tasmania. Although rain is not the sole determinant of pasture growth (sunlight hours, seasons, temperature, humidity, soil location and nutrients are also influential), it is a key factor, because cattle feed is one the most important productive costs and the pasture availability (or absence) is strongly related to farm profitability and business management. The dairy industry is water intensive, often requiring irrigated pasture (ABARE and New Zealand Ministry of Agriculture, 2006) in states and regions.

3.4.1 Drought in Australia

Australia’s climate conditions are extremely variable, particularly with rainfall. Over a ten-year period, Australia has three good, four regular and three below average years. Generally rainfall deficits are directly associated with El Niño, a climate phenomenon that affects central and eastern Pacific causing changes in the atmosphere and ocean temperature and circulation (currents) (Australian Government Bureau of Meteorology AUGVBOM, 2011a).
Drought refers to an acute deficit of water supply to meet a specified demand. Persistent high pressure over most of Australia leads to low and often erratic rainfall. Drought tends to occur when the high-pressure systems are more extensive than usual, excluding rain-bearing systems for lengthy periods of time (AUGVBOM, 2011b).

During drought periods as well as in flood situations, agriculture suffers serious damage in rural and primary productive areas affecting the general economy of the country. It is normal to see an increase in fruits and vegetables prices as a consequence. In the case of milk production, a rainfall shortage causes a negative (and sometimes a dramatic) impact directly on pasture growth and consequently on feed supplies, which affects production, profitability and the financial position of farmers. Droughts also impact negatively on vegetation, erosion and the occurrence of forest fires, all enormous threats for farming and agribusiness.

The last major drought in Australia, termed “The Millennium Drought”, began in 1996 and extended to the end of September 2010, after reaching a peak in 2006-2007. As a result of damages triggered by this and previous droughts, the Australian Government supports farmers and rural communities (Australian Government, 2011b). To do this, since 1992 Australia has had The National Drought Development Policy, that is based on sustainability, risk management, productivity and structural adjustment. Its first objective ‘encourage primary producer and other sectors to adopt self-reliant approaches to managing for climate variability’ (Australian Government and Department of Agriculture Fisheries and Forestry, 1992, p. 1) expresses the urgent need to improve farmers capacities in order to efficiently face future climate conditions.

Thus, endeavour is not concentrated only in the government’s measures but also in farmers and the rural population working together and being an active part confronting unfavourable conditions. This policy includes various measures, like household support, grants and subsidies, financial assessments and counselling, research and development, education and training.

Drought policy is characterised for having defined conditions of eligibility, particularly for farmers to obtain any grant (including grants for primary producers who want to exit the farming industry).

In 2010, the Bureau of Meteorology stated that latest rainfall across Australia helped in relieve deficiencies caused by dry conditions (Australian National Climate Center, 2010). However, plentiful rainfall in 2010-2011 increased water storage and helped avoid a further water crisis
3.4.2 Australia’s Land Use and Soil

In 2001/02 the total land area under primary production (livestock grazing, dryland and irrigated agriculture) was nearly to 4.7 million km² or 60% of the continent; 58% of that portion was for livestock grazing (Bureau of Rural Science of Australia, 2001-02).

Australian soils are deficient in major and minor nutrients particularly phosphorus (Malcolm et al., 1996). A suitable soil for agriculture must be well irrigated, with a proper content of organic matter and an adequate texture. Soils with good properties for grazing, such as land derived from basalt, are rare. Most soils used for agriculture require significant annual applications of Phosphorus (P) and Potassium (K) (Malcolm et al., 2009).

3.5 THE AUSTRALIAN DAIRY INDUSTRY

3.5.1 Overview

The farm gate price of the Australian dairy industry is estimated at 3.9 billion dollars, the third major rural industry behind beef and wheat production. The industry provides 40,000 jobs directly (on farms and manufacturing) and a large number of employees in related activities (principally transport and distribution, services and research) (Dairy Australia, 2010). Dairy production is of vital importance in some rural regions, raising employment and boosting local economies, especially because of the manufacturing processes.

Temperate areas are the most suitable environment for dairying; some sub-tropical zones provide good conditions for milk production, but dairy farm management is challenging. Figure 12 shows eight dairy regions, three of those situated in Victoria, the state which dominates the Australian milk production. Victoria supplies 60% of the total production and processes 70% of manufactured products (Export Victoria, 2009). Additionally at least 80% of the dairy production is located in Victoria and Tasmania, between coordinates 35° and 43° latitude. Except for the Northern Territory, dairy farms are distributed throughout the country, guaranteeing the fresh milk supply for the whole population. The Australian dairy market offers a diverse range of products, including fresh milk, custard, yogurt, chilled desserts and a wide variety of cheese (Dairy Australia, 2010).
Dairy product quality is carefully regulated by an official national standard (the Food Standards Australia New Zealand (FSANZ) Food Standards Code (the Code)) consistent with international standards and characteristic of developed countries. Dairy manufacturers might alter the milk composition using an ultra-filtration process or by adding or withdrawing milk components to reach at least 32 g/kg (3.2%) of fat and 30 g/kg (3.0%) of protein (Dairy Australia, 2012). Hence, local and overseas consumers obtain consistent products in terms of composition and taste.

Figure 12. Australian Dairy regions

Source: Ashton & Mackinnon, ABARE, 2008
3.5.2 Milk production

Total milk production in Australia has remained reasonably constant during the last 10 years, at around 9,000 million litres (L) per year. In 2011, milk production reached 9,100 million litres (Dairy Australia, 2011b).

3.5.3 Seasonality of Production

Despite the sharp differences between dairy regions, milk production frequently increases from September to January, achieving a peak in October. The most pronounced seasonality occurs in Victoria, Tasmania and South Australia, whose main feed system based on pasture requires an optimal grass allocation; even though milk supply is not under risk in winter, milk production decreases when pasture growth is reduced. In contrast, milk production in NSW, Queensland and WA is uniform throughout the year (Martin et al., 2000).

3.5.4 Dairy herd

Australia has a national dairy herd size of 1.6 million cattle in 2009-2010 (Dairy Australia, 2010). This number represents a decrease over the past three decades, when the Australian number in some years exceeded 2 million cattle, as illustrated in Table 1.

The Friesian-Holstein breed is most prevalent the Australian dairy herd due to its high milk yield (Malcolm et al., 2009), accounting for some 70% of all dairy cattle. Other important breeds include the Jersey, crossbreeds and Australia's own breed, the Illawarra (also Scandinavian Reds, Red Poll but to a lesser degree).

Over the last ten years, dairy herd size has increased and dairy farm numbers have decreased. The average herd size has risen from 85 cows in 1980 to an estimated 250 currently. There are also less but bigger farms. A small number of very large farm operations, with over 1,000 head of cattle, are also found.
Historically, the largest herds have been located in Victoria. However, the most important livestock reduction occurred in Victoria, minus 382,000 dairy cows in ten years, as shown in Table 1. The national average stocking rate was 1.36 head/ha in 1991-92 and 1.59 head/ha in 2006-07. In 2007 the largest cattle-stockling rate was in Victoria (1.71 head/ha), Tasmania (1.63 head/ha) and SA (1.51 head/ha), while the smallest were in WA (1.10 head/ha), NSW (1.22 head/ha) and Queensland (1.24 head/ha) (Ashton and Mackinnon, 2008).

Table 1. Number of dairy cows in Australia (‘000)

<table>
<thead>
<tr>
<th>Year</th>
<th>NSW</th>
<th>VIC</th>
<th>QLD*</th>
<th>SA</th>
<th>WA</th>
<th>TAS</th>
<th>AUST</th>
</tr>
</thead>
<tbody>
<tr>
<td>At March 31</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1979/80</td>
<td>311</td>
<td>1,047</td>
<td>247</td>
<td>103</td>
<td>71</td>
<td>103</td>
<td>1,880</td>
</tr>
<tr>
<td>1989/90</td>
<td>238</td>
<td>968</td>
<td>201</td>
<td>89</td>
<td>64</td>
<td>92</td>
<td>1,654</td>
</tr>
<tr>
<td>1999/00</td>
<td>289</td>
<td>1,377</td>
<td>195</td>
<td>105</td>
<td>65</td>
<td>139</td>
<td>2,171</td>
</tr>
<tr>
<td>At June 30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2000/01**</td>
<td>268</td>
<td>1,377</td>
<td>186</td>
<td>124</td>
<td>72</td>
<td>148</td>
<td>2,176</td>
</tr>
<tr>
<td>2001/02</td>
<td>264</td>
<td>1,363</td>
<td>174</td>
<td>110</td>
<td>75</td>
<td>134</td>
<td>2,123</td>
</tr>
<tr>
<td>2002/03</td>
<td>250</td>
<td>1,303</td>
<td>159</td>
<td>117</td>
<td>77</td>
<td>142</td>
<td>2,050</td>
</tr>
<tr>
<td>2003/04</td>
<td>248</td>
<td>1,297</td>
<td>171</td>
<td>116</td>
<td>74</td>
<td>133</td>
<td>2,038</td>
</tr>
<tr>
<td>2004/05 (e)</td>
<td>245</td>
<td>1,295</td>
<td>150</td>
<td>115</td>
<td>70</td>
<td>135</td>
<td>2,010</td>
</tr>
<tr>
<td>New Series***</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2005/06</td>
<td>222</td>
<td>1,217</td>
<td>127</td>
<td>104</td>
<td>67</td>
<td>143</td>
<td>1,880</td>
</tr>
<tr>
<td>2006/07</td>
<td>213</td>
<td>1,157</td>
<td>122</td>
<td>105</td>
<td>54</td>
<td>133</td>
<td>1,786</td>
</tr>
<tr>
<td>2007/08</td>
<td>195</td>
<td>1,055</td>
<td>100</td>
<td>103</td>
<td>54</td>
<td>134</td>
<td>1,641</td>
</tr>
<tr>
<td>2008/09</td>
<td>201</td>
<td>1,061</td>
<td>107</td>
<td>106</td>
<td>52</td>
<td>149</td>
<td>1,676</td>
</tr>
<tr>
<td>2009/10 (p)</td>
<td>205</td>
<td>995</td>
<td>110</td>
<td>95</td>
<td>55</td>
<td>140</td>
<td>1,600</td>
</tr>
</tbody>
</table>

* For 1999 and 2000, QLD state figure includes NT cow numbers
** From 2001, census date is June 30, NT and ACT numbers are included in the national total
*** Change in ABS data collection
Source: Dairy Australia, 2010

3.5.5 Cattle Management and Genetics

In 1998 more than 60% of dairy farmers used some artificial insemination on their herd (Martin et al., 2000), but that percentage has increased in the last decade due to the desire to improve the Australian dairy herd. The Australian Dairy Herd Improvement Scheme (ADHIS) plays a central role working on the productivity gain rate improvement using the advanced genetic manipulation. This organisation was formed in 1982 as an initiative of the Australian Dairy Farmers (ADF) with the support of the Standing Committee on Agriculture. The ADHIS receives
the majority of its funding from Dairy Australia through the Dairy Service Levy. The main products of ADHIS are the Australian Breeding Values (ABVs, an estimate of an animal’s genetic merit under local condition), and the ABV (g) (genomics) (a new technology which uses DNA data to assist in the calculation of ABVs for animals). Furthermore, Australian Profit Ranking and the Good Bulls Guide are two relevant tools developed by ADHIS for an efficient breeding selection. Farmers also receive technical support and accurate information to facilitate their decision making process on reproductive topics.

3.5.6 Calving Pattern

The lactation curve is defined as the trend in milk production after a cow calves. This curve is the core measure influencing feeding practices on dairy farms. On average, the lactation curve reaches its peak about 6 weeks after calving (Malcolm et al., 1996).

The decision about what calving pattern to choose (seasonal, split or year round) is influenced by seasonality of pasture production (Animal AusVet, 2005). Based on the calving pattern, farmers know factors such as the milk flow, the herd demand for feed and the timing of animal movement into and out of the milking herd. Within the dairy regions of Australia some use split calving patterns. The core calving patterns are described in Table 2.

Table 2. Australian calving pattern in each dairy region

<table>
<thead>
<tr>
<th>Calving pattern</th>
<th>Dairy region</th>
</tr>
</thead>
<tbody>
<tr>
<td>Year round</td>
<td>▪ North, central and South-east Queensland and Far North Coast NSW</td>
</tr>
<tr>
<td></td>
<td>▪ South-west WA</td>
</tr>
<tr>
<td>Seasonal Autumn</td>
<td>▪ Tasmania</td>
</tr>
<tr>
<td></td>
<td>▪ Western Victoria, South-east SA, Adelaide Hills</td>
</tr>
<tr>
<td></td>
<td>▪ Mid-North, Central and South Coast NSW, Gippsland, North-east Victoria</td>
</tr>
<tr>
<td>Seasonal Spring</td>
<td>▪ Northern Victoria, Riverina and Central West NSW</td>
</tr>
</tbody>
</table>

Source: Adapted from “A Review of the Structure and Dynamics of the Australian Dairy Cattle Industry”, Animal AusVet, 2005
The use of year-round calving pattern is decreasing throughout the Australian dairy industry. On this aspect, Australia has the InCalf program, a Dairy Australia’s national project for improving dairy herd fertility with a farm focus on management to get cows in calf as soon as mating starts. InCalf provides a range of tools, books and reports to fully assist producers on dairy herd management.

### 3.5.7 Dairy Farms

In 1979-80 the number of dairy farms was almost 22,000 with an average herd size of 86 cows. However, in 2002-03 Australia totalled 10,654 dairy farms with 196 cows per farm. According to Dairy Australia, in 2010 there were 7,511 registered farms with an average of 220 cows. This evidences the trend over recent decades for fewer but larger dairy farms, which is the same trend as in New Zealand dairy production (ABARE, 2003).

In the late 1990s dairy farm numbers increased in south west Victoria, apparently due to better market conditions for dairying compared to sheep and beef enterprises. The number of dairy farms slightly increased in NSW and SA (Fulkerson and Doyle, 2001).

In 2008 largest dairy farms were in SA, WA and Tasmania, having the biggest dairy herd and milk production. These farms are diversified and also include sheep and beef cows. On the other hand, the smallest farms are operated in Queensland, northern Victoria, Riverina and Gippsland, obtaining lower milk production because of the fewer dairy cattle. Farmers there are exclusively dairying. (Mackinnon et al., 2010).

Dairy farms are mainly family-owned and operated, similar to the New Zealand model. Only 2% of Australian farms are corporate businesses (Dairy Australia, 2010).

Table 3 shows historical information on dairy farms number by state in three different periods of time. Estimates for 2011 show a significant decline of 628 farms, 571 of them situated in Victoria.
Table 3. Number of registered dairy farms in Australia

<table>
<thead>
<tr>
<th>Year</th>
<th>NSW</th>
<th>VIC</th>
<th>QLD</th>
<th>SA</th>
<th>WA</th>
<th>TAS</th>
<th>AUST</th>
</tr>
</thead>
<tbody>
<tr>
<td>1989/90</td>
<td>2.220</td>
<td>8.840</td>
<td>1.970</td>
<td>969</td>
<td>496</td>
<td>901</td>
<td>15.396</td>
</tr>
<tr>
<td>1999/00</td>
<td>1.725</td>
<td>7.806</td>
<td>1.545</td>
<td>667</td>
<td>419</td>
<td>734</td>
<td>12.896</td>
</tr>
<tr>
<td>2000/01</td>
<td>1.391</td>
<td>7.559</td>
<td>1.305</td>
<td>587</td>
<td>359</td>
<td>638</td>
<td>11.839</td>
</tr>
<tr>
<td>2001/02</td>
<td>1.323</td>
<td>7.079</td>
<td>1.152</td>
<td>538</td>
<td>344</td>
<td>612</td>
<td>11.048</td>
</tr>
<tr>
<td>2002/03</td>
<td>1.290</td>
<td>6.801</td>
<td>1.125</td>
<td>516</td>
<td>325</td>
<td>597</td>
<td>10.654</td>
</tr>
<tr>
<td>2003/04</td>
<td>1.096</td>
<td>6.242</td>
<td>0.967</td>
<td>458</td>
<td>305</td>
<td>543</td>
<td>9.611</td>
</tr>
<tr>
<td>2004/05</td>
<td>1.063</td>
<td>6.108</td>
<td>0.885</td>
<td>402</td>
<td>278</td>
<td>507</td>
<td>9.243</td>
</tr>
<tr>
<td>2005/06</td>
<td>1.024</td>
<td>5.892</td>
<td>0.802</td>
<td>383</td>
<td>245</td>
<td>498</td>
<td>8.844</td>
</tr>
<tr>
<td>2006/07</td>
<td>0.924</td>
<td>5.346</td>
<td>0.734</td>
<td>354</td>
<td>222</td>
<td>475</td>
<td>8.055</td>
</tr>
<tr>
<td>2007/08</td>
<td>0.886</td>
<td>5.422</td>
<td>0.664</td>
<td>332</td>
<td>186</td>
<td>463</td>
<td>7.953</td>
</tr>
<tr>
<td>2008/09</td>
<td>0.860</td>
<td>5.462</td>
<td>0.648</td>
<td>320</td>
<td>183</td>
<td>451</td>
<td>7.924</td>
</tr>
<tr>
<td>2009/10</td>
<td>0.820</td>
<td>5.159</td>
<td>0.621</td>
<td>306</td>
<td>165</td>
<td>440</td>
<td>7.511</td>
</tr>
<tr>
<td>2010/11</td>
<td>0.807</td>
<td>4.588</td>
<td>0.595</td>
<td>286</td>
<td>170</td>
<td>437</td>
<td>6.883</td>
</tr>
</tbody>
</table>

Source: Dairy Australia, 2010

3.5.8 Milk Yield

The average annual milk production (AAMP) in Australia has increased substantially since the late 1970s as shown in table 4. This important increase is caused by improvements in herd genetics, adoption of technology and feed management practices, including more use of feeding grains, concentrates and by-products (Martin et al., 2000, Dairy Australia, 2000, Mackinnon et al., 2010). Tasmania shows the lowest increase in milk production linked to the low cost grazing system.

Table 4. Average annual milk production in Australia in selected dates

<table>
<thead>
<tr>
<th>Year</th>
<th>AMMP (L/cow)</th>
<th>Highest AAMP State (L/cow)</th>
<th>Lowest AAMP State (L/cow)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1979/80</td>
<td>2,848</td>
<td>VIC - 3,012</td>
<td>QLD - 1,984</td>
</tr>
<tr>
<td>1989/90</td>
<td>3,781</td>
<td>WA - 4,205</td>
<td>NSW - 3,602</td>
</tr>
<tr>
<td>1999/00</td>
<td>4,996</td>
<td>SA - 6,790</td>
<td>TAS - 4,381</td>
</tr>
<tr>
<td>2009/10</td>
<td>5,445</td>
<td>WA - 6,641</td>
<td>TAS - 4,633</td>
</tr>
</tbody>
</table>

Source: Dairy Australia, 2010
Summarising, Figure 13 compares the trend in milk production, size of herd and number of dairy farms, showing the significant increase in the AAMP after nineties.

![Trends in Australian milk production 1979 - 2010: milk yield, herd size and farms number](image)

**Figure 13. Trends in Australian milk production, size of herd farms number 1979-2010**

Source: Made by the author based on Dairy Australia, 2010

### 3.5.9 Production Systems

Australian has 5 main feeding systems on dairy farms (Dairy Australia, 2011a):

1. The low bail feed system consists of grazed pasture, other foraging and up to 1.0 tonne grain/concentrates fed in bail;
2. The moderate-high bail feed system, similar to the first one but including more than 1.0 tonne grain/concentrates fed in bail;
3. The partial mixed ration (PMR) system includes pasture grazed for most or all year, partial mixed ration on feed pad with more or less grain/concentrates fed in bail;
4. The hybrid system comprises pasture grazed for less than 9 months per year and similar to PMR for mixed ration and concentrates; and
5. The Total Mixed Ration (TMR) system is characterised to contain zero grazing, because cows are housed and fed using total mixed ration
The main parameters influencing the feeding system to be used are the farm’s natural resources, climate variability, labour constraints, technology and machinery (Little and Grains2Milk Program, 2010).

The main feeding system in Australia is the moderate-high bail feeding system, with 50% of farms using this technique. This is the most popular system in Victoria, closely followed by the low-bail system. This is also the most commonly used system in Tasmania (while the moderate-high bail system is ranked second). Within these two states, the TMR system is almost non-existent, occurring only in Queensland, SA and NSW (Little and Grains2Milk Program, 2010), where the Hybrid system is also widely used. Herd size is also a key factor in deciding the system option, while feeding system 1 and 2 are used in farms with smallest herd sizes, largest herds are mainly fed using systems 3, 4 and 5 (Little and Grains2Milk Program, 2010).

Farmers using systems 3, 4 and 5 have a larger volume of production compared to systems 1 and 2. Eighteen per cent of all Australian farmers use feeding systems 3, 4 and 5 and they account for 26% of total annual milk production. The imperative for dairy cattle feeding systems is to balance the supply of fibre, water, energy and protein. Vitamins and minerals are also required to complement rations, which are provided using concentrates and supplements (Target 10 Project, 2002).

In 2008-10 land for dairy pasture production was 70% planted on perennial species, while the remaining 30% was annual or annual-perennial mix species (Mackinnon et al., 2010).

### 3.5.10 Consumption of Dairy Products

Australia’s total per capita consumption was estimated at 301 litres (milk equivalent) in 2010 (Dairy Australia, 2010), with a substantial growth in the last thirty years, 239L/ capita in 1980; 244L/capita in 1990 and 274L/capita in 2000 (Dairy Australia, 2010). Shares of consumption by product are:

- Fluid milk: 102.4 Litres;
- Cheese: 12.9 Kilograms;
- Butter: 3.8 Kg; and
- Yogurt: 7.1 Kg
Consumption of fluid milk has been reasonably steady during the last 10 years and stabilised at around 100 litres since the mid-eighties (ABS, 2010b). In developed countries like Australia, this is a normal consumption level.

The Australian dairy production must be able to produce and deliver milk in enough volume for 5 states and two Territories. About a half of the milk production of WA (Perth), Queensland (Brisbane and Cairns) and NSW (Sydney) is used to produce fluid milk (market milk). Victoria and Tasmania allocates over 90% of their milk production for manufactured products for international trade (Dairy Australia, 2010).

### 3.5.11 Farm Gate Price

The Australian dairy market is open and has been deregulated since 2000; the government only participates as the regulatory body on food standard and food safety assurance. Consequently, prices that Australian farmers receive for their milk are determined by international markets (Dairy Australia, 2010). Higher international prices and good market conditions stimulate dairy farmers to increase milk production. According to FAO, towards 2019 milk prices should rise 15%-40% compared with the previous decade (OECD-FAO, 2010). In 2009 the milk price in Victoria ranged from AU$4.31 to $4.40/Kg Milk Solids (MS), varying between AU$3.99/Kg MS and AU$5.78/Kg MS (Department of Primary Industries Victoria, 2010). Prices paid are higher for milk from split calving farms than seasonal farms because they produce milk out of season. Therefore, the split calving pattern is predominant in Australia (DPI Victoria, 2010).

Australian milk prices are based on the milk fat and protein solids. Manufacturers can establish different prices (for instance depending on location of production), and they generally offer incentives for volume, milk quality and production out of peak season. In contrast penalties can also be applied. Australian farmers are forced to lower their costs and increase efficiency, because the farm gate price is one of the lowest in the world (Dairy Australia, 2010). This is similar to New Zealand; although some claim that “New Zealand’s dairy costs cannot be consistently matched anywhere else in the world” (Armentano et al., 2004, p. 14). Milk prices in selected countries during the commodity price boom of 2007 are shown in Figure 14. Australia and New Zealand have similar level of prices since 1995.
3.5.12 Costs of Production

Production costs are divided into variable and overhead costs. The most important category of variable costs is feed cost which is stressed in year round calving systems. During drought times pasture availability is reduced below herd requirements increasing the cost of feeding. In contrast, seasonal calving systems in which lactation starts in the period of larger pasture production, has lower cost and subsequent higher cash incomes (DPI 2010). The evidence shows that mixed rations, including grain and concentrates increase the milk yield. Furthermore, during drought periods, farmers are forced to supply alternative feed, increasing these costs. Other significant costs are fertiliser, animal health, labour, interest, repairs and maintenance.

Australia and New Zealand have similar costs of production. The largest difference is in the use of grains in Australian dairy feeding systems (Armentano et al., 2004). The International Farm Comparison Network (IFCN) has conducted a cost analysis on dairy farms, technically defined as costs from the profits and loss account of the dairy farm, plus opportunity costs for own production factors (family labour, own land, own capital), minus the non-milk returns (returns from cull cows, calves of heifers, returns from manure and returns coupled direct payments) (IDF, 2010). According to this worldwide analysis, in 2008 Australia and New Zealand had costs
between US$28-37 per 100 Kg milk, similar to Eastern Europe, South America and Asia. Oceania, however, presents the lowest oscillation between higher and lower costs (IDF, 2010).

Given the need to learn more about this topic, this data will be considered further in the next chapter.

3.5.13 Technology

In recent years Australian dairy farmers have adopted a wide range of technologies (including new management practices) in order to enhance performance, productivity and incomes. The Total Factor Productivity (TFP) has increased by an average 0.8% in the last twenty years, (Dharma, 2011) less than the 1.3% average in New Zealand (ABARE, 2003). Farmers’ age and the industry feasibility are factors limiting technology adoption (Ashton and Mackinnon, 2008, Mackinnon et al., 2010).

Regarding on-farm technology, dairy farmers have gradually adopted the following (Ashton and Mackinnon, 2008, Mackinnon et al., 2010):

- Vehicles, particularly tractors, have sharply increased in 2007-2008;

- Installing or improving milking sheds, being predominantly the Herringbone type angle in 90 degrees (particularly in Victoria), followed by 45 degrees herringbone angle. The second most important system is the large-scale rotary shed. A gradual decrease in the use of walk-through sheds is observed, however the method still represents 20% in NSW and 24% in Tasmania. The larger quantities of milk production demand suitable milk vats; in 1991-92, the average capacity reached 2,000 L, but in 2009, refrigerated bulk vats dominate farm equipment, 40% of those of 7,500 L capacity;

- Conducting soil tests as a guide for land nutrient requirements and subsequent efficient fertiliser application. This service is provided by fertiliser companies, consultants and to a lesser extent by the State Department of Agriculture;
• Analysis of feedstuff in independent laboratories has grown in significance and currently it is a much demanded service by dairy farmers due to its usefulness on protein content calculation;

• Grazing practices have changed as a result of incorporation of grain, concentrates and by-product. Farmers have been forced to implement these new feeding components due to the water constraints resulting in a positive influence on milk yield per cow. Regarding hay/silage availability, historically the majority of producers have their own production (made on farm instead of purchasing);

• Grazing systems are generally a mixture of rotational and electric fences (49%), then rotational grazing (33%), followed by continuous grazing and temporary electric fences, both used in 9% of respondents;

• In terms of cattle health, during the last twenty years 51% of dairy farms have implemented a mastitis program. This disease impacts on milk quantity and quality, reducing the chance of extra bonus over normal farm gate price;

• In 2008-09 72% of dairy farms used computer programs for herd management. Internet connection is predominantly “dial up”, followed by satellite. ADSL and wireless are less popular connectivity systems.

Some Australian dairy farmers have adopted automated backing gates, vat cleaning systems, cup removers, teat spraying, drafting gates and milk flow meters. There are 22 farms throughout Australia with Robotic milking platforms.

### 3.5.14 Capital Invested and Farm Incomes

Dairy farmer investments have been concentrated on land purchase, to increase the scale of farms. This expansion promotes larger herds and allows farmers to take advantage of economies of scale, spreading costs over more units of production. Other important items are buildings, vehicles (mainly tractors) and plant and machinery (such as cropping harvesting and handle machinery). During the last three years, large investments have been made in farm
houses and accommodation. Dairy farm debt has changed similarly; land purchases represent the largest share of debt while the second largest item is working capital and the third is borrowings for reconstructive debts (Dharma, 2011).

Regarding farm cash incomes (FCI) and farm business profit\(^3\) (FBP) (ABARE, 2003, p. 1), Figure 15 shows the fluctuating trends during the last decade. Volatility of prices has been observed after the dairy sector was fully deregulated and consequently the variations in farm business profit result from a higher dependence on global prices and periods of drought (shortage of irrigation, less fodder availability, costs of grains and supplements increased). The dramatic decrease in 2001-02 (caused by drought conditions) represented a reduction of 80% in FCI, the greatest fall in 25 years (ABARE, 2003). In contrast, 2007-08 was a good year with FCI recovering to AU$126,300 and declining again to AU$87,960 in 2008-09. In 2009-10 the FCI decreased to AU$77,300. Despite achieving lower costs in feeding herds, some farmers have reduced their milk production responding to lower farm gate prices (Dharma, 2011).

![Figure 15. Average farm cash income and business profit on Australian dairy farms](source: Dharma & Martin, ABARE, 2010)

\(^3\)‘Farm cash income is a measure of the cash funds available for farm investment and consumption after covering all production costs, including interest payments, and is one of a number of measures of farm financial performance used by ABARE. Farm cash income does not include structural adjustment payments. Farm cash income is a short term measure of farm financial performance as it excludes depreciation and changes in inventories. A longer term measure including these items is farm business profit’.
3.5.15 Human Resources/Labour

The agriculture sector has a high rate of self-employment and casual workers; for dairy this trend is normal due to family-owned and operated farms. Other important labour features are long job tenure, lower salaries and high presence of part-time jobs, older workforce compared to other industrial sources, higher participation of women and lower level of tertiary qualification (Productivity Commission, 2005).

The dairy workforce is concentrated mostly in Victoria. Despite this, dairy farms are not a high employment demanding sector within agriculture, which is dominated by grain, sheep and beef cattle.

The success of a dairy farm depends on management ability. Australia has developed a position in the world dairy market because farmers are prepared to adopt new technology. Business planning, risk management, information and communication technologies are important tools, along with those strictly related on-farm production factors. New entrants to the industry should be even more competent to make up for years of experience.

The attitude about skills development is positive between producers. From 2006 to 2009, a dairy farmer survey showed that the most demanded training was herd nutrition and pasture management; nevertheless, in 2009 at least 50% farmers declared not being interested in any course (Mackinnon et al., 2010).

The number of cows milked per operator increased 66% between 1991/92 to 2003/04 (Lubulwa and Shafron, 2007) while the milk production per labour unit has risen to more than 190,000 litres from 1995 to 2009. Both indicators consider a 40 hour-shift per week (Mackinnon et al., 2010).

In terms of earnings, almost 70% of all full-time agriculture workers received less than $700 per week in 2003. In the same year the average weekly earnings for full-time paid employees was $575 (Productivity Commission, 2005).

The dairy industry may face a shortage of workers in coming years due to an aging population and the higher labour competitiveness between industries, particularly in the service sector. One way to respond is by providing specialised training to people interested in a dairy career.
By the partnership between Dairy Australia and Goulburn Oven Institute of TAFE\(^4\) (GOTAFE), The National Centre for Dairy Education Australia (NCDEA) is supported. The NCDEA offers a range of nationally and internationally recognised apprenticeships, traineeships, certificates and diplomas, related to on-farm activities and farm management. Education is delivered across the country, covering all dairy zones. Courses have an average duration of 1 to 3 years, after which, students are skilled (including significant on-field training) and having knowledge for specific work on dairy farms and/or dairy manufacturers.

### 3.5.16 Dairy Manufacturing

Within the Australian dairy manufacturing sector, diverse companies participate. One group are multi-national dairy companies such as Fonterra (New Zealand), Kirin (Japan) and Parmalat (Italy). Another group is the farmer-owned Cooperatives (Challenge Dairies, Norco and Hastings Valley as examples), which have developed in recent decades. Currently these are important in total market share, the largest being Murray Goulburn. Public companies are also entering the market. Some dairy processors have also become specialised in product lines. For example Warrnambool Cheese and Butter Factory, the privately owned Bega Cheese Limited, Tatura Milk Industries and Regal Cream, and Burra.

Dairy processors are high-technology industries. In Victoria over the past thirty years the manufacturing sector has experienced significant structural changes, motivated principally by increased milk production. Investments have been concentrated on refrigeration technology, instantaneous measures of bacteria, and new equipment for cheese production. New plants have been opened, new production processes established and there has been a significant expansion of facilities. Dairy manufacturers have also financed marketing campaigns and product development, focused on market niches (D.N. Harry and Associates, 2011).

The utilisation of milk is shown in Figure 16. The Australian market has exhibited similar trends for more than a decade, with cheese production being the leading manufacturing product

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\(^4\) TAFE is a government-owned and nationally operated system of colleges offering qualifications that are recognized and transferable internationally.
(produced mainly in Victoria, in diverse varieties and presentations). The “other” item this includes yogurts, custards and chilled desserts.

Figure 16. Utilization of milk in Australia in 2009/10

Source: Adapted from “Australian Dairy Industry In Focus, Dairy Australia, 2010”

In 2008 supermarkets and hypermarkets supplied 75.1% of the total market value leading the distribution channel and this trend remains. The rest is distributed mostly by convenience stores and specialist retailers.

3.5.17 Prices of Dairy Products

Milk is a staple product sensitive to price changes. In January 2011, one of the largest supermarket chains, Coles, dropped the price of the home-brand milk (generic milk) to AU$ 1 a litre. Woolworth Supermarkets quickly matched the offer with the same strategy. Subsequently Aldi and Franklin Supermarkets joined Coles and Woolworth in this “milk price war”. This situation triggered a significant debate about farm gate prices and trade practices affecting producers and convenience retailers. The supermarkets argued that the difference in prices is not being transferred to producer, but absorbed within their own margin.

Discussion is focused on long-term sustainability of reduced milk prices. This situation is a serious threat to producers because it forces them to supply fresh milk with the same costs of
production but lower farm gate prices. In the long run this will affect consumers. Queensland has already suffered a milk shortage during 2011 (Paddy Hintz, 2011); farmers argued they haven’t recovered the level of production of before floods, when they faced lower farm gate prices. In addition, if people prefer generic milk, producers lose a premium paid for branded milk (Paddy Hintz, 2011). Because of this situation, the milk value chain was depreciated by AU $77 million in one year.

On February 10th 2011, The Senate Economic Committee received an inquiry named “The impacts of supermarket price decisions on the dairy industry”. As in 2009, when another inquiry was submitted, the committee finally reported -in 2010 and November 2011- by delivering a series of recommendations. Suggestions encourage all those involved (including the Australian Government) to protect the dairy supply chain and its values of transparency, trust and integrity. The industry must reject actions that threaten directly or indirectly milk suppliers and consumers (Australia. Parliament. Senate. Economics References Committee, 2010, 2011).

### 3.5.18 External Trade of Dairy Products

Australian has always maintained a large milk production surplus after satisfying its domestic consumption; this extra significant volume is destined to export markets, allowing Australia to become the third largest global dairy supplier (after New Zealand and the Europe Union as a whole) (ABARE, 2003). Despite the fact that Australian dairy products face trade barriers and distortions (Australian Dairy Industry Council, 2008), the industry exports 40%-60% of its production to consumers in Asia, the Middle East, Africa and other countries. In the last five years the major importing countries for Australian dairy products were Japan, China, Singapore, Indonesia and Malaysia. For products in 2009 cheese accounted for over 50% of exports and was distributed in more than 60 countries around the world (Dairy Australia, 2010).

Australia imports relatively small quantities of dairy products, with New Zealand being the largest supplier. Cheese is the largest category of imported products (also from Bulgaria, Italy, Denmark, and Norway). The remainder of imports consist of smaller quantities of butter, WMP,
SMP and ice cream (Export Victoria, 2009). The balance of payments of the Australian dairy products is positive.

The total Australian dairy export value reached AU$2.4 billion in 2009-2010, falling by 17% from 2008 and 2009. Strategically the industry is constantly focused on exporting more valuable products to take advantage of the income increase of Asiatic countries and promoting the nutritional benefits of dairy products.

3.5.19 Research, Development and Public Investment

Due to its significance to the Australian economy, agriculture has a policy of public-funded R&D. Nearly $150 million are spent on dairy projects yearly. Financial support is granted jointly by the Australian government, State government departments, Dairy Australia, the dairy companies and private investors (Dairy Australia, 2011d). Much of this research is scientific, investigating soil nutrition, herd breed and pasture production, plagues, cattle diseases and weeds. Government funds are delivered to different organisations that act as intermediaries, such as CSIRO, universities and the Australian Centre for International Agricultural Research and Cooperative Research Centre (CRC). Therefore resources are centrally managed and efficiently used.

The structure of Australian research and development is extremely complex. The important aspect is that the industry is developing and receiving information continuously by reports, books and a wide range of publications which are readily available free of charge. Moreover Dairy Australia in its role to coordinate the industry operation publishes mainly online updated information about different topics. Statistical information and specific state information are also provided by ABARE, Victorian Department of Primary Industries (DPI) and others. There are a large number of students carrying out research about dairy improvements, most of them obtaining their PhD degrees and contributing to the dairy industry development. Similarly, much of the published information is obtained from direct surveys of dairy farmers, conducted regularly in order to collect accurate data, to understand farmer attitude to the industry future and to gather information about farmer needs. Thereafter information is analysed and made available to all members of the Australian dairy value chain as an input for decision-making
processes and for policy makers. This system provides well-designed supportive data and includes the partnership and commitment of all tiers of the milk production structure.

3.5.20 Dairy Related Organisations

The structure of dairy industry organisations is illustrated in Figure 17. All members of the Australian Dairy value chain are represented in order to work together for equitable growth and development of the industry.

![Figure 17. Australian Dairy Industry Organisations](source: Dairy Australia, 2010)

The four main bodies in the structure are (Dairy Australia, 2010):

1. The **Australian Dairy Products Federation (ADPF)** is the national organisation representing manufacturers and traders in front of the Australian authorities.
2. The **Australian Dairy Farmers Limited (ADFL)** is composed of the 6 dairy farmer organisations (one for each state). It represents dairy farmers and forms the dairy commodity council of the National Farmers Federation.
3. The **Australian Dairy Industry Council (ADIC)** has the main purpose of representing the Australian dairy industry on national and international subjects; this group also coordinates industry policy.
4. **Dairy Australia** is a limited liability company that receives funds from farmer levies and the Federal Government. Dairy Australia has two members, dairy farmers (Group A) and two peak industry bodies (Group B). Its core role is to ‘facilitate profitable, partnerships, industry collaboration and collective action that pools and aligns industry funds, resources, expertise and in-kind support to meet critical industry needs’ (Dairy Australia, 2010, p. 33). The organisation prepares an annual Strategic Plan in force for 5 years.

Additionally, state dairy or food regulatory authorities, established under state legislation, are currently represented by six state authorities and one territorial authority. Their responsibility is to assure safety of milk and dairy foods.

### 3.5.21 Environment

Environmental issues are important in Australia for several reasons. The most critical one is that according to the GHG emissions\(^5\) global inventory, developed countries are primarily responsible for higher emissions. ‘Australia accounts for just 1.5 per cent of global emissions, but is the developed world’s highest emitter per capita due to a reliance on coal to generate electricity’ (Grubel, 2011). The greenhouse effect involves greenhouse gases helping the atmosphere to retain heat and keep the surface of the earth warm. However, due to the industrialisation of countries, greenhouses gases increased considerably and the atmosphere is unable to remove them, causing the effect known as “global warming” measured by the carbon footprint (Wiedmann and Minx, 2008).

In 2010, Australian emissions rose 0.5%, from 540 Mt Co2-e in 2009 to an estimated 543 Mt co2-e (million tonnes of carbon dioxide equivalent) (Australian Government, April 2011). Agriculture is the second largest source of emissions -15% of the total in 2009- (Australian Government, 2011e) and has shown a decrease in the last decade falling 2.4% (Australian Government, April 2011). In contrast stationary energy (fuel combustion) has increased and currently the energy sector produces over 70% of the Australia’s national inventory emissions, being the largest contributor. Figure 18 shows the evolution of emissions sources in Australia.

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\(^5\) Green gases includes: methane, C0\(_2\), nitrous oxide, water vapour and some artificial chemists.
Within agriculture, livestock is the most emitting sector in Australia, representing over 65% of the total. Although emissions have decreased, this has been caused principally by herd reductions not by mitigation measures. Livestock emissions comprise enteric fermentation and manure management being derived mainly from cattle and a lesser extent from sheep. The Australian dairy sector accounts for 10% of the total agriculture emissions (Dairy Australia, 2011c), less than from beef cattle. With respect to on-farm methane production, grazing systems on average have higher emissions than mixed farming systems (FAO, 2010a). This occurs because digestion in ruminants produces methane (CH\(_4\)) from enteric (microbial) fermentation, expelled mainly by belching. Manure management is also an important contributor to CH\(_4\) production. Off-farm dairy industry activities also produce emissions.

In 1997 Australia signed the international agreement referred to as Kyoto Protocol that was subsequently ratified in 2007. This pact originated under the United Nations Framework Convention on Climate Change in Japan, aspiring to a reduction by at least 5 per cent below 1990 levels during 2008 to 2012 (Australian Government, 2011c). Australia has been committed to reach an average of 583 Mt CO\(_2\)-e annually (Australian Government, 2011c).

The carbon footprint ‘is a measure of the exclusive total amount of carbon dioxide emissions that is directly and indirectly caused by an activity or is accumulated over the life stages of a product’ (Wiedmann and Minx, 2008, p. 5). Australia has taken several measures to reduce its emissions.
emissions based on mitigation (focus on reducing the amount of greenhouse gas emissions into the atmosphere helping to avoid future impacts), adaptation (promoting an adjustment process to cope climate change effects that are already occurring) and global solution (helping to shape long-term solutions). Under this strategy, the government has developed and is partially implementing several policies to reduce Australia’s carbon footprint. One of the main initiatives is changing energy utilisation practices towards clean energy. Investment in mitigation might require more than AU$5 billion. The Carbon Price reform, one of the biggest economic transformations recently enacted has caused a major dispute about how this policy is affecting not only industries and businesses but also households.

All agricultural activities are exempt from carbon pricing due to the difficulty in calculating and measuring emanations. However, all agricultural businesses are required to pay the carbon price for off-farm emissions or energy consumption (fossil fuels and electricity). Subsequently the Australian government is encouraging farmers, to move towards more efficient and sustainable agricultural production under The Carbon Farming Initiative. By this, farmers can generate credits and subsequently sell them to other farms, offsetting their GHG emissions (Australian Government, 2011e). Dairying can obtain credit mainly by reducing methane emissions from cattle, managing manure and reducing fertiliser pollution.

In addition farmers, scientists and the dairy industry are conducting a wide range of research to reduce emissions because global warming will progressively affect water reserves and dairy cattle. Caused by global warming, heat stress reduces the animal’s ability to produce milk (Pennington and VanDevender). Several abatement alternatives have being encountered and are under assessment, including (Eckard et al., 2010):

- Animal manipulation: unproductive animal reduction, breeding ruminants with lower CH₄, genetic manipulation, rumen manipulation (microbial population alteration);
- Dietary manipulation: forage quality improvements, balance proteins-energy contains in supplements, urinary frequency handling (reducing N₂O emissions), adding condensed tannins (reducing CH₄ emissions and urinary nitrogen); and
- Soil treatments: controlled applications of Nitrate-based fertilizers, grazing time reduction, enhancing irrigation and drainage (reducing the loss of nitrogen).
All these strategies are expensive, not straightforward on their design and implementation, and they must be evaluated in terms of profitability. However, the industry needs to continue working to develop strategies, techniques and methods that contribute to emissions mitigation besides an urgent adaptation to the changing environmental conditions.

3.6 REGULATION AND DEREGULATION AND ITS IMPACT ON THE CURRENT DAIRY SECTOR

For nearly fifty years, the Australian dairy industry ‘received support in both the market and manufacturing sectors, through artificially higher domestic consumer prices’ (Martin et al., 2000, p. 13). Briefly, while state governments’ provided a cash subsidy to support the market price of milk, the manufactured sector received assistance through the Domestic Market Support Scheme in order to regulate farm gate prices. The dairy industry in Australia was completely deregulated on 1 July 2000. This included both market milk sector and manufactured milk.

These changes were motivated in part by two specific events: the 1995 Uruguay Round on Agriculture under the General Agreement on Tariffs and Trade (for manufacturing milk) and the Competition Principles Agreements signed by the Council of Australian Government (COAG), in the same year (for market milk) (Martin et al., 2000).

This adjustment in the regulatory framework was implemented gradually. The Commonwealth government delivered around AU$1.6 billion to assist dairy farmers who were producing milk on September 1999 (The Dairy Structural Adjustment Program, DSAP). The support package also included funds for farmers exiting the industry (The Dairy Exit Program, DEP, up to AU$45,000 tax free) and resources for diversification.

However, the largest migration from the dairy industry occurred in the 1980’s (21,900 farms in 1979/80, 11,800 farms in 2000/01) (Dairy Australia, 2008). After deregulation a substantial number of farmers left the industry. Therefore, deregulation resulted in price reductions increasing the need for efficiency to maintain profitability and competitiveness in the global market.
3.7 CONCLUSION

In this chapter, information relevant to research questions A and B has been canvassed. Firstly, the development of the dairy industry in Australia has been sustained by a favourable political and economic environment along with corporate networks, the active participation of members of the dairy value chain and the Australian government which provides financial support for research activities. Continuous information flows and intensive investigation in different fields of dairying are key influences that allow lower costs and efficient performance. Dairy producers and manufacturers are market oriented and, along with scientists, they are generally concerned and committed about environmental care, due to the significant contribution of livestock to the total GHG emissions. Even though booms and recessions on global markets are always factors to consider, Australian dairy production is an internationally competitive industry and a significant world dairy supplier.

Secondly, deregulation is a major factor in the history of the Australian dairy industry. After 2000, the industry was restructured and only producers committed to competitiveness remained in the business. In this open market, characterised by the high influence of international prices and the proximity to the Asian markets, the industry changed by product transformations, larger farms and cattle, technology adoption, adapted feeding systems, training and a continuing search for productivity improvement. Droughts, reduced water allocation, domestic price setting, irrigated land and labour availability are permanent constraints that encourage farmers to enhance productivity.
CHAPTER FOUR: THE CHILEAN DAIRY INDUSTRY

4.1 INTRODUCTION

The purpose of chapter four is to describe the Chilean dairy industry in order to extract relevant information to compare both industries answering research questions. Firstly, Chile is introduced by a brief general overview. Then a macroeconomic structure is presented to observe conditions that underpin industry performance. Subsequently, the main features regarding milk production, including historical and current statistics are outlined. Due to the shortage of recent information, much of the data comes from the Chilean national census of 1997 or estimates from other sources.

4.2 GENERAL OVERVIEW

Chile is located in south-western side of South America, between 17°30’ and 56°30’ south latitude. Chilean territories also include Oceania (Easter Island) and the Antarctic. The total land area is 2,006,096 km², of which only 756,626 km² are continental areas without considering the Territorial Sea and the 200 miles of Mar Patrimonial (Instituto Nacional de Estadísticas de Chile INE [National Statistics Institute], 2008). Chile borders with Peru to the north, Bolivia to the northeast, Argentina to the east, and the Pacific Ocean to the west, and with the South Pole to the south (Figure 19). The coast washes the Chilean land in more than 8,000 Km. and the Andes mountains separate Chile from Argentina and Bolivia (Vera, 2003).

Chile is a Democratic Presidential Republic whose independent powers are Executive, Legislative and Judicial and is regulated under the Constitution of 1980.

Chile is a unitary state and its administration is functionally and territorially decentralised (OAS, 2010). The territory is divided into fifteen regions, as listed in table 5.

Chile has a centralised national budget, both in its revenue and distribution. This system has an impact on regional budgets and economic resource availability. Chilean regional development shows important levels of inequity, particularly among large and small cities or between regions with different levels of natural resources. Regional inequities are
substantially higher in Chile than in most OECD countries and are directly linked with large differences in labour productivity (OECD, 2009). The decentralisation, directly related to human development, has been a concern from the 1970s and is still important; Chile remains very concentrated from an economic and demographic viewpoint.

Table 5. Administrative Division of Chile

<table>
<thead>
<tr>
<th>Region</th>
<th>Regional Capital</th>
<th>No Provinces</th>
<th>No Municipalities</th>
</tr>
</thead>
<tbody>
<tr>
<td>I of Tarapacá</td>
<td>Iquique</td>
<td>2</td>
<td>7</td>
</tr>
<tr>
<td>II of Antofagasta</td>
<td>Antofagasta</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>III of Atacama</td>
<td>Copiapó</td>
<td>3</td>
<td>9</td>
</tr>
<tr>
<td>IV of Coquimbo</td>
<td>Coquimbo</td>
<td>3</td>
<td>15</td>
</tr>
<tr>
<td>V of Valparaíso</td>
<td>Valparaíso</td>
<td>7</td>
<td>38</td>
</tr>
<tr>
<td>VI of O’Higgins</td>
<td>Rancagua</td>
<td>3</td>
<td>33</td>
</tr>
<tr>
<td>VII of Maule</td>
<td>Talca</td>
<td>4</td>
<td>30</td>
</tr>
<tr>
<td>VIII of Bío-Bío</td>
<td>Concepción</td>
<td>4</td>
<td>54</td>
</tr>
<tr>
<td>IX of La Araucanía</td>
<td>Temuco</td>
<td>2</td>
<td>32</td>
</tr>
<tr>
<td>X of Los Ríos</td>
<td>Valdivia</td>
<td>4</td>
<td>30</td>
</tr>
<tr>
<td>XI of Aysen</td>
<td>Coyhaique</td>
<td>4</td>
<td>10</td>
</tr>
<tr>
<td>XII of Magallanes</td>
<td>Puerto Aysen</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>Metropolitana</td>
<td>Santiago</td>
<td>6</td>
<td>52</td>
</tr>
<tr>
<td>XIV of Los Ríos</td>
<td>Puerto Montt</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>XV of Arica-Parinacota</td>
<td>Arica</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td></td>
<td><strong>53</strong></td>
<td><strong>346</strong></td>
</tr>
</tbody>
</table>

Source: INE, 2008

At the 2002 National Census, Chile's population was over 15 million people (INE, 2008), however the OECD (2010) estimated that in 2008 Chile had 16.8 million people (OECD, 2010b). The most populous region is The Metropolitan (the only landlocked region), with 6,061,000 people, 40% of Chilean population. Of the country's total population, 86% are urban and 14% are rural (INE, 2008).
Figure 19. Chile’s Political-Administrative Division

Source: Gallardo Fernández, 2008
4.3 CHILE’S ECONOMY

The macroeconomic framework of Chile has assisted in the strong performance of the economy since the early 1990s, manifested in good living standards, contained inflation and lower fiscal deficits (OECD, 2010b). According to The Wall Street Journal’s Index of Economic Freedom\(^6\), in 2009 Chile ranked the 11\(^{th}\) freest country and was considered a regional leader in South America (DATAMONITOR, 2009). In 2011, the International Institute for Management Development (IMD) World Competitiveness Yearbook ranked Chile in 25\(^{th}\) place of 59 countries, the best position for a South American country (IMD, 2011).

A stable democracy being attractive to investment has also supported the rapid progress of Chile. Even though poverty has dramatically reduced from 40% in 1987 to 13.7% in 2009 (DATAMONITOR, 2009, OECD, 2009), Chile still has an enormous debt with vulnerable population. Income inequities in Chile are the largest in South America (OECD, 2009). Improvements in education, public safety, health and research & development (R&D) are continuing issues and remain challenging to Chilean authorities. Currently investment in R&D for Chile represents only 1\% of GDP (DATAMONITOR, 2009) well below developed economies.

Chile’s traditional economic activities are related to natural resources extraction, such as copper mining, forestry lumber and pulp, fisheries and agriculture (INE, 2008). However, as in Australia, the major contributor to the GDP in the last decade has been the service sector (Table 6). Even though mineral exports represent almost 50\% of Chilean foreign trade (OECD, 2009), this utilises less labour due to mechanisation.

<table>
<thead>
<tr>
<th>Economic Activity</th>
<th>GDP (%)</th>
<th>Employment rate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agriculture</td>
<td>3.7</td>
<td>11.5</td>
</tr>
<tr>
<td>Mining</td>
<td>17.6</td>
<td>1.5</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>12.8</td>
<td>12.9</td>
</tr>
<tr>
<td>Services</td>
<td>65.9</td>
<td>74.1</td>
</tr>
</tbody>
</table>

Source: OECD, 2009

\(^6\)The Heritage Foundation, in partnership with the Wall Street Journal, publishes the Index of Economic Freedom, which evaluates various subcomponents of economic freedom, including levels of business, trade, fiscal, monetary, and labor freedom; government spending; and property rights.
4.3.1 Inflation

The Central Bank of Chile manages monetary policy. Chile had over 20% annual inflation in the 1980s. Even in the early 1990s the inflation rate exceeded 10%. However, from 1994 inflation rate began to decline to 7% by recent years. This change was mainly the result of the establishment of an inflation target that was met every year, except when global contraction occurred, such as in 2007 and 2008.

Inflation is the main economic problem in Chile and the major challenge is to reduce it towards 3% per annum (García, 2008). This indicator is largely influenced by food and energy prices, because of Chile’s energy dependency.

4.3.2 Gross Domestic Product and Per capita Income

The Chilean GDP has increased over the last two decades; however global economic crises significantly impacted its stability. From 1988 to 1997 Chile’s annual rate of GDP growth reached 7.9% but in 1999 a contraction reduced this by 0.8%. In 2005, GDP recovered to 6.3% but in 2008 it contracted again to 3.7% (OECD, 2009). During 2009 real GDP reached -1.7% but it recovered again in 2010, achieving 5.3%, despite the earthquake and tsunami that hit Chile in 2010. The Chilean economy grew at 6.0% in 2011.

Per Capita GDP in 2008 was US$10,302\(^7\) (OECD, 2011). This indicator conceals a substantial variability and still presents considerable differences on its distribution. The Chilean per capita income inequality presents a Gini Coefficient of 54 (OECD, 2009).

4.3.3 Employment

The unemployment rate in Chile has stabilised at levels above the average of OECD countries. Between 1991 and 1997, the unemployment rate reached an average 6.4% annually and from 1998 to date it has remained close to 10%. Between 2007 and 2010 the rate has been 7% on average, with a peak of 10.8% in 2009, while in 2010 it was 8.5% (INE, 2011).

\(^7\) At 2008 Chilean prices and exchange rate
Besides world recessions, distortions in the Chilean productive matrix also impacts on the labour market. Thus, while small enterprises are major generators of employment, their contribution to the GDP is slight. Furthermore weak employment policies are observed. In general, besides wages rigidity, Chile does not have casual employment or youth employment programs and most workers seek long-term employment. According to a recent analysis although Chile experiences significant growth unemployment will continue to be high due to structural weaknesses (Cowan et al., 2003). The Chilean GDP growth and unemployment rate are shown in Figure 20.

![GDP Growth vs Unemployment Rate in Chile](image)

**Figure 20. Chilean GDP growth and Unemployment Rate 1990-2007**

Source: Centro de Estudios sobre Desarrollo Económico CEDE [Centre for Research on Economic Development], 2008

The Chilean labour market is dominated by males with only 45% of females in the labour force participation rate, compared to 62% average in OECD countries (OECD, 2011).

### 4.3.4 Exchange rate

Chilean Peso is the official currency of Chile. Figure 21 shows the exchange rate of the Chilean peso with respect to the US dollar since January 1990. In general, during the 1990’s, the Chilean peso remained devaluated against the US dollar, a situation that was overturned from 1999 to 2002. The global economy instability caused by the European
uncertainty helped the US dollar to recover, as it is considered a more reliable currency in the field of investment.

![Figure 21. Chilean Peso-US Dollar Exchange Rate 1990-2011](source: Banco Central de Chile, 2011)

4.4 CHILE’S CLIMATE CONDITIONS

There are several factors influencing the wide range of climates in Chile: reliefs (the Andes Mountain, the Coastal Mountain and the Intermediate Depression), the country position in front of the Pacific Sea, the Humboldt Current and the Pacific Anticyclone. Furthermore, all these factors are combined with the vast latitudinal extension of Chile, around 4,300 km (Errázuriz et al., 1998)

Broadly Chile presents three types of climate: Desert in the north, Mediterranean in the central area and Oceanic in the south. The variations according to region include: Arid, Desert, Mediterranean, Rainy and Maritime Temperate Tundra, Cold Steppe, High Ice and Polar climate (US Central Intelligence Agency CIA, 2009).

With respect to temperature, Chile has similar weather behaviour to Australia, registering higher temperatures in the north and lower towards the south. From the Aconcagua river basin, V region to the basin of river Maule, VII region, Chile is influenced by Mediterranean weather; 8° to 20° averages describe temperature. In addition the winter season is marked by larger rainfall an average of 450 mm to 650 mm annually. From there, the rainy
temperate climate prevails; the rain pattern reaches over 1,000 mm and a lower and uniform temperature, of 11º average. In Valdivia, X region, rain is abundant, 2,300 mm to 3,000 mm on average; temperate in winter does not exceed 12º and being more humid, it is ideal for the development of flora and animal grazing.

Even though Chile is not permanently affected by droughts, lower milk production occurs because of unfavourable climate conditions. Since late 2010 Central-South Chile has been affected by La Niña phenomenon; rains have become scanty and temperature lower than normal which delayed pasture growth. This information was forecasted in advance by meteorology service in Chile and was timely informed to farmers along with a brief manual of recommendations to face the drought wisely (TDC, 2012).

4.4.1 Chile’s Land Use and Soil

Soils in Chile are influenced by volcanic activity and their structure is variable and limited in development, so that many are considered young soils (Vera, 2003). Most Chilean soils presents a pH less than 6 and needs to be fertilised by Phosphorus (P) and to a lesser extent by Sulphur (S) and Potassium (K) (Vera, 2003)

Regarding land use, six main activities have been identified. Table 7 shows soils utilisation in Chile (Vera, 2003). Land located mainly from IV to X regions is most suitable for agricultural purposes.

<table>
<thead>
<tr>
<th>Land Use class</th>
<th>Area (ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urban and Industrial</td>
<td>60,362</td>
</tr>
<tr>
<td>Agricultural</td>
<td>3,814,363</td>
</tr>
<tr>
<td>Native pasture and bush</td>
<td>20,589,673</td>
</tr>
<tr>
<td>Forest</td>
<td>15,636,505</td>
</tr>
<tr>
<td>Wetlands</td>
<td>4,498,061</td>
</tr>
</tbody>
</table>

Source: Vera, 2003

According to the 1997 census, Chile has 1,010,048 Ha of improved pasture and 11,914,910 ha of natural pasture, with 50% of each located in X region (INE 1998).
4.5 THE CHILEAN DAIRY INDUSTRY

4.5.1 Overview

The Chilean milk production represents 0.4% of the world’s milk production (IDF, 2010). Dairy production comprises 6% of the agriculture GDP of Chile, although in southern regions it reaches 50% of the sector GDP. Sixty thousand people are directly employed by the dairy industry and about 100,000 are indirectly related to complementary services to the industry (TDC, 2010).

Production of milk in Chile is concentrated in southern regions that account for 85% of the total milk, with the Ríos region producing 65% and Araucania and Bio-Bío regions supplying 20% of total milk. The remaining 15% comes from Metropolitana, Talca and Rancagua regions (Ostrowski and Claus, 2001). The southern production is mainly based on grazing due to appropriate conditions for pasture growth, while dairying in central areas is more intensive and dependant on supplements and concentrates.

The Chilean dairy industry is diverse in terms of productive structure and performance. A recent investigation and fieldwork showed that most producers are involved in beef cattle businesses that compete for the same resources as dairying (Bywater, 2010). Specific productive parameters are almost non-existent and even more, due to the presence of large farms and a significant number of small farms average indicators do not provide a proper overview of the industry because of significant variability in the industry structure. These and a series of other deficiencies need to be overcome in order to emerge as a competitive dairy supplier in overseas markets.

4.5.2 Milk Production

Milk production volume is estimated from data on deliveries by main dairy processors. The Chilean milk production shows an unsteady trend during the previous decade. From 1996 to 1999 milk production rose to 2,000 million litres. However, due to lower prices of imported products, many producers, especially small ones, were forced to cease operations (Esnaola, 2010). Since 1999 the volume of milk increased annually until 2010, except for 2009 when it declined significantly by 7.8%. Table 8 shows the Chilean dairy production and deliveries to manufacturers within the last ten years.
Table 8. Production and deliveries of milk in Chile

<table>
<thead>
<tr>
<th>Year</th>
<th>Production (million litres)</th>
<th>Deliveries (million litres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>1,990</td>
<td>1,447</td>
</tr>
<tr>
<td>2001</td>
<td>2,190</td>
<td>1,636</td>
</tr>
<tr>
<td>2002</td>
<td>2,170</td>
<td>1,605</td>
</tr>
<tr>
<td>2003</td>
<td>2,130</td>
<td>1,563</td>
</tr>
<tr>
<td>2004</td>
<td>2,250</td>
<td>1,676</td>
</tr>
<tr>
<td>2005</td>
<td>2,300</td>
<td>1,723</td>
</tr>
<tr>
<td>2006</td>
<td>2,400</td>
<td>1,818</td>
</tr>
<tr>
<td>2007</td>
<td>2,450</td>
<td>1,874</td>
</tr>
<tr>
<td>2008</td>
<td>2,550</td>
<td>1,971</td>
</tr>
<tr>
<td>2009</td>
<td>2,350</td>
<td>1,772</td>
</tr>
<tr>
<td>2010</td>
<td>2,530</td>
<td>1,895</td>
</tr>
</tbody>
</table>

Source: Oficina de Estudios y Políticas Agrarias ODEPA [Office of Agricultural Studies and Policies], 2011

An average of 25% of the total milk production does not supply the main dairy processors. Firstly, a small part is destined towards calf rearing. But most important the difference between production and deliveries occurs due to the presence of small processing plants and informal processors that mainly manufacture cheese supplying local markets; fresh milk supplied by this group is difficult to quantify. In 2008 Chile registered 101 small processing plants, 57% of them located in southern regions (Velis, 2008).

With respect to dairy regions, the Metropolitan presents the most important reduction on milk production, because its agricultural profile is closer to horticulture. However, Los Ríos region has risen its production establishing itself as the dairy region of Chile and showing an increase of 5% yearly (Ganderats, 2011)
4.5.3  **Seasonality of Production**

As in Australia, in Chile seasonality follows the curve of pasture growing, this being more pronounced in southern regions. In contrast, the central region that depends more on concentrates is less marked. The peak of pasture production occurs in October. Between 2000 and 2009 the average seasonality index\(^8\) (Ling, 2001, p. 1) in Chile was 1.5; whereas in Metropolitan it is 1.1, and in Los Lagos it is 1.7 (Ganderats, 2011).

4.5.4  **Dairy Herd**

According the national census of 1997, there were 615,000 dairy cattle in Chile, 15% of the total numbers of cattle. Despite this data, the last approach estimated the Chilean dairy cattle at 450,000 cows (TDC, 2010). Dairy cattle numbers are concentrated in VII, IX and particularly in X and there it is the bulk of milk production. In line with the increase in dairy exports, farmers are encouraged to enlarge livestock by 4.5% annually in order to reach 750,000 heads in the next 5 years (TDC, 2010).

From 1975 to 1997 Chilean dairy cows numbers increased, however the subsequent decrease in the last decade is explained by the competition for agriculture suitable land; other farm products have become more profitable. However when business expectations are favourable, it is normal to observe an increase in the number of cows that farmers designate to milking. As well while in 1997 the 45% of cattle was in herds of less than 100 cows, in 2007 45% cattle was in herds of more than 200 cows (Ganderats, 2011).

Chilean farms have a large number of dual-purpose cows. Holstein-Frisian is the predominant dairy breed as well as in Argentina and Uruguay (Ostrowski and Claus, 2001). Cross Breeds and Jersey are also present to a lesser extent.

The stocking rate in the dairy region of Los Ríos is 1.6 average head/ha (Ponce and Santibañez, 2003). A gradual increase in the dairy cattle along with an increase in grazing will likely stimulate a higher stoking rate in the next few years (TDC, 2010).

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\(^8\) ‘The index expresses a particular month’s milk deliveries as a percentage of the 12-month moving average centred on that month’.
4.5.5 Cattle Management and Genetics

Artificial insemination in Chile has been used for more than 50 years. This process was led by the Universidad Austral whose extraction centre was established in 1956 in Valdivia based on imported bulls (Universidad Austral de Chile UACh). In the same way, the public Servicio Agricola y Ganadero (Agricultural and Livestock Service), SAG, was involved in genetic improvement. Nevertheless by 1998 this department of the SAG had disappeared (Dirven, 2001).

Currently the Universidad Austral is in charge of the production and distribution of Chilean semen (20% of the total approximately) while the cooperative Cooprinsem conducts the genetic evaluation. Despite this ‘there is no national system for evaluating the genetic merit of individual cows’ (Bywater, 2010, p. 16).

More than ten private companies sell imported semen certified by the International Bull Evaluation Service (Interbull), that is notably more expensive that national semen. At the end of nineties 20%-30% of farmers used artificial insemination and a rate of 10% increase annually was forecasted (Dirven, 2001).

In May 2011 a new organisation was created with the purpose of promoting and developing the bovine genetics in Chile acting as a connecting platform of joint actions between public and private sectors. The Asociación de Criadores Bovinos de Chile (The Cattle Breeders’ Association Chile) expects to contribute to the development of herd genetics in Chile.

Since 2009 Chile has been free of foot and mouth disease (FMD), so that vaccination is not required. Of Chile’s milk producing neighbours, Uruguay is FMD free and vaccination is practiced while Argentina and Brazil have a mixture of FMD free zone where vaccination is and is not practiced (The World Organisation for Animal Health OIE, 2009). In addition, Chile presents only negligible risk of Bovine Spongiform Encephalopathy (BSE) (as well as Argentina and Uruguay), and in Brazil the disease is in a “controlled” status as determined by the World Organisation for Animal Health (OIE, 2011).

It is expected that there will be the imminent eradication of bovine tuberculosis, brucellosis and leukemia. The SAG plays the role of ensuring animal health and is globally recognised in its work (TDC, 2010). Livestock lameness is also a condition that affects the performance and profitability of dairy farms. However, the diagnosis and treatment of this disorder
depends more on land management decisions (and preventive measures) than external control schemes.

4.5.6 Calving Pattern

Over 50% of southern dairy farms use a spring and autumn seasonal calving pattern (more concentrated in spring) especially in Maule, Araucanía and Los Lagos (Bywater, 2010). In Bío-Bío and Los Ríos a year-round calving pattern is utilised by 45% (Velis et al., 2010). In central regions the predominant calving pattern is year round (TDC, 2010). Besides the availability of food, in general, dairy processors exert influence on dairy calving patterns. The trend is towards an uninterrupted supply of milk within the year to efficiently use the installed capacity addressing local and global demand for dairy products.

4.5.7 Dairy Farms

The 1997 national census showed the existence of 48,000 farms with dairy herds. However, only 20,000 participated in commercial milk production (INE, 1998). Unfortunately, the last data collected in 2007 does not specify between meat and dairy herds. The Dairy Consortium, meanwhile, estimated that there was a total of 12,000 dairy producers (Ganderats, 2010)

In Chile there is a wide range in farm size. For instance the largest dairy farm is situated in Puerto Octay, Osorno, X region. With an area of 19,500 ha its production was 40 million litres yearly in 2001; in contrast, many farmers produced less than 25 L/daily (Dirven, 2001).

Currently, the area used for milk production is 700,000 ha, most with improved pasture (TDC, 2010). Although Chile has at least 2 million hectares available in the IX, X and XV regions (TDC, 2010), forestry and tourism have important development potential (Ostrowski and Claus, 2001) competing with dairying.

Chilean dairy farms are mainly family-owned. Farm management is mainly headed by the owner with almost no participation by the spouse, sons or daughters. Eighty-six per cent of farmers are male (Velis et al., 2010). Productive tasks are mainly conducted by hired labour.
This is principally explained by lower costs of workforce which is generally poorly skilled (Dirven, 2001).

Small milk producers will tend to disappear in line with the trend of modern agriculture. The lack of economies of scale has triggered producers towards a change of productive sector or the sale to larger producers (Vera, 2003). This concentration has become a normal trend in the US, Canada and the EU (Dirven, 2001).

4.5.8 Milk Yield

In the Los Rios region the average milk production is 3,120 L/ha (Universidad Austral de Chile UACH, 2009). Between 150 to 200 cows milk yield is 5,000 L/ha while in herds over 300 cows reaches 8,000 L/ha (Dumont and Navarro, 2006).

In terms of yield per cow, in herds over 100 cows situated in the X region, milk yield varies between 5,900 and 6,600 L per cow (Ostrowski and Claus, 2001). The Chilean national production average reaches 5,600 L/per cow.

4.5.9 Production Systems

Available information allows the identification of two main feeding systems. In Southern regions, feeding is based upon free grazing particularly sown pastures year-round, forage and silage (Vera, 2003); climate condition in southern Chile has shown a significant adaptation to temperate humid grass species such as White Clover, Orchard grass and English ryegrass (Vera, 2003). A minor percentage corresponds to forage and supplements. In central regions on mainly irrigated land, dairy cattle are kept in feedlots with high incidence of conserved forages, concentrates, supplements and a small use of pasture (TMR system). For Central Chile Lucerne is used for direct grazing and hay making, and in some cases, there is also irrigated maize for silage (Vera, 2003). In Chile dairy systems supplementation is mainly based on oat or grass silage (Velis et al., 2010). In contrast its South American competitors, such as Argentina, Uruguay and Brazil use maize silage given the availability of grains (Ostrowski and Claus, 2001). Chile is not a grain producer but an importer and much of the imported grain is destined for human consumption.
In Southern regions, the pasture contributes 30-40% of total Dry Matter (DM) consumption. Pasture efficiency in Chile does not exceed 50-60% average in cattle diets (TDC, 2010).

Between the two feeding systems it is possible to find mixed systems, which combine pasture rations with dried diets. There is less information available about the percentages and daily rations.

4.5.10 Farm Gate Price

As in Australia, the price of milk in Chile is based on milk solids, fat and protein content. In addition, there is an important trend to improve the milk quality and volume produced continuously throughout the year. To achieve this, manufacturers establish different prices and incentives. The farm gate price in Chile also differs according to location of production. Thus, producers in the Metropolitan region receive highest prices due to the closeness to processor plants and consumers and a lower cost of transport. Whereas in July 2011 the average milk price in Chile was US$0.42/L, producers in the Metropolitan region received US$0.45/L (Esnaola, 2011).

Figure 22 shows the prices paid to Chilean farmers from 2000 to 2011\textsuperscript{9}. The situation in South America demonstrated that by 1999 the farm gate price of milk in the X region of Chile was slightly higher than in Argentina, Brazil and Uruguay (Ostrowski and Claus, 2001).

\textbf{Figure 22. Farm gate price in Chile 2000-2011 (AUS$ of July 2012)}

\textit{Source: Esnaola, 2011}

\textsuperscript{9} Prices have been converted to Australian dollars considering an exchange rate of 1CH peso = AUS$0.00 in July 2011
Changes in international prices impact domestic prices. However, prices lags are observed due to the presence of stocks previously imported. In addition, variations in domestic prices are lower than international prices deviations (Esnaola, 2010).

4.5.11 Costs and Profitability

According to the IFCN cost analysis, the Chilean milk production costs are in the range of 28-37 US$/Kg milk, the same level as Oceania (IDF, 2010). The main item of costs in Chile is concentrates for feeding; the lower availability of grains increases prices. In the last five years the remaining relevant costs are associated with grassland and forage, replacement cattle and remunerations (Vidal Mujica, 2011). However, in Chilean farms, the opportunity cost of capital represents a minor percentage in relation to actual expenses and amortisation. Furthermore labour is less expensive in Chile than in Brazil, Argentina and Uruguay, although productivity is lower. The cost of the land, in turn, is higher than in Argentina and Uruguay, but land productivity is also higher. Finally, the cost of capital for Chilean producers is similar to Uruguay reaching 1.5 US$ per 100 Kg milk (Ostrowski and Claus, 2001). The return has shown a variable trend in the five years, but in 2010 reaches 10% average (0%-20%) (Ganderats, 2011).

In several production systems of Argentina and Uruguay, the farm gate price is insufficient to cover productive costs. In Chile the situation is different and prices received are normally the highest in the region (Ostrowski and Claus, 2001).

4.5.12 Technology

Technology adoption and use varies with farm sizes and production systems (Dumont and Navarro, 2006). Generally larger farms are more technologically advanced than smaller farms. Most dairy farms with over 100 cattle use cooling tanks, electric fences, machinery, vehicles and frequently conduct soil analyses (Velis et al., 2010). On the other hand, most small farms have access to cooling tanks in the collection centres that store fresh milk, maintaining cold temperature and sanitary conditions required for delivery to plants. The governmental Instituto Nacional de Desarrollo Agropecuario (Agricultural Development
Institute) INDAP has supported these kinds of initiatives through grants to small producers strategically organised and working collaboratively.

4.5.13 Human Resources and Labour

At least seven of fifteen regions of Chile are farming dependent. Agricultural labour is highly demanded during harvest but there are significant levels of unemployment after season. In livestock systems, however, the situation is different with a more even trend.

According to farmers, it is difficult to determine exactly the contribution of workers to dairy production itself. Labour is not only related to dairy activities, but also to beef, crops and forestry. However, there is an agreement about the need to measure indicators on litres/worker and litres/milker (Bywater, 2010). Although a recently conducted study has delivered labour productivity figures (Bywater, 2010), in general information about labour is difficult to access and for small farms is almost non-existent.

Regarding earnings, in 2011 most full-time paid employees in agriculture received AU$400/week\(^{11}\) average (or AU$2.2/hour) according to the minimum wage in Chile (Ministerio del Trabajo y Previsión Social; Subsecretaría del Trabajo [Ministry of Labor and Social Welfare; Secretary of Labour], 2011).

In the 1980’s, the FAO supported projects that attempted to strengthen strategic areas of the Chilean milk production development. Several related to the establishment of training centres to improve human capacity including tertiary education (FAO, 2007). Despite this, dairy farmers have clearly stated that workers skills are insufficient and not in line with technology advances (Dirven, 2001). Farmers and workers have access to different workshops and training delivered by the Dairy Consortium, the Universidad Austral, INACAP, technical-agricultural schools, private consultant and public organisations. The Servicio Nacional de Capacitación y Empleo SENCE (the National Training and Labour Service) provide some tax benefits that encourage farmers to participate in instruction that in the past was partially accepted. The Asociación Gremial de Exportadores de Leche, EXPORLAC (The Milk Exporters Trade Association) along with SENCE are constantly working with the Certification Program of Job Skills, whereby it is expected to train 1,500 workers in the next three years.

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\(^{11}\) At Australian currency of $500 per peso
4.5.14 Consumption of Dairy Products

Consumption of dairy products in South America is lower than in developed countries, except for Uruguay and Argentina with intake levels of 291 and 220 L/per capita respectively in 2005. In contrast, the Chilean population’s total consumption reached only 124 L/per capita (INE 2006). From those, only 19.2 L corresponds to liquid or dry milk per capita (La Tercera, 2011).

Figure 23 shows estimates of dairy consumption in Chile. As observed, the trend is not steady and presents negatives variation over recent decades, as in 1999, 2002 and 2004. Some estimates mentioned a consumption close to 150 L/capita in 1999, a figure that currently has not been achieved (Dirven, 2001). The most commonly consumed dairy products in Chile are aged cheese, powder and liquid milk. Yogurts have increased in popularity in recent years.

In the mid-1980s the organisation PROMOLAC (Promoción de lácteos or dairy products promotion) was created to stimulate the consumption of dairy products. PROMOLAC is constituted by dairy producer federations and dairy manufacturers. In the 1990s the television campaign “Yo tomo” (I drink) was launched. This initiative, funded by public and privates resources, showed Chilean celebrities drinking milk as a way to build a relationship...
between success and nutritious food. Nowadays, the advertising also includes the words “Yo como” (I eat) because of varieties and presentations of other dairy products.

Despite efforts in advertising, the price of dairy products in the Chilean domestic market is high enough to affect middle and low class population, particularly considering the average per capita income of Chilean people and even more the deviation in income allocation. This important driver of consumption has been dismissed by members of the Chilean value chain who continues believe in the power of promotion over a price adjustment that allow a substantial increase in dairy products consumption. For instance, in 2011 one litre of long life milk cost AUS$1.24 on average (ODEPA, 2011).

To improve the nutritional condition of the Chilean population and guarantee access to milk, the government continuously delivers powder milk for children younger than 6 years and elderly people by the Municipal Health Centres (Gobierno de Chile, 2012). Furthermore, via the program “Auxilio Escolar y Becas” (School Aid and Scholarship) students of public schools receive at least one ration of milk during school hours (Gobierno de Chile Ministerio de Educación [Chilean Government Education Ministry]).

4.5.15 Dairy Manufacturing

The Chilean dairy market includes 12 main companies processing milk. Of those, 4 companies account for almost 75% of total processed milk and have plants in the X region. Table 9 shows relative share and milk reception in 2009 and 2010. The historically largest Chilean manufacturer company SOPROLE (Sociedad de Productores Lecheros) was purchased by the New Zealand’s largest milk producer FONTERRA in 2008. FONTERRA controls 99.44% of Soprole’s shares. On the other hand, Colún is a Chilean cooperative founded in 1949 and currently leads the cheese exports to Mexico. In 2010, SOPROLE and Nestlé expressed their willingness to merge operations in a kind of joint venture; however the Fiscalía Nacional Económica de Chile (FNE) opposed the initiative after investigation. The FNE claimed that this joint-venture might affect competition, affecting producers, milk suppliers and consumers (Radio Cooperativa [Cooperative Radio], 2011). If they merged SOPROLE and Nestlé would control almost 45% of total Chilean milk processing capacity.

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12 At Australian currency of $500 per peso
Table 9. Sharing of production in the Chilean dairy industry

<table>
<thead>
<tr>
<th>Dairy Processor</th>
<th>2009 (Thousand litre)</th>
<th>2010 (Thousand litre)</th>
<th>Share 2010</th>
</tr>
</thead>
<tbody>
<tr>
<td>Colún</td>
<td>370,966,902</td>
<td>424,337,413</td>
<td>21.2%</td>
</tr>
<tr>
<td>Soprole</td>
<td>453,400,926</td>
<td>462,734,397</td>
<td>23.1%</td>
</tr>
<tr>
<td>Nestlé</td>
<td>347,148,976</td>
<td>385,545,447</td>
<td>19.3%</td>
</tr>
<tr>
<td>Watt’s S.A.</td>
<td>205,054,377</td>
<td>231,266,760</td>
<td>11.5%</td>
</tr>
<tr>
<td>Mulpuimo</td>
<td>114,332,000</td>
<td>130,967,265</td>
<td>6.5%</td>
</tr>
<tr>
<td>Surlat</td>
<td>156,002,187</td>
<td>111,630,573</td>
<td>5.6%</td>
</tr>
<tr>
<td>Quillayes</td>
<td>36,377,660</td>
<td>67,192,973</td>
<td>3.4%</td>
</tr>
<tr>
<td>Danone Chile S.A.</td>
<td>47,171,363</td>
<td>53,698,709</td>
<td>2.7%</td>
</tr>
<tr>
<td>Lácteos del Sur</td>
<td>0</td>
<td>35,656,958</td>
<td>1.8%</td>
</tr>
<tr>
<td>Valle Verde</td>
<td>0</td>
<td>36,723,919</td>
<td>1.8%</td>
</tr>
<tr>
<td>Lácteos Valdivia</td>
<td>0</td>
<td>34,551,670</td>
<td>1.7%</td>
</tr>
<tr>
<td>Lácteos Puerto Varas</td>
<td>11,919,659</td>
<td>19,100,709</td>
<td>1.0%</td>
</tr>
<tr>
<td>Chilolac</td>
<td>7,638,025</td>
<td>9,155,079</td>
<td>0.5%</td>
</tr>
<tr>
<td>A. Cuinco</td>
<td>13,131,080</td>
<td>105,843</td>
<td>0.0%</td>
</tr>
<tr>
<td>Lácteos Frutillar</td>
<td>9,526,564</td>
<td>0</td>
<td>0.0%</td>
</tr>
<tr>
<td>Total</td>
<td>1,772,669,719</td>
<td>2,002,667,715</td>
<td>100.0%</td>
</tr>
</tbody>
</table>

Source: Esnaola, 2010

The principal line of dairy products in Chile is milk powder and the Chilean market does not include fresh milk. Instead, Chile has WMP, SMP and Long life milk (LLM). LLM is processed under Ultra High Temperature pasteurisation\(^{13}\) (UHT) (Tetra Pak, 2011) and packed into aseptic packages (Tetra Pak registered mark) in whole, slim and light varieties. The high consumption of powder and UHT milk is explained by several reasons. First is the need for food safety, namely, thermal processes destroying harmful microorganisms. Second are the difficulties of transporting milk across the country. Third are the consumption pattern and dry milk storage trend (Esnaola, 2011). Finally the Chilean consumer is not demanding about the quality of dairy products and there is not pressure for improve the organoleptic

\(^{13}\)‘Liquid food products are exposed to brief, intense heating to temperatures in the range of 135 to 140 degrees Celsius. UHT treatment is a continuous process which takes place in a closed system that prevents the product from being contaminated by airborne micro-organisms. The product passes through heating and cooling stages in quick succession. Aseptic filling is an integral part of the process that avoids re-infection. The end result is a product that can be conserved for around six months without refrigeration’.
quality of milk (taste, appearance, colour, aroma, size and firmness). This same situation is observed in countries to which Chile exports, mainly in Latin America (Dirven, 2001). Apparently nutritional value of milk subjected to repetitive thermal processes differs to fresh milk. Nevertheless there is not conclusive information so far.

Ninety per cent of total milk delivered to plants is for milk powder (45%), fluid milk, and cheese (TDC, 2010, Anrique G. and Bidegain P., 2010). At least 90% of the Chilean cheese production is manufactured in Los Ríos and Los Lagos regions (Ostrowski and Claus, 2001). In contrast, fresh dairy products are mainly processed in central regions. During winter the industry normally transforms substantial quantities of fluid milk to dry milk, taking advantage of productive surpluses from the summer season (Hennicke, 2010).

The Chilean dairy manufacturers have an average processing capacity of 9 million L/day. According to a recent analysis, this capacity is able to cover demands in the next four years at current seasonality. However, an increase of 4% in milk production at new rates of seasonality might exceed the installed capacity by 2015 (Anrique G. and Bidegain P., 2010).

The main distribution channels of dairy products are supermarket chains followed by smaller grocery stores. In general, medium and small dairy processors experience several restrictions when selling their products in supermarkets. Firstly, expensive costs of “shelf space”; secondly, the payment frequency is every 45-60 days, forcing small companies to require significant amounts of working capital; and finally supermarkets operate with high profit margins (Dirven, 2001). Therefore, the most popular brands in supermarkets are the big dairy companies.

4.5.16 External Trade

Chile has been historically an importer of dairy products; however, since 2004 Chile became a net exporter with increasing production. This growth is the result of the intensification in production and changes in feeding systems (Salazar et al., 2007). Along with a steady domestic consumption, the dairy industry achieved a productive surplus that allowed sale to international markets. Currently Chile exports around 15% of its production (TDC, 2010) and continues importing dairy products but to a lesser extent. Table 10 shows external trade figures for dairy in Chile, since 2001.
Chile had diversified its exportable portfolio to include UTH milk, WMP, SMP, cream, cheeses, yogurt, condensed milk and caramel. In the last four years the largest exported products were cheese (especially Gouda), WMP, yogurt and condensed milk (ODEPA, 2011). Even though export markets are diverse, Chile is highly dependent on Mexico particularly on cheese trading, where it takes over 80% of total volume and generates the greatest revenue. However, this dependence has been reduced since Chile began exporting dairy products to 42 countries; Venezuela, Brazil, the US and Peru accounted for 40% of exports in 2010-2011. Currently Chilean dairy products are slowly penetrating distant markets such as China, Algeria, Philippines, United Arab Emirates and Turkey (ODEPA, 2011). The signing of number of important Free Trade Agreements has helped develop new commercial relationships.

Regarding imports, the Chilean market demands mainly WMP, SMP and cheese, with Argentina, Uruguay, the US and Brazil being principal suppliers (ODEPA, 2011).

### 4.5.17 Research and Information Flows (Extension)

The Chilean dairy cluster does not have an effective information system. Even though the governmental Oficina de Estudios y Políticas Agrarias, ODEPA (The Office of Agricultural Studies and Policies) releases consolidated information, in general, milk production and consumption data differ according to where it is sourced. The structure of the ODEPA documents is standard and does not cover all significant indicators that allow the reader to visualise the whole industry; for instance, the ODEPA does not mention the number of farms and livestock producing milk. This occurs because most of ODEPA figures are taken
from the Instituto Nacional de Estadísticas INE (The National Statistics Institute) whose last official census was in 1997. Since then data have been partially updated.

There are many excellent technical papers and publications on production issues. However, there is no evidence about the real access or distribution of those documents. In addition, a recent study of Chilean reading behaviour conducted by the Universidad de Chile, shows that the Chilean population do not understand 84% of long complex texts (Universidad de Chile Facultad de Economía y Negocios, 2011) Therefore, if publications are written in a technical and incomprehensible language, these are not playing an optimal role due to a tight connection between education, comprehension skills and development of human capital.

Information availability is a weakness of the Chilean dairy value chain because it affects the decision making process. Producers, in turn, have expressed the need for monthly information. Currently there is no consensus about the distribution channel; while some farmers prefer electronic media, others choose traditional printed newsletters. An important datum provided by farmers is that only when they find an aspect that highly differs from average performances, they decide to delve into data that might assist them (Bywater, 2010).

In general, investment in R&D is conducted by The Universidad Austral that accesses and releases first source information; some private consultants also align on this task. The government indirectly provides funds for the sector through public services and organisations such as the Corporación de Fomento (Chilean Economic Development Agency) CORFO (PROFO line), INE, INIA, INDAP and the Fundación para la Innovación Agraria, FIA (The Foundation for Agricultural Innovation). Nevertheless, these organisations usually have regional budget allocations more than industry budgets, they work by project, support collective ideas of organised farmers and have fairly inflexible regulation. For instance, in the X region The Dairy Cluster has been organised to boost productive systems reaching sustainability, employment, commercial and operative efficiency. Observing the map of members it is possible to identify, in addition to producers, collection centres, processors, and 46 organisations that participate of the dairy business structure. This composition seems to be so complex that any investment initiative will be unsuccessful without an agreement of most members. In addition, grants and funds are mainly oriented to the X region given its dairy vocation.
4.5.18 Related Organisations, Agencies and Public Institutions Participation

Dairy farmers seem to be organised under associations that fulfil the role or representation. From those, the most important according to their participation in general coordination bodies are CALS, BIOLECHE, APROLECHE AND FEDELECHE. However in southern regions 64% of farmers claimed not to be affiliated to any organisation. Apparently, these associations have not been effective to motivate the enrolment. Veterinarians have been identified as the main sources of experience and knowledge (Dirven, 2001).

In the 1980’s, FAO was present in Chile. The FAO supported the milk production system by significant investment and advisory services. The FAO helped in institutional strengthening, facilitating the development and implementation of policies, strategies and programs in the Chilean livestock sector (FAO, 2007).

The importance of the Universidad Austral is evident through labour training as well in supportive and advisory. The University has a remarkable group of professionals, most of them veterinarians, directly involved in boosting the sector by knowledge and skills improvement.

The development of the milk industry has prompted the emergence of services businesses. From specialised magazines, laboratories and supplies, companies are currently participating in the value chain.

Finally, the Chilean government intervention does not specifically focus on milk but on agriculture as a whole in supporting the local economic development. While some institutions play the role of researchers, others provide training and deliver grants and subsidies.

4.5.19 Environment

The Chilean economy depends on and utilises natural resources. The OECD has stated that as with many countries in South America, Chile needs to diversify its production because it has potential in manufacturing goods (OECD, 2009), and such a change that has already occurred.
Regarding GHG emissions, Chile accounts for 0.2% of global emissions that means 3.9 tons per person in 2004, above the average of Latin America. Even though the information of emissions by economic sector is not available, Chile has increased its total CO\textsubscript{2} emissions by 3.8% from 2006 to 2007, reaching 69.8 million in 2007 (DATAMONITOR, 2009). Chile is a party in the Kyoto Protocol Agreement and several other covenants related to environmental care (DATAMONITOR, 2009). In line with this, the FIA published in February 2010 a document highlighting relevant concepts, the global regulatory framework and the impact on the Chilean agroforestry. This publication suggests a series of measures of prevention, mitigation and adaptation (Nauenschanwer Alvarado, 2010). However Chilean farmers are currently uninvolved with GHG issues because, this issue seems to be distant.

In contrast, for Chilean dairy farmers environmental issues are more related to manure and waste management. Although regulation is not absolutely clear on this topic, there is a large quantity of information available. Improved slurry handling is likely to reduce the contamination of surface or groundwater. Because an intensification of production is expected, this will increase organic waste. Recommendations, from both government and private advisors, cover almost every stage of the milk production and in general, suggestions recommend the efficient consumption of water in waste disposal and the reuse of fertilisers obtained from manure (Salazar et al., 2007, Dumont and Navarro, 2006).

4.5.20 The Dairy Consortium

In recent years, the Universidad Austral and the Instituto de Investigaciones Agropecuarias (The Agricultural Research Institute) INIA started a joint effort to create an organisation that represented every member of the Chilean value chain. In October 2005, the Dairy Consortium was founded as a Corporate Technological Research Consortium. With an initial budget of US$6 million, 66% from public funds, the corporation Dairy Consortium consists of The Federación de Productores lecheros de Chile FEDELECHE (The Chilean Dairy Producers Federation), the main dairy processors COLUN, NESTLÉ, SOPROLE, SURLAT and WATT’S, as well as the services providers companies BIOLECHE, COOPRINSEM, TODO AGRO LTDA., The Universidad Austral and INIA.

The core aim of the Dairy Consortium is to conduct a broad range of strategic actions that support the development of the Chilean dairy industry, searching for improvement to foster its competitiveness and profitability. After 4 years working the Consortium published
the “Competitive Strategic Development for the Chilean Dairy Sector 2010-2020” (TDC, 2010). This constitutes the first step in establishing the general guideline to strategic objectives and goals. Within the documents the Consorcio describes the Chilean value chain isolating weaknesses to be addressed to becoming a competitive world dairy supplier. Firstly the document describes the current situation of the Chilean dairy industry in terms of production profile, growth, global opportunities, GDP contribution, strengths and weaknesses. Subsequently objectives and strategic goals are stated according to different scopes, such as milk production, dairy processors, commercialisation (domestic and overseas), industry sustainability (environment and image), related support, loan access, digital connectivity and research. In total the Dairy Consortium’s strategic guideline contains seventeen objectives and thirty-four goals to be addressed within ten years.

Other significant achievements to date are:

1. The research report “A review of Indicators, Project M1P2” conducted by the New Zealander dairy specialist Tony Bywater after visiting Chile during 2009 (Bywater, 2010);
2. The identification of the Chilean dairy macro zones as well as the first approach to production indicators collected from sample farms;
3. A series of research projects currently ongoing that encompass farming, industry, market, human resources and environment areas; and
4. The recent visits to Australia (November 2011) with the purpose of identifying and learning from good practices.

The Consorcio, a kind of Dairy Australia in Chile, was created under the logic of collaborative work and networks consolidation. Further the Consorcio acts as a bridge connecting the government institutions with the private players, reaching shared goals.

4.5.21 The Dairy Consortium’s strategic document review

In general, the Dairy Consortium’s strategic document shows the same scope that this study does in terms of the search for production improvements. It also incorporates an encouraging global standpoint meeting its leadership and representativeness roles. However, the Consortium conducted the plan in a particularly optimistic business scenario;
this research recommends a more cautious stance and a more comprehensive standpoint of all members partaking in the industry.

The most important weaknesses found in the consortium aims and goals are described in Table 11 and over those it is suggested to work more deeply.

**Table 11. The Dairy Consortium’s strategic document review**

<table>
<thead>
<tr>
<th>Scope</th>
<th>Main findings’ condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>Business environment</td>
<td>Clear abstraction; the Chilean economy’s inhibitors are not considered</td>
</tr>
<tr>
<td>Farms structure</td>
<td>Small milk producers are not expressly mentioned as part of the dairy cluster throughout, underestimating their contribution that represent 25% of total milk production</td>
</tr>
<tr>
<td>Statistics and production information</td>
<td>No reference whatsoever to the paucity of production indicators, relevant in determining the ex-ante assessment, the baseline for upcoming performances and the decision making process</td>
</tr>
<tr>
<td>Management</td>
<td>Each goal’s deadline, method, scope and monitoring actions are not defined</td>
</tr>
<tr>
<td>Goals ranking</td>
<td>Numbered goals but not established according to their priority or impact over the value chain</td>
</tr>
<tr>
<td>Technology</td>
<td>Technology investment and adoption as a way to improve productivity are not promoted</td>
</tr>
<tr>
<td>Production orientation</td>
<td>Quantity oriented and only brief attempts to promote quality orientation</td>
</tr>
<tr>
<td>Implementation costs</td>
<td>No approach respect individual or general costs expected to arise in some suggestions implementation</td>
</tr>
<tr>
<td>Environmental care and sustainable production</td>
<td>Partial, discreet and unconvincing approach</td>
</tr>
<tr>
<td>Goals’ scope</td>
<td>At least 2 goals are defined considering adjustments that belong to the Chilean state’s action range</td>
</tr>
<tr>
<td>---------------</td>
<td>--------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Strategic document dissemination</td>
<td>Through the Corporative website which does not guarantee massive access</td>
</tr>
</tbody>
</table>

The Dairy Consortium must fulfil the role of a representative entity. An upcoming assignment is to convert the strategic plan to a business plan incorporating all participants of the Chilean dairy cluster. It is also desirable the Consortium contribution to provide simple structures and processes (no bureaucracy, complexity and uncertainty) for all milk members within the industry.

### 4.6 CONCLUSION

Chapter four completes the information needed to answer research questions A and B. Regarding macroeconomic factors, Chile’s economy has developed successfully in recent decades, which stimulates industries’ establishment and consolidation. However the country still presents high levels of social and income imbalance that impacts markets. Certain structural deficiencies particularly on R&D funds, training and labour market are important obstacles impacting costs, productivity and subsequently competitive internationalisation attempts. The paucity of a governmental environmental strategy prevents the dairy cluster members to become aware of environmentally friendly practices.

On the other hand, the Chilean dairy industry has made progress recently although it is still partially disjointed and lacking in production statistics. Besides the heterogeneity in the primary structure, characterised by the presence of large and small milk suppliers, the sector is diverse with respect to milk quality. Following a global trend, the dairy farms have become larger but fewer. Even though milk production demonstrates a reasonable growth it is still slightly unstable. In an industry dominated by a few processors, the Chile market counts with the most diverse range of dairy products, but unaffordable prices result in a low per capita consumption.
CHAPTER FIVE: CROSS COUNTRY COMPARISON

5.1 INTRODUCTION

The aim of this chapter is to compare the profile of the Chilean and Australian dairy production systems. Firstly and consistent with Porter's Diamond (Porter, 1990), the comparison begins by contrasting macroeconomic conditions documenting each countries' advantages and factor conditions. Then, the competitiveness of dairy production in Chile is outlined. The Chilean industry is firstly observed from the Porters' Five Forces (Porter, 1980) perspective and subsequently analysed under the Value Chain model (Porter, 1985). Finally, the costs of production in Australia, New Zealand and Chile are considered.

5.2 COMPETITIVE ADVANTAGES OF CHILE AND AUSTRALIA

Porter's diamond (Porter, 1990) determines elements of the economy that are encouraging or inhibiting industrial development. Factors of production that a country possesses may be categorised differently. Factors are categorised as being basic and advanced, according to how significant they are for competitiveness.

Beside the categories of factors, it is also significant to identify relationships and dynamics between variables. From a combination of factors a country defines its production profile and often its policies.

In previous sections, chapters three and four detailed descriptions of Chile and Australia were given, both about macroeconomic settings and dairy industries features. In the following section macroeconomic variables and their implications are discussed.

5.2.1 GDP and Per Capita Income Implications

The economies of Australia and Chile are markedly different: the first one is a member of the developed countries group, the second one is gaining ground among reasonably stable growth nations with a favourable position in South America. However, whether the Chilean
economic position is a tangible achievement or an assumption when Chile is compared to other slow-growing or stagnated South American countries is still a matter of inquiry.

Australia is defined as a rapid growing economy, dynamic and highly resilient. Australia has had an acceptable expansion of its economy's production possibilities. After the great depression of the 1930's, Australia has not shown such a serious economic contraction experiencing mild reactions to the recent global crisis, and showing a consistent trend of economic progress. Australia is one step ahead of Chile in issues such as environmental policy, research investment budget, labour inclusion and regulations. Still Australia has large differences in income distribution among the population. The Gini coefficient rose from 0.303 in 1997-1998 to 0.331 in 2007-2008, below the OECD countries average (0.31 in 2011).

Chile, in turn, has maintained relatively fast growth in the last decade as evidenced by GDP figures. Chile is taking off towards significant economic progress. A GDP that performs efficiently rising by 3.5% annually characterises countries undergoing an economic step up. Chile, too, has reacted positively to recent global economic slowdowns (Asia 1997 and The US 2008). The increase in the inflation rate by 4.6% in 1998, the high volatility in financial markets and the international lending contraction manifested a major shock. The history of the Chilean economy is turbulent because, as well as the rest of developing countries, Chile is particularly subject to changes in the world economy. Chilean authorities are always coping with poverty, delinquency, minorities’ discrimination, high rates of unemployment and variable levels of inflation. Income inequality locates Chile in an unfavourable position, the worst in Latin America. Australia per capita income (AU$ 45,000) is more than four times higher than Chile (AU$10,300), despite having a similar population size and certain resemblances on natural resources endowment. The 2009 Gini coefficient of Chile, of 0.54 is considered extremely high. According to experts inequality is gradually becoming larger. Inequity impacts on different spheres of countries and is directly linked with growth and development retardation. In Chile, income inequity is impacting not only on consumption, poverty and education level, but consequently on productive inputs including labour availability and training.
5.2.2  Investment and Energy Implications

Australia and Chile are considered trustable low risk economies, but situated in different reliability levels. According to the 2011 IMD competitiveness ranking, both countries are situated within the first 30 spots, 9th and 25th respectively. This positive condition is mainly driven by price stability or contained inflation rates that impact on social and economic spheres and thereby on countries’ development. It is evident that in the last decade inflation in Chile has been efficiently controlled, after the economy underwent critical periods when inflation was over 20% annually. The Central Bank of Chile and The Reserve Bank of Australia have coped with inflation using a strict monetary policy with inflation targets. Price stability promotes a smooth functioning of financial markets and consequently it attracts foreign investment. Capital flows entering a country stimulate the economy. However, commercial openness might trigger resources unsustainability and overuse, components that are permanently questioned from diverse sectors of societies.

A good example of investment attraction occurred in the Chilean dairying. Apparently enticed by low cost land, similar climate conditions and Chile’s fiscal discipline, groups of New Zealanders farmers have arrived in Chile to run dairy farms. It is expected that the arrival of capital and vast experience might motivate changes in farm management, not only in terms of productivity, but reinforcing environmental care initiatives. This relationship encourages the construction of more permanent links to professionalise the milk business including better flows of information, development projects and experts on field.

In terms of inflation influence, Chile evidences an important weakness due to its energy dependence whose solution is still a pending challenge. Chile’s energy sources include natural gas largely from Argentina; crude oil and charcoal from different suppliers (including Australia). As an input for all kind of industries, primary energy’s global availability and volatility, along with fuel price rises, should have productive repercussions particularly under the Chilean industrial development scenario and the increase of its motor vehicle fleet. The transport sector is the highest energy consumer and is generally supplied by petroleum derivatives. However, mining is the largest electricity consumer, competing with household consumers that are undergoing a new process of residential (and commercial) electrification.
Facing this growing energy consumption trend, Chilean authorities have strengthened the related institutionalism, defining a position as well as preliminary strategies, policies and plans around this issue. This restructuring will facilitate the energy efficiency action plan implementation, pointing towards an energetic matrix diversification at the short, medium and long term. Such a plan considers a series of certain measures in order to promote the efficient use of energy across the population but especially the search for new sources of renewable energy, energy megaprojects and investment in extension of the electricity generation capacity. In general, energy utilisation initiatives are slightly related to environmental care, namely, tourist heritage protection, climate change or GHG emissions. Recently conducted environmental studies have demonstrated that the last approved dam in Southern Chile (Patagonia) “Hidroaysén” will affect thousand hectares of natural flora and fauna landscapes with touristic potential, causing further collateral effects over population wellbeing and their economic activities.

5.2.3 Employment and Workforce Implications

The labour market in Australia and Chile also demonstrate core differences. The Australian unemployment rate fluctuates more moderately than the Chilean rate. Bordering on 5.0% average unemployment, the labour market in Australia is described as inclusive, diverse and permanently adapting. High rates of migration provide a particular scenario for workers and authorities. Australia promotes for instance, young employment policies, establishes casual employment rates per hour and a reasonable minimum wage. In contrast, Chile, with an average unemployment rate close to 8%, shows structural deficiencies in the labour market which mainly impacts on the young population and promotes the search for long term employment and subsequently stiffens the system. Exhaustive analyses have shown the inability of the minimum wage in covering households’ basic demands increasing the gap between professionals, technicians and less trained workers, such as agricultural labour. These imperfections stimulate the occurrence of underemployment or underutilisation of workers’ productive capacity. Further, women in Chile are not greatly incorporated to the labour market as in Australia; there is still a gender gap to access quality jobs and similar wages levels.

Strongly related to employment, the education system in Chile has been severely questioned and subject of extensive analyses. The last study conducted by the OECD in
2004 is insightful. Enormous inequities between primary and secondary education resulted in foundation weaknesses for tertiary education. Higher education promotes university studies over technical education or short courses linked to specific industrial occupations. In general, no specialised instruction is provided for labour in dairy chores causing at the same time, an absence of training standards.

Furthermore, statistics and trends confirm a future constraint in agricultural workers availability in Chile and even deeper in Australia. Normally, the agricultural workforce in Chile is more prone to accept low-paying jobs in accordance with their level of training. As a fact, other South American countries are providing large quantities of labour to Chile; workers that attracted to economic stability arrive in Chile searching for better working conditions. However, in spite of a significant volume of available labour, the absence of suitable qualifications has led to a productive decline, and even lower if compared to Argentinean, Uruguayan and Brazilian dairy farms.

Chile also has permanent labour inspections on farms, because several groups of immigrants have been found undocumented and in deplorable working circumstances. All these conditions are pushing the system towards employment sustainability sharpening the need for certain policies, both unresolved. Such a situation remains in a strict relationship with the structural economic change that Chile and Australia have suffered. While mining and agriculture sustain exports, urbanised service-based economies offer more attractive jobs. The labour market is now more competitive and also more dependent on services companies.

5.2.4 Exchange Rate and Resource Based Exports Implications

The exchange rates of Australia and Chile have shown currency appreciation. From 2008 the US dollar price has become particularly volatile, a situation exacerbated in 2011 when it underwent a deeper depreciation due to a recession in the US economy. However, given the economic stability of Australia and its level of sharing in overseas markets the purchase of its currency is highly boosted. Thus, investments have become more profitable and less risky when done in Australian dollars. The Chilean currency, on the other hand, has no international weight. In Chile, massive inflow of dollars is occasionally controlled by public intervention. Chilean peso appreciation triggers a permanent pressure from exporters of diverse sectors (particularly from those linked to agriculture) urging
authorities on purchasing the US currency. Without being a grant, this action searches for the protection of producers’ earnings, rather than being a measure that balance currencies. Exporters pretend to offset their accounts reducing the normal exchange rate risk.

Henceforth, the most important implication for Australian and Chilean agriculture sectors, including dairying, is in relation to farmers’ final income. When US dollars derived from dairy exports are converted into the local currency, the final revenue and subsequent losses become evident. In addition, the depreciation of the US currency, that normally rules global dairy prices, is rendered as a decrease in prices paid to milk producers. The impact of global prices is more visible on Australian farmers’ revenues than Chilean ones. In 2001, Chilean farmers received higher farmgate price than Argentinean, Brazilian and Uruguayan farmers. This situation will gradually change with more openness of Chilean dairy products to the overseas milk market.

The impact of currency variations is higher in export dependent countries such Chile and Australia, because the exchange rate is part of monetary policies and must be managed wisely. The export base of both countries is mining and agriculture; nevertheless Chile also has a great income from forestry and mariculture exports. Despite this resemblance, there is an important difference between the export trends because Chile is more likely to have primary production exports. The expected and often suggested export diversification process or second export phase has occurred partially. The Chilean wine industry placing products in various countries around the world is a good example.

5.2.5 Natural Resources and Environment Implications

While Australia is pioneering environmental policies, Chile is hardly progressing, with the low research investment identified by the OECD studies. The most recent and relevant government approach about climate change has been an explanatory publication whose contents only provide elementary actions taken from other experiences. In general, climate change, global warming and GHG emission are unfamiliar subjects for the average population, entrepreneurs and farmers. Only few attempts to address these topics are observed from environmentalists or proactive world-care attitude groups.

Regarding water availability, Australia faces extensive and intensive periods of droughts which have led authorities to formulate a stricter policy in order to guarantee an efficient
water allocation. For agriculture, water availability constitutes a permanent challenge and along with land availability are the two more important constraints for agriculture expansion. Chile, on the other hand does not record severe drought seasons, though, since 2010 has been undergoing this adverse condition that might worsen due to the climate change. Irrigated areas, whose rivers effluents are the Andes snowmelt, have lost flow rate. Authorities have reacted and the first approach achieved has shown a gap on assessing the quantity of available water. No system to measure the water descending from high summits has been developed. Seemingly, irrigation water is inefficiently handled and its distribution reflects private agreements that normally favour larger farms.

Southern regions maintain near 2 million of vacant hectares that will be potentially destined for agriculture. A shortage of some lands nutrients will be addressed via fertilisation. This becomes an opportunity not only for dairy but also for any activity that searches for productive expansion in line with the Southern Chile agro-climatic landscape.

5.2.6 Commercial Openness Implications

Chile and Australia are open economies. Chile records over 27 Free Trade Agreements (FTA). While for producers/exporters new markets and millions of consumers emerge, also low prices and product diversification positively affects household budget and preferences. Australia and Chile signed a FTA that came into force in March 2009.

Chile has developed a global policy of becoming a leader in food production which is disseminated by PROCHILE, the Chilean Export Development Agency. The most remarkable point of this policy is the favourable environmental conditions of Chile, heritage mainly protected by the Andes Mountain. This background acts in favour of primary production, which in some manner guarantees the food safety. In general, Chilean fruit, seafood (salmon) and aforementioned wines have good reputation in important markets such as the US, the EU and Japan. Given the same hemisphere location and seasonality, Chilean and Australian food products might compete for the same external markets.

Both Australia and Chile maintain a surplus on their trade balance.
5.2.7 **Budget Concentration and Administrative Centralisation Implications**

The centralised political structure of Chile affects funds accessibility and, in general, it favours certain regions. Capital accumulation results, among others, in new capital attraction and active working population movements. Most of agriculture-based Chilean regions have been greatly struck for a shortage of fiscal funds that usually sustain the Metropolitan region. Australia allocates resources independently under states and territories and hence supports different productive sectors according to their potential and profitability. Political decentralisation and administrative devolution have been pointed out as prerequisites for regional competitiveness and commercial internationalisation.

Regional resources allocation in Chile involves bureaucratic practices. Regional governments and public agencies, in charge of resources approaches, maintain a series of requisites usually hard to fulfil. Moreover, most promotion programs are focused on small enterprises and hence productive systems are not observed thoroughly. The Dairy Consortium, currently funded by public and private funds, is an example of a well-submitted proposal. However, the Consortium should assure private income sustainability, to continue functioning during the next few years. Under a neoliberal economic system the Chilean State is less paternalistic because of the expected self-regulated market.

5.2.8 **Infrastructure and Communication Development Implications**

Chilean ports and road infrastructure have been improved as a result of commercial openness. Natural disasters such as tremors and earthquakes have become essential in testing infrastructure conditions and they are also forcing its renovation. In spite of good roads, the shortage of fresh milk in local markets has been explained due to transporting difficulties, which is not a compelling reason.

Chile has a rail freight network primarily used on minerals transport, but with a low impact on the national economy. Rail transport is far below Australian railways quality. Australia and Chile’s geography and location make them highly dependent on maritime freight and hence, merchandise harbours are crucial to maintain adequate trade flows.

Like Australia, Chile has incorporated its communication to the Internet progressively. Remote rural geographical areas still undergo problems of connectivity; however, through
Chilean public and private determination, the virtual highway is approaching a wide population.

Despite achieved progresses, most kind of information flows, for instance, from government to small farmers (such as grant access communications) or global market figures towards medium size enterprises seems to be non-effective. A first explanation relates to the lack of effective infrastructure or communication channels and the second to message comprehension, linked to certain cognitive failures of a great part of the Chilean population.

5.2.9 Factor Conditions Summary

The main surrounding factors affecting industries in Chile are presented under Porter's diamond model (Porter, 1990). Factor conditions are organised as motivators and inhibitors of business development.

<table>
<thead>
<tr>
<th>MOTIVATORS</th>
<th>INHIBITORS</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Economic stability and optimistic growth forecasts for incoming years</td>
<td>• Socio-economic structure characterised by higher levels of inequity particularly in population income</td>
</tr>
<tr>
<td>• Fiscal discipline and restrictive monetary policy with inflation target</td>
<td>• Considerable variability of inflation rates highly dependent on food and energy</td>
</tr>
<tr>
<td>• Surplus on trade balance</td>
<td>• Structural deficiencies in education and training system</td>
</tr>
<tr>
<td>• High incidence of government on exchange rate adjustments, reducing foreign exchange risk</td>
<td>• High occurrence of underemployment and low incorporation of women to work</td>
</tr>
<tr>
<td>• Trade liberalisation and 27 FTAs currently in force.</td>
<td>• Deficiency of energy sources and dependence of Argentine gas</td>
</tr>
</tbody>
</table>

Table 12. Chilean economy motivators and inhibitors on business development
According to this analysis Chile has a similar number of motivators and inhibitors, however it is necessary to establish those of major impact according to the Chilean dairy industry profile. The shortage of productive indicators makes these tasks more complex to conduct. However, in terms of factors and farmers/processors engagement, the final assessment indicates that all members involved in the Chilean dairy production should know this scenario.

Despite the low incidence in government policy, inhibitors related to training, underemployment, primary products exports, water administration and environmental issues might become enormous opportunities to submit innovative proposals. The experience gained by working regularly in the country side managing natural resources

<table>
<thead>
<tr>
<th>Motivators</th>
<th>Inhibitors</th>
</tr>
</thead>
<tbody>
<tr>
<td>25th position on IMD ranking competitiveness</td>
<td>Lack of environmental policies in line with current issues (Global warming, GHG emissions)</td>
</tr>
<tr>
<td>Near 2 million ha of available land</td>
<td>Structural deficiencies in labour market, sensitive employability levels, high unemployment rates and low salaries</td>
</tr>
<tr>
<td>Improvement on communication and infrastructure according with globalisation processes.</td>
<td>Insufficiently skilled labour causing low labour cost but low productivity</td>
</tr>
<tr>
<td>Political support: Internationalisation policy, enhancing phytosanitary heritage and good commercial reputation of food products in world markets</td>
<td>Inefficient water administration and incipient arrangements and practices to address it</td>
</tr>
<tr>
<td>Foreign direct investment promotion</td>
<td>Politic concentration generating uneven public funds allocation and unequal regions development</td>
</tr>
<tr>
<td>Farmers association and linkages encouragement</td>
<td>Exports based on primary products and important risks of resources depletion</td>
</tr>
</tbody>
</table>
should trigger a special commitment that might be reflected through intelligent actions without losing sight of the business’s final purpose, profitability.

5.3 **DAIRY INDUSTRY COMPETITIVENESS**

5.3.1 **The Five Competitive Forces Analysis (Porter, 1980)**

Below, the Chilean industry will be subjected to the 5 forces analysis. According to Porter's diagram (Porter, 1980), the next description will consider main dynamisms that run within the industry. Structural determinants of the intensity of competition are described by each force.

### A. Industry Competitors rivalry

<table>
<thead>
<tr>
<th>Industry concentration and diversity:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Vastly concentrated and slightly balanced</strong></td>
<td></td>
</tr>
<tr>
<td>Market formed mainly by 12 companies</td>
<td></td>
</tr>
<tr>
<td>Only 4 processing companies account for 80% of production/commercialisation</td>
<td></td>
</tr>
<tr>
<td>Two of the largest manufacturers, Nestlé and SOPROLE (Fonterra), are foreign-owned companies</td>
<td></td>
</tr>
<tr>
<td>Highly technologic industry growth strictly related with suppliers deliveries</td>
<td></td>
</tr>
<tr>
<td>Companies merging and small plants purchasing have become a normal practice following a global trend</td>
<td></td>
</tr>
<tr>
<td>Australian industry shows similar concentration, property behaviour and development as the Chilean industry.</td>
<td></td>
</tr>
<tr>
<td>These features are typical of oligopolistic markets.</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Differentiation:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Average</strong></td>
<td></td>
</tr>
<tr>
<td>Most dairy processors have similar product-mix: fluid milk (whole, slim and light long life milk), WMP, SMP, cheese, butter and yogurt</td>
<td></td>
</tr>
<tr>
<td>Main differences lie in canned products, such as condensed milk, chilled desserts and cheese varieties</td>
<td></td>
</tr>
<tr>
<td>In some cases, packaging design and shape marks differences allowing brand distinction</td>
<td></td>
</tr>
</tbody>
</table>
- Leading companies dominance causes a parallelism of price decisions and establishment (oligopoly)
- Trend towards specialisation by product line
- Regarding distribution big companies have larger market share according to supermarkets’ requirements which sharpens consumer preferences for certain brands. Smaller processors count with local preferences due to a higher community identification
- In Australia, dairy market is fairly similar to the Chilean one, but it is dominated by fresh milk while WMP is more marginal or destined to exports. A main difference between Australia and Chile lies in the concept of home-brand or generic milk and dairy products quality. Generic milk has become important in the Australian market and competes in terms of prices (cheaper) with branded milk

<table>
<thead>
<tr>
<th>Storage Cost Conditions:</th>
<th>• High turnover rate due to good sales and dairy product perishability</th>
</tr>
</thead>
<tbody>
<tr>
<td>High but affordable</td>
<td>• Powder milk constitutes an exception especially when fluid milk is regularly converted to dry milk in favour of long-term storing (normal situation in Chile not in Australia)</td>
</tr>
<tr>
<td></td>
<td>• Significantly affected by milk production seasonality</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Productive Capacity increments</th>
<th>• Industry operates under economies of scale</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average</td>
<td>• Boosted by global exchange and demand increase</td>
</tr>
<tr>
<td></td>
<td>• Significant investment flows</td>
</tr>
<tr>
<td></td>
<td>• Industrial growth follows milk production increases and seasonality</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Exit Barriers</th>
<th>• Significant assets specialisation, infrastructure and development investment</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>• Large-scale firms purchasing by recognised big processors taking advantage of existing infrastructure</td>
</tr>
</tbody>
</table>
## B. Threats of potential entrants

<table>
<thead>
<tr>
<th>Threat</th>
<th>Description</th>
</tr>
</thead>
</table>
| **Capital requirements**                    | *High* • Capital-intensive industry, assets specialisation  
• Large capital investment discourages new entrants  
• Industry promotes entrance of multi-national experienced dairy processors generally by small companies purchase (such as PARMALAT and its arrival to Chile in 1994, currently SURLAT) |
| **Economies of scale**                      | *High* • Industry and larger milk farmers operate under economies of scale                                                                                                                                  |
| **Absolute cost advantages**                | *Average* • Location of plants and strategic relationship with milk producers (such as previous buying and selling agreements) constitute cost advantages in favour of competitiveness and high profitability levels |
| **Product differentiation**                 | *Low* • Only linked to top brands  
• Market offers similar dairy products                                                      |
| **Access to distribution channels**         | *Medium* • High costs of market penetration, especially in main distributors supermarkets chains; affordable by large companies                                                                                 |
| **Government and legal barriers**           | *Low* • Under an open market structure, governments do not establish rigorous or protecting legislation (for instance decree or taxes on foreign operations).  
• Improve enforcement of product standards by sanitary regulation (nutritional information, manufacture and expiry dates)  
• Foreign capital arrival is promoted in free market economies of Chile and Australia     |
| **Retaliation by established processors**   | *Average* • Due to an oligopoly itself controls competition by high entrance barriers, retaliation is moderate and probably offset by aggressive advertising |
### C. Bargaining power of suppliers

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
</table>
| Number and concentration                     | **High**  
- Many small suppliers, high dispersion (Chile)  
- Less variation and dispersion in suppliers size (Australia) |
| Availability of input to processors          | **High but irregular**  
- Progressing on seasonality reduction  
- Chilean productive surplus from 2001  
- Impacted by differences in production systems, yield, productivity and finally quality of milk  
- Location of production favouring or contracting negotiation attempts  
- Permanent threats of input imports (dry milk) impacting farmgate prices  
- Influence of global prices over domestic prices |
| Industry backward integration                 | **Low**  
- Low industrial vertical integration but an increasing number of operations using pre-purchasing agreements |
| Threats from suppliers                        | **Low**  
- Low grade of producers associativity  
- Gradual demise of cooperatives |
| Industry dependency and importance for providers | **High**  
- Elevated perishability compels producers to accept purchase conditions imposed by manufacturers  
- Suppliers net incomes exclusively relies on processors purchases  
- Mutual dependence |
| Industry total cost contributed by suppliers  | **Average**  
- Milk is the main input and represents a significant percentage of industry total purchase costs, that however is managed according imports and previous stocks  
- Larger milk producers have moderate market power in terms of negotiation conditions (including payout) |
### D. Bargaining power of buyers

| Number of retailers | Medium | • Formed by few large volume buyers (supermarkets) and many retail outlets  
|                     |        | • Retail supermarkets are strong because of high volumes purchased  
| Backward integration | Average | • Appearance of supermarkets home brands products  
| Total cost of client contributed by industry | Medium | • Medium significance for retailers, given dairy products nutritional importance, those expected to be accessible  
| Clients profitability | Medium | • Under its commodity condition, dairy products create value largely for manufacturers not for distributors (neither for farmers), however supermarkets establish the “shelf space” price interfering in dairy products availability and maintaining valuable levels of revenues  
| Substitutes availability | Low | • Less differentiated products facilitate switching supplier  
|                     |        | • Dry milk favours distribution of convenience and local stores consistent with Chilean consumer’s preferences  

### E. Threats of substitute products

| Substitutes availability | Moderate | • Imported products which however, are introduced to market via larger manufacturers, more linked to a particular company exchange policy than opening a new source of competition  
|                         |          | • Customer loyalty and companies good reputation obstruct substitutes entrance (mostly for differentiated products)  
|                         |          | • For commodities such as drinking milk, butter and cheese substitutes become a viable option, especially if they compete at reduced prices  

Summarising, the dairy industry five forces analysis demonstrates the existence of high barriers of entry and exit. Even though it seems to be particularly evident for dairy manufacturers, the fact is that primary milk production also performs under similar standards. Hence, milk farms and companies associated with dairy processing are long-term businesses, presenting sustainable but potentially unstable profitability as shown in Figure 24.

Unstable prosperity for farmers and processors is often explained by unmanageable climatic factors and high levels of volatility in milk and dairy prices respectively, all those commodities in world markets. In contrast, for processors high profitability is generally linked to economies of scale, dominance of market variables including timely supplies, and the minimum variation in most dairy products demand in front of price changes, namely low demand elasticity (Mastrianna, 2010). With the exception of differentiated products (of lower productive incidence such as fine cheeses, canned products and chilled desserts), drinking and powder milk, butter and ordinary cheese (main processing lines), are slightly sensitive to price variations.

Figure 24. Impact of entry and exit barriers on business profitability
Source: Made by the author based on Porter, 1980
However, due to the close relationship between dairy processors that both in Chile and Australia compete in an oligopoly, the demand elasticity responds more to competitors’ reactions. When a firm establishes a price rise, it is less appealing for competitors and demand will be moderately elastic causing a fall in business total revenue for the involved firm. In contrast, if one company decides a price reduction, competitors, more likely to match this behaviour, will transform demand in inelastic and a fall in total revenue will be easily tangible.

In order to maintain certain effective levels of profitability, dairy manufacturing acts strategically, managing information that emerges from local and overseas markets, crucial for the decision-making process. Within industries, where experience is particularly valuable, dairy processors operate collaboratively in line with strategic and tactics defined by competitors in search for a steady profit maximisation.

5.3.2 The Value Chain Analysis (Porter, 1985; Fearne, 2004, 2009)

The dairy industry value chain mapping and interrelationship is diagrammed in Figure 25 (The Foreign Investment Advisory Service, 2007).

The next analysis aims to disaggregate activities that industries conduct to source, process and deliver goods or services to specific markets. This activity breakdown is helpful in determining contribution and costs allocation in the global process of transformation.
Figure 25. Dairy Value Chain Industry Structure

Source: Made by the author based on Moving Towards Competitiveness: A Value Chain Approach, FIAS, 2007
The analysis applicable for any dairy industry, counting dairy farmers, manufacturers and other related, resulted in the following classification.

**Primary activities**

| 1. Inbound logistics | Critical activity corresponding to raw materials supplying. Dairy production (on-farm) and consequently milk delivery from farms to plants (industry). Milk supply occurs every 24-48 hours maintaining the cold chain between tanks farm and factory cooling  
- High coordination between logistic, storing and production process  
- Careful treatment of dry inputs warehousing and inventory control  
- High incidence of transport, generally outsourced due to its specificity and impact on costs and profitability  
- High dependence between milk producers and processors given strict levels of coordination in achieve a timely provisioning  
- This stage may incorporate an intermediate storing of fresh milk when cooperative collector centres are in use (Farmers’ cooperative management) |
| 2. Operations | Central production, transformation process given result fresh milk (input) to dairy products (output) for human consumption in different varieties and presentations  
- Point of quality control of inputs  
- Contribution to products differentiation  
- Coordination with processor R&D activities  
- Operation generates profits margin to processors that operates in economies of scale  
- High incidence of milk producers respecting milk availability, attributes and quality  
- Use of fresh milk along with different conversion factors and processing techniques (essentially thermal processes, fermentation and sterilisation) give raise to certain quality of output  
- Value added to final products |
### Outbound logistics
- Continuous function allowing collection, storage and physical distribution of dairy products to retailers
- Generally outsourced activity
- Domestic or external markets

### Marketing & Sales
- Most related to processors (milk is a commodity for farmers)
- Advertising and brand positioning
- High contribution to product differentiation and frequently linked with a specific company policy and strategy
- Customer loyalty policy and movements

### Service
- Associated with post sale assistance, customer service or industrial purchasers’ approaches, including policy on low quality or defective products

### Support Activities:

#### 1. Firm infrastructure
- Related to business management: planning, organisation, production and control. Such functions are expressly differentiated in larger companies
- Legal structure of companies determine the manner of business direction
- In general larger farmers and processors have incorporated standard practices to optimise production flows in order to gain profitability
- For farmers this item differs according their property size or volume of milk obtained. But in general administrative tasks lie in the owner and family members
- Important for strategy, policies and procedures design and implementation
- Information and communication play a central role regarding this topic

#### 2. Human resource management
- Critical function in farm duties due to cattle handling. Even not all labour work with dairy herds, all activities indirectly affect milk production itself
- Search for workers commitment
- Less significant in automatic and mechanised activities, but
relevant in the administrative jobs
- Skilled, trained and in lesser extent experienced labour is expected and requested
- Source of competitive advantage generally associated with a particular policy of companies

### 3. Technology development

- Greatly related to infrastructure
- Larger industries and larger farmers are technology adopters; for farmers technology adoption is a more gradual process.
- Productivity improvements are often associated to technology that in general favours yields, timing, costs savings, productivity, standards and profitability. Often it corresponds to a particular policy of companies
- Related to significant investment, but also information and communication development, know-how and ongoing learning processes

### 4. Procurement

- General coordination in order to count with consumable or intangible items; costs of this function are expresses proportional and spread throughout company activities, hence are not significantly high
- Activity that might use and generate permanent and updated flows of information
- For processors it often includes global purchasing scale for certain inputs in manufacturing (such as dry milk)
- Often it corresponds to a particular policy of companies

The importance of this activities breakdown lies in the need for individual valuation. This is chiefly important for entrepreneurs running dairy farms. By such an idea, dairy farms should create a product value and transfer it to their clients, the processors; otherwise, any attempt to build a profitable link with processors will be unfruitful. In order to accomplish such a task, businesses should compete using a strategy in line with their particular goals. Dealing with a commodity is hard in terms of valuation creation. However, it seems to a fair approach to invest in improving milk quality as well as volume enhancing, since the farmgate price is established in line with compositional quality parameters.
The dynamism and interdependency of the milk value chain activities indicates that a supplier who is devoid of a strategy or formula to be competitive will be forced out of the market. Still small non-competitive producers, both regarding milk quality and quantity, face high barriers to leave the business. Having made the investment and having assumed all risks involved in milk production and given the specific nature of infrastructure, it is very difficult to think of reconversion. Further small producers cannot compete on volume and therefore, costs are proportionally higher and they trade on tight margins (Fearne and Duffy, 2006). At the same time they face a lack of investment and creditworthiness. For small farmers, milk production is occasionally their main activity but a secondary source of income. The possibility of consolidating in a less demanding farming production corresponding to their productive vocation will not become a real choice unless supported at least by public agencies.

Some important findings from the value chain and the dairy industry structure indicate:

- For dairy products the main cost centres are located into primary activities; however technology development, a supportive activity, might also become a considerable cost depending on firm's policy. As an example, a farmer involved in friendly environmental practices might increase technology costs according with innovation in milk production (organic or biodynamic farms for instance).

- The dairy value chain becomes stronger if it is conducted with optimum resources and partnership, which sometimes seems to exclude small suppliers or minor processors due to their productive and economic limitations. This gap, clearly identified in the Chilean production, perturbs the system.

- On average, the final price is the addition of costs generated during the whole transformation process. However, because manufacturers operate under economies of scale, profitability is higher than average farmers’ revenues. In 2009 world leading processors’ turnover reached between 0.1 to 27.3 billion dollars (IDF, 2010). In addition, large farms are more profitable than medium or small size; nevertheless production systems and others factors may mark significant differences regardless of a farms dimensions.

- The main value of dairy products is added in transformation from fresh to drinking milk. Moreover, this creates customer value.
• Inputs quality manifestly impacts outputs quality, particularly compositional quality (milk solids quantity). Nevertheless, applied technology and conversion factors are critical in determining dairy products quality and nutritional attributes. Processors decide independently about transformation methods (respecting food regulations) and thus, not all dairy products have the same quality or nutritional contribution.

• Production risk is mostly assumed by farmers, not only affected by variable climate conditions on crops and livestock but also working with renewable natural resources. Larger farmers are generally more efficient on volume, costs, and profitability than smaller producers due to economies of scale and exclusive dedication to milk production.

• Dairy processors frequently distribute supply risk on numerous providers as a strategy to minimise adverse unmanageable effects or weaknesses affecting primary production. Farmers’ dispersion becomes strength to processors because to lower milk trading volumes appear more likely to price negotiation. However, it is a weakness which affects the main input quality and standards. This fact has encouraged processors to establish the milk farmgate price according to solid contents as a manner to unify fresh milk features. The current trend is to move toward competitive production, regardless of the farmer productive stratum.

• The relationship between milk producers and manufacturers should be extremely intimate; milk perishability increases coordination actions. The power of price setting rests on processors as providers of final products as the outcome of milk transformation process. As a result, farmers’ fragility becomes evident, worsening the small producers’ situation.
Australia, Chile and New Zealand (NZ) share certain resemblances in terms of factors of production. Their same hemisphere location and subsequent equal seasons bring uniform climate conditions but different topography that influence water sources and allocation. Resources endowment becomes a comparative advantage that renders agriculture and livestock suitable productions. Australia, Chile and NZ are export dependant countries and compete in overseas market with a range of food products such as fruits, wines and dairy. In terms of dairy product exports, Australia and NZ have export-oriented industries.

Australia and particularly NZ are recognised as exceptionally qualified in production, manufacturing and exports of dairy products with NZ currently the most competitive world dairy supplier. Furthermore both industries operate in deregulated markets. The reasons for this successful performance are numerous, but progressive productivity improvements along with an efficient administration costs play a core role, blessed further by good weather traits for pasture growth in some regions. For Chile to achieve the aim of becoming a larger global dairy supplier, it is necessary to conduct an earnest endeavour and learning from knowledgeable competitors.

Below, a table containing the productive dairy profile of Australia, Chile and NZ in 2009-2011 is presented. This table was mostly constructed using statistics of chapter three and four. Figures were selected from those clearly available in Chilean records. Even though there are important figures that would allow a better comparison, such as milk solid production, factory paid prices and labour productivity, dairy farms in Chile do not maintain records to calculate them. Most data corresponds to large farms in Los Ríos, X region, the most representative and consolidated dairy zone of Chile.
Table 13. Productive structure of dairy production in Australia, Chile and New Zealand

<table>
<thead>
<tr>
<th>Item</th>
<th>Australia</th>
<th>Chile</th>
<th>New Zealand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total area (ha)</td>
<td>2,500,000(e)</td>
<td>700,000</td>
<td>1,560,000</td>
</tr>
<tr>
<td>Number of farms</td>
<td>7,511</td>
<td>12,000</td>
<td>12,810*</td>
</tr>
<tr>
<td>Business ownership</td>
<td>Family owned managed and operated/ high female participation</td>
<td>Family owned and managed/ external labour, low female participation</td>
<td>Family owned managed and operated/ high female participation</td>
</tr>
<tr>
<td>Total dairy cows (heads)</td>
<td>1,600,000</td>
<td>450,000</td>
<td>4,396,675</td>
</tr>
<tr>
<td>Average herd size (heads)</td>
<td>220</td>
<td>200</td>
<td>376</td>
</tr>
<tr>
<td>Average annual milk production (L/cow)</td>
<td>5,600</td>
<td>5,445</td>
<td>3,642</td>
</tr>
<tr>
<td>Milk yield per ha (L/ha)</td>
<td>8,904</td>
<td>8,712</td>
<td>10,052</td>
</tr>
<tr>
<td>Total milk production (million L)</td>
<td>9,100</td>
<td>2,530</td>
<td>16,483</td>
</tr>
<tr>
<td>Main production system</td>
<td>Pasture based and up to 1.0 tonne grain/concentrates</td>
<td>Free grazing, moderate concentrate</td>
<td>All-grass, few concentrates</td>
</tr>
<tr>
<td>Main Calving pattern</td>
<td>Seasonal Spring and Autumn</td>
<td>Seasonal Spring</td>
<td>Seasonal</td>
</tr>
<tr>
<td>Stocking rate (head/ha)</td>
<td>1.59</td>
<td>1.6</td>
<td>2.76</td>
</tr>
<tr>
<td>Costs range</td>
<td>28-37 U$ 100 kg</td>
<td>28-37 U$ 100 kg</td>
<td>28-37 U$ 100 kg</td>
</tr>
<tr>
<td>Price of land (AU$/ha)</td>
<td>12,000</td>
<td>8,240</td>
<td>27,000</td>
</tr>
<tr>
<td>Farmgate price (AU cents/L)</td>
<td>43.2</td>
<td>41.3**</td>
<td>52.8***</td>
</tr>
<tr>
<td>Domestic per capita consumption (L milk/year)</td>
<td>102.4</td>
<td>19.2</td>
<td>77.6</td>
</tr>
<tr>
<td>Exports (% of milk production)</td>
<td>45</td>
<td>15</td>
<td>95</td>
</tr>
<tr>
<td>Main exported products</td>
<td>Milk powder/cheese/ butter</td>
<td>Cheese/WMP/ yogurt/condensed milk</td>
<td>Butter/Milk powder/ cheese</td>
</tr>
<tr>
<td>Main overseas markets</td>
<td>Japan, Singapore, China</td>
<td>Mexico, Venezuela, Brazil</td>
<td>The US, China, Japan</td>
</tr>
</tbody>
</table>

(e) Estimated
(* 2005 data
(**) 1AU$=NZ$0.8, average exchange rate 2010
(***) 1AU$=US$1.04, average exchange rate 2010

Source: DairyNZ, 2011; IUF’s Dairy Industry Research, 2011; IDF, 2010; Clark et al., 2012; Moreno, 2011
A first glance shows significant differences between the three industries but also some resemblances that might support Chilean dairy industry development:

1. Unlike Australia and NZ, the Chilean milk production area - particularly low in this moment - might increase given the land availability that will permit milk production expansion. Additionally, outstanding climate conditions promote the placement of new dairy farms in Southern Chile. The cost of land in Chile is lower than in Australia and NZ as shown in Table 13.

2. The productive structure of Chilean milk farms has followed the normal trend of less but larger farms. However, in Chile the presence of many small farms is a fact but not their incorporation to the value chain which is partial. In Chile, 25% of milk production is delivered by small producers that have implemented common collector tanks and obtained certain governmental grants by working co-operatively. Nonetheless, small farmers have higher costs and are less competitive and profitable. Small and medium size producers operate on tight margins (Fearne and Duffy, 2006).

3. Without changes in dairy cattle numbers and the genetic management, the goal of boosting milk production will not be accomplished. A herd increase will allow the distribution of costs in a higher number of productive units. Apparently milk yield per cow in Chile has been measured in large farms, obtaining encouraging figures that do not represent an average including small production. Assuming only competitive farms will remain in the business in the medium term, the panorama seems to be positive and milk yield might present a lower standard deviation.

4. Yield per hectare has been included in Table 13 as reference. However, yield per hectare is not an indicator of economic efficiency is one technical efficiency measure, and a high yield or a low yield can be profitable-profit depends on all inputs, not just the hectares. Technical efficiency is not economic efficiency. Chilean milk producers should work to improve yield per hectare progressing on technical efficiency but without overlook profitability parameters.

5. NZ technical and economic productivity has improved mostly because of a better milk solid production, based on intense usage of low cost pasture. According to this analysis if in the short term Chile becomes a competitive supplier, it may not compete for the same markets as that of Australia and NZ for at least three main reasons: milk
production volume, upcoming processing capacity limitations and questionable quality standards.

6. Friesian cows are the main breed in Chile and Australian and hence, it can be assumed that their body weights are similar. Regarding New Zealand dairy herd, one-fourth of total dairy cattle comprises Holstein-Jersey crossbreed (Armentano et al., 2004). Therefore, at least three-fourth of the NZ dairy herds is constituted of Holstein genetics, though these cows are a smaller genotype than the Holstein-Friesians of the US. The stocking rate in Chile is slightly below Australia and rather below New Zealand. This figure will enable an increase in animals per hectare; a goal defined by the Chilean Dairy Consortium (TDC, 2010). However, unless better grassland management occurs, the current pasture productivity hinders any new approach. This justified the high cost of fodder to supply proper rations to the cattle; there is an urgent need of change in this aspect.

7. From the cost of land standpoint, Chile shows an advantage in terms of availability and prices. However, Australian farmers have increased their average farm debt in recent years due to land purchases, motivated by milk production expansion, high profits and low interest rates and investment provided by the Australian Government (Dharma and Martin, 2010, Mackinnon et al., 2010). This situation is opposite to the Chilean scenario where no governmental support is provided and lower investments are determined by market interest rate, production size and business attractiveness.

8. Having more affordable land prices (that however have doubled in recent years), Chile shows a competitive advantage over Australia and New Zealand; however with the current rate of pasture productivity (pasture efficiency in Chile does not exceed 50-60% average), costs of production are higher while land values, interest (financing cost) and rent (lease cost) do not represent significant pressure for controlling costs exhaustively. Improving pasture yield, Chile could increase the stocking rate and adopt a target feeding system with focus on milk solid production. This will enhance profitability indicators (mainly operating profits) per ha as well as overall financial performance (if compare to other dairy producing countries/systems and assuming a similar internal rate or return). As land is a capital cost, Chile might increase the return on capital employed and mobilise new competitors, higher investment and involvement on milk production.
9. Currently Chile has economic and political attributes which attract foreign capital. Availability of natural resources, such as agricultural land at low prices is also an incentive for external investment. Chile has emerged as one of the Latin America’s most attractive markets for investing in diverse economic sectors (mining, financial services, agribusiness). For the purposes of this thesis a particular case is occurring in dairy production, however, due to high prices of land in New Zealand (NZ), New Zealander dairy farmers are also moving for instance, to Tasmania and Western Australia, all these locations with similar and suitable climate conditions for pasture growth.

10. It is expected that there will be a reduction in milk production seasonality, which will help decrease the production of dry milk for storage and its subsequent re-transformation. However, it will be necessary to assess permanently the industry processing capacity that withstands any unexpected milk surplus.

11. The low participation of family members in productive chores brings at least two weaknesses: firstly the incorporation of more external, slightly trained and unproductive labour; secondly, despite low wages, more workers mean a greater payout. This results in high labour costs.

12. Preliminary information indicates certain shortages in the Chilean milk quality that triggers an easy access to countries with lower quality standards. These quality assumptions are the result of thermal process application repeatedly. This alteration from fresh milk to dry milk and vice-versa has apparently impacted on nutritional attributes of dairy products.

13. Chilean milk consumption is lower than Australia and NZ. On the other hand, Chilean dairy products exports have increased constantly since 2001. From this standpoint a dilemma is stated. While dairy processors operate under sustainable levels of earning, the majority of population have economic restrictions to access milk due to average household incomes. Besides efforts on advertising and dairy products TV campaigns, milk consumption in Chile has not increased in line with milk production volume increases. This gap between milk production and milk consumption is that the dairy industry should consider addressing. Final products prices adjustment comes as a way out.
Chile’s continent location not only favours the phytosanitary heritage but it is also strategic in terms of access to neighbour markets. As a result, Chile’s major export markets are certain American countries. The high reliance on Mexico (fine cheeses) should be balanced in the short-term due to joint efforts to reach new markets. Perhaps the chance to enhance exports proportionally might be focused in differentiation and higher value added products, as a competitive strategy in overseas markets. Latin America has several deficit countries but seemingly export payment conditions are not reliable enough.

Given the difficulty to homogenise costs, these are presented proportionally within average dairy farms budget. Table 14 contains main general cash costs centres for Australia, Chile and NZ. Chilean data correspond to 2005, Oceania to 2003-2004 plus some data from 2006.

Table 14. Australia, Chile and New Zealand: proportion of costs categories in milk production

<table>
<thead>
<tr>
<th>Item of cost / Countries</th>
<th>Australia %</th>
<th>Chile %</th>
<th>New Zealand %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purchases of dairy cattle</td>
<td>1.9%</td>
<td>16.9%</td>
<td>1.5%</td>
</tr>
<tr>
<td>Hired labour</td>
<td>6.3%</td>
<td>16.0%</td>
<td>12.1%</td>
</tr>
<tr>
<td>Fertiliser</td>
<td>7.7%</td>
<td>17.0%</td>
<td>11.4%</td>
</tr>
<tr>
<td>Fodder</td>
<td>29.8%</td>
<td>27.0%</td>
<td>17.6%</td>
</tr>
<tr>
<td>Repairs and maintenance</td>
<td>7.8%</td>
<td>7.4%</td>
<td>6.7%</td>
</tr>
<tr>
<td>Electricity</td>
<td>3.0%</td>
<td>2.6%</td>
<td>2.8%</td>
</tr>
<tr>
<td>Dairy supplies</td>
<td>1.8%</td>
<td>4.7%</td>
<td>1.8%</td>
</tr>
<tr>
<td>Interest</td>
<td>9.9%</td>
<td>1.3%</td>
<td>22.7%</td>
</tr>
<tr>
<td>Other cash cost</td>
<td>31.8%</td>
<td>7.0%</td>
<td>23.4%</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td><strong>100.0%</strong></td>
<td><strong>100.0%</strong></td>
<td><strong>100.0%</strong></td>
</tr>
</tbody>
</table>

Depreciation not included

Source: Made by the author based on ABARE, 2005; Vidal Mujica, 2011; Moreno, 2011; DPI Victoria 2007, 2008, 2010

Australian milk production shows a significant proportion of “other cash costs”. Fifty per cent of this item mainly consists of on-farm services (animal health, insemination, others), water charges and rates and fuel oil and grease. The remaining costs comprise payment to sharefarmers; livestock and other materials; contracts; crop and pasture chemicals and agistment.
Interest costs are probably explained by differences in agricultural land prices shown in Table 12 and differences in debt. New Zealander farmers afford higher land prices and consistently higher interest payment. Interest rates are directly proportional to property values and this cost is reasonably lower for Australian and Chilean dairy producers respectively. In terms of energy costs, Australia and New Zealand farmers have increased this category due to the utilisation of environmental friendly sheds power.

Costs structure is strongly affected by feeding. Pasture based feeding systems show advantages in terms of cost savings. Cows in New Zealand are fed mainly on grazing and receive few supplements. In Chile, although outstanding grass growth conditions exist, the low utilisation of pasture, caused by a deficient management, has prevented a more efficient and low cost feeding system. Nevertheless, favourable pasture growth continues being a source of comparative cost advantage while an accurate pasture management a source of competitive advantage. Facing a permanent shortage of grain production, feeding is complemented by fodder and concentrates. Very similar to Australia, feeding represents almost 30% of total costs. From the remaining costs, 50% corresponds to fertilizers, replacement cattle and labour. Costs proportion has been almost unalterable in Chile in the last ten years (Ostrowski and Claus, 2001, Vidal Mujica, 2011) and thereby productivity increases have been achieved by milk volume increases from previously lower yielding cows but not by, for instance, higher labour productivity. In Chile cow replacement implies high turnover of herds; however as normal, the market for calves’ purchases markedly differs with discard livestock in terms of prices, producing marginal revenue. The cost of cattle replacement is proportionally higher in Chile because average Chilean farmers buy in replacements rather that rear their own. This way, competitive primary production of milk is based on a cost strategy, due to the variability of farm gate prices, high risks in natural resources management and vast difficulties in implementing the segmentation or differentiation as strategies for commodities. The effectiveness of costs of current and future production systems will allow an accurate control of inputs as the centre of costs over outputs.

The search for the economic efficiency in primary production should be a permanent challenge particularly when the industry needs to increase milk volume. But Chilean producers need to control cost increases. As with Australia and NZ, Chile dairying should base a volume increase in an average herd size increase that supports a cost strategy. Even though this goal will bring increases in fodder and supplements purchases, a major number
of heads should allow a more efficient way of apportioning costs. The demand of fertilizers and labour for better paddock yield is likely to rise similarly. All these factors constitute a virtuous circle if managed properly in favour of costs reduction. In general, a milk farm in southern Chile is fostered if it operates intensively. However, increasing cattle per hectare is achievable only if the pasture shows yield levels representing most of livestock feeding. Considering a farm runs with family labour, a stocking rate of 2.0/ha with over 70% of grassland performance should bring lower costs and higher profitability.

Technology progress in the Chilean dairy production might increase costs in the short term but also bring along substantial increases in productivity and savings in the long term. The technology adoption process might increase the cost curve of production factors. This is because given a determined level of output the input combination should undergo a process of adjustment accordingly to changes in final prices, which is particularly variable for fresh milk. Additionally in the long term, the marginal rate of technical substitution (Nicholson and Snyder, 2011, p. 307) is expected to decrease if labour is trained and becomes more productive. Optimisation of the total production factors, particularly labour and capital, is desirable.

5.5 CONCLUSIONS

Chapter five delivers information to answer research question C. After concluding the comparison analysis, the Chilean dairy industry shows significant factors of competitiveness but it also faces an important group of constraints. The industry structure confers the attribute of “with potential” to primary production and “competitive” to dairy processors. This means that Chilean milk production is considered a potential dairy supplier in global markets because the industry shows capacity or partially developed ability to become competitive. Such statements are based in the main findings presented in Table 15.

---

14 Rate at which labour can be substituted for capital considers a constant output.
Table 15. Summary of productive factors impacting the competitiveness of the Chilean dairy industry

<table>
<thead>
<tr>
<th>Supporting Factors</th>
<th>Weakening Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Good environmental conditions for pasture growth, high potential of costs reduction in southern areas</td>
<td>• Low grassland yield due to deficient management and fertilisation, high cost supplement utilisation</td>
</tr>
<tr>
<td>• Large number of medium/large producers representing 75% of milk production</td>
<td>• High dispersion in producers</td>
</tr>
<tr>
<td>• Moderate level of investment</td>
<td>• Many small farmers delivering 25% of milk to local or minor processors. Extremely small Individual production reaches levels minor to 25 L/ daily</td>
</tr>
<tr>
<td>• Low land value ($/ha)</td>
<td>• Variable quality attributes</td>
</tr>
<tr>
<td>• Increasing productive surplus</td>
<td>• Primary production lowly orientated to quality impacting quality of final products.</td>
</tr>
<tr>
<td>• Industry quantity oriented</td>
<td>• Repetitive thermal treatment to fresh milk discrediting dairy products quality</td>
</tr>
<tr>
<td>• Attempts to increase productivity, good level of milk yield</td>
<td>• Domestic consumption lower than the FAO suggested standard (120 Lt/per capita v/s 150 Lt/per capita respectively)</td>
</tr>
<tr>
<td>• Lower labour productivity</td>
<td>• Consumption increase promoted only by advertising not final prices intervention</td>
</tr>
<tr>
<td>• Domestic consumption covered</td>
<td>• High milk prices according to population income</td>
</tr>
<tr>
<td>• Industry gradually oriented to overseas markets</td>
<td></td>
</tr>
<tr>
<td>• Dairy products diversification</td>
<td></td>
</tr>
<tr>
<td>• Parallelism in final price decision and establishment (oligopoly)</td>
<td></td>
</tr>
</tbody>
</table>
Resemblances and differences between Chile and Australia, both in their macroeconomic dynamics and dairying structure, are observable. On the one hand, regarding the macroeconomic framework, Chile is giving important steps to offer sustainable economic conditions for businesses establishment and development and also attempting to attract foreign investment and capital. However, the Chilean economy still presents considerable gaps that in one way or another affects industry performance. Of those, a sharp social-economic inequity, below standard education system, structurally inefficient labour market (high rates of unemployment), lack of environmental commitment, fiscal budget concentration and deficiency of energy sources, with high dependence of foreign suppliers, are particularly significant negative factor conditions impacting competitiveness. Australia, by contrast, shows a stable economy whose statistics fluctuate reasonably with a high level of resilience, an essential attribute within globalisation. An inclusive labour market, average level of inequity, decentralised fiscal budget and a serious commitment to environmental care are key factors backing up industry performance. As example, Chile has low productive labour along with lesser incorporation of family members to on-farms duties. The average agriculture wage in Chile was AU$2.2 per hour in 2011, while in Australia reached AU$11.5 per hour in 2003. In both countries, however, agriculture labour is one of the lowest paid activities if compared with other sectors of the economy.
From the five forces and the value chain analyses main findings are:

- The structure of each dairy industry: few and large dairy processors operating in an oligopoly. The Chilean industry has evolved in the last 10 years becoming a bifurcated system consisting of four large processors-exporters and several mid-size and small companies or cooperatives. Under this model, and despite closer coordination actions between manufactures and farmers, the influence of milk suppliers is insignificant and it only has an impact when milk is delivered by organised groups offering large volumes. Processors’ profitability is knowingly high, as well as market presence. The usage of strategies is chiefly applied for dairy manufacturers.

- Dairy farms in Australia and Chile present similar trends in terms of number. The Chilean dairy cluster members have seen how dairy cattle strongly decreased, particularly for unstable profitability of the business. Despite the vast presence of small producers in the Chilean milk structure, most of them have left the business because of serious problems of low income;

- The paucity of production statistics in primary production hinders a proper interpretation of the Chilean dairy industry operational and financial performance and even more makes impossible an effective decision making process. Two important differences between both industries are the degree of professionalisation and quality orientation, which is clearly identified in Australia, but not in Chile; and

- The quality of Australian dairy products fulfils the highest international norms. These production standards allow the industry to offer superior nutritionally products, which increases consumers’ valuation. Thus, this differentiated strategic action becomes a source of competitiveness that facilitates the entry to foreign markets particularly in developed countries.

- The Chilean dairy value chain is weak in terms of collaborative linkages and members alignment. This lack of cooperation has spawned a supply chain lacks of strategy and system interdependency.
CHAPTER SIX: DISCUSSION AND CONCLUDING COMMENTS

6.1 INTRODUCTION

In Chapter six final conclusions are delivered answering the last research question. Firstly a brief summary of ideas to use when considering business environments is suggested. Secondly, a table containing general improvements that boosts the Chilean milk production is offered based on a comparison with Australian dairying. Thirdly, a brief approach and suggestions about the strategic document conducted by the Chilean Dairy Consortium is developed. Finally, future studies to carry out are suggested in order to bridge the gap between the current performance/structure of the Chilean dairy cluster and the situation expected to arise when venturing into global trade.

6.2 COMPETITIVENESS AND POTENTIAL OF THE CHILEAN DAIRY INDUSTRY

6.2.1 Business Environment

From the comparison with the Australian, and to a lesser extent the New Zealand (NZ) industry, the Chilean dairy industry is partially competitive and presents important signs of ongoing potential. However, the Chilean dairy industry shows weak production linkages and an insufficient level of collaboration between cluster members. This structural drawback affects the system interdependency causing greater vulnerability throughout the supply chain.

As observed, the absence of a public framework, namely a governmental policy or approach about certain current issues, affects, in some way or another, the dairy industry and in general, the primary production. However, awareness of local market conditions becomes a competitive factor given the importance of information to businesses operations. In the following, some ideas are suggested in order to improve the business scenario, transforming weaknesses and threats to strengths and opportunities.

- About the exchange rate: Formulation of a long-term plan for technology imports under dollar depreciation periods (machinery, equipment, experts, know-how, and information).
• **About production surface:** Production expansion strategy by the purchase of available hectares in southern Chile.

• **About foreign dairy investors:** Promote their participation as part of the most representative associations in order to share experience and good practices.

• **About trade openness:**

  A. Consolidate a professional network between Chile and Australia under the FTA in force from 2009. It is desirable to coordinate permanent visits of Australian dairy experts to Chile.

  B. It is highly advisable to approach the Chilean viticulture and wine industry in order to learn from a successful and sustainable experience in foreign markets.

• **About labour training:** Formulation and consolidation of a specific syllabuses and curriculum (subjects) for dairy workers on farms and for manufacturing in line with productivity changes. Due to primary producers commonly show a lack of business skills, it is suggested to incorporate to the syllabus, marketing theories and tools.

• **About woman at work:** Incentives such as differentiated working hours and wages are suggested in order to promote women incorporation to dairying.

• **About water management:** Avoid misappropriation and foster collective agreements for water use.

• **About associativity:** Strength associativity and representativeness; farmers organisation should innovate in providing services that attract 64% of non-member farmers.

• **About outgoing information:** In the medium-term, farmers should provide reliable information to regional authorities and policy makers. Formal proposals submitted preferably via Dairy Consortium about environmental care, non-traditional energy sources, training, development projects to attract fiscal budget, etc. should demonstrate the process of growing, development and professionalisation of the sector, positioning it as a proactive industry in searching for further support.
6.3 SUGGESTIONS AND RECOMMENDATIONS TO IMPROVE THE CHILEAN DAIRY PRODUCTION

The Chilean dairy industry needs to implement a series of enhancement actions to underpin productivity, meeting the requirements of domestic and overseas markets. The industry needs consolidation and adjustment on the value supply chain in order to become efficient by operational integration.

The following is a table containing recommendations taken from the Australian diagnosis that encourages a proper development of the Chilean dairy cluster:

**Table 16. Recommendations for the Chilean dairy production improvement**

<table>
<thead>
<tr>
<th>Primary Production</th>
<th></th>
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</thead>
<tbody>
<tr>
<td></td>
<td>• Advance in core production indicators ensuring a lower average standard deviation</td>
</tr>
<tr>
<td></td>
<td>• Animal genetic improvement focus on determined herd genetic characteristics to achieve better yield performance (TDC, 2010)</td>
</tr>
<tr>
<td></td>
<td>• Genetic gain for pasture growth including improvements in pasture efficiency/yield</td>
</tr>
<tr>
<td></td>
<td>• New knowledge by pastoral farmers</td>
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<tr>
<td></td>
<td>• If possible increase the stocking rate</td>
</tr>
<tr>
<td></td>
<td>• Ongoing and increasing rate of technology adoption and technification (including soils testing, fertiliser management, software for herd and financial management, etc.)</td>
</tr>
<tr>
<td></td>
<td>• Innovation in more profitable and efficient low-cost feed systems</td>
</tr>
<tr>
<td></td>
<td>• Operate under economies of scale, increasing productivity per head, per ha and per labour unit</td>
</tr>
<tr>
<td></td>
<td>• Establish a cost strategy exhaustively restraining cost centres</td>
</tr>
<tr>
<td></td>
<td>• Implementing an efficient resource management system with a focus in planning and controlling functions</td>
</tr>
<tr>
<td></td>
<td>• Replacement of capital for high productivity labour</td>
</tr>
<tr>
<td></td>
<td>• Greater inclusion of women and family members</td>
</tr>
<tr>
<td></td>
<td>• Permanently promote animal welfare and health practices</td>
</tr>
<tr>
<td></td>
<td>• Improving fresh milk quality not only as a main input in processing but to reach appropriate prices and incentives payout</td>
</tr>
</tbody>
</table>
| Industry and markets | • Build capacity for farmers to wisely respond to the global declining term of trade  
• Consolidate training programs to improve workers competences.  
• Recruiting and retaining appropriately skilled labour for primary milk production and manufacturing.  
• Promote local small markets consolidation  
• If recognised promote the transition of small producer by financial assistance such as Australian reconversion schemes (For instance the Marginal Dairy Farms Agreements of South Australia (South Australia Parliament, 1971))  
• Incorporation of environmentally friendly and good practices based on sustainable resource utilisation  
• Consolidate tight linkages between public sector and private agents  
• Search for R&D, innovation, financial and extension support  
• Recover, if possible, some vanished institutions  
• Collect producers' demands as feedback for programs design  
• Implement an efficient and continuous information system from producers to business environment and vice versa  
• Formulate a communication plan  
• A cultural change of outdated patterns that negatively affect milk production (see things differently, do things differently) |
|----------------------|----------------------------------------------------------------------------------|
|                      | • Clarity on payment factors avoiding tense contract renegotiations and ambiguous condition for milk pricing  
• Increase the transparency, trust and commitment of the dairy market  
• Prevent discriminatory practices to farmers  
• Provide technical and financial assistance to farmers  
• Provide continuous training and fair work conditions to human resources  
• Review the product quality and price policies, keeping a responsible attitude regarding the nutrition and access of all consumers  
• Evaluate the possible incorporation of fresh dairy products (drinking milk) to the local market |
This thesis manifests a clear consistency with previously conducted analyses in terms of certain structural macroeconomic weaknesses that the Chilean dairy industry faces and the urgent need to progress on restraining costs of production looking for productivity improvement. Southern Chile shows excellent environmental conditions to emulate the experience of Australia and subsequently New Zealand and the industry has potential of expansion due to land availability. Central Chile, in turn, might approach the profitable Californian model of production.

In terms of animal and pasture genetic areas several differences and divergence are observed. Chile does not have a program of evaluation and breeding and only those farmers who have a selection process of breeding bulls receive the benefits of producing with genetically superior dairy herds (Ponce and Santibañez, 2003). The remaining milk producers use crosses to absorb local breeds which results in uneven production yield. Therefore suggestion is to work more thoroughly in these areas, considering the total of producers and improving the genetic attributes in the industry situation as a whole, due to their importance in costs of production, profitability and milk quality standards.

Chilean dairying shows considerable weaknesses in terms of shortages of production records. Chilean dairy farmers are unfamiliar with global terms of trade and present deficient management skills. Due to the dairy industry being controlled by processors, farmers should be assisted to adopt a well-informed and proactive attitude. The industry competitiveness depends in one way or another on milk production as a system, despite processors stocks occasionally relying on exports. Milk producers should boost their strengths in order to compete by cost leadership. In respect to the adoption of new strategies, if growth expectations and development continue optimistically, differentiated dairy products such as organic or biodynamic might have a place in the Chilean market in upcoming years.

Overall, the Chilean dairy industry needs to incorporate the value chain thinking suggested by Fearne (Fearne, 2009). This recent approach changes the classic standpoint towards a model whose analysis constitutes an opportunity for continuous improvement and conducting of changes as identified for Chilean milk production. Within this value chain thinking all members of the chain are aligned and operationally integrated. For small producers this allows revealing and fostering of potential, especially by providing advancing tools, for instance, unimpeded access to loans and technology. Leadership, open-mine managers and regional development boards are been emphasised as core requirements to
successful outcomes of the milk production system. It is also significant to boost more informed and demanding consumers increasing the bargaining power of costumers as key drivers of efficient markets. The Chilean cluster needs to overcome outmoded paradigms that impede a higher degree of interconnection and productivity increases.

Efficiency of production should impact positively on Chilean milk farms and processors earning. Profitability gains, however, must not be at the expense of poor management. Productivity improvements should be directly proportional to research investment, products’ quality and accessibility, wages adjustment and good environmental practices. A collaborative value chain able of innovate and co-innovate also cultivates values of trust, integrity and transparency for optimal and equal level of outcomes and profits.

### 6.4 Further Studies

The development of the Chilean dairy sector should be supported by a series of different studies. This thesis suggests further research in the following topics in favour mainly of farmers and consumers, as displayed in Table 17.

**Table 17. Proposed studies to be conducted to enhance the Chilean dairy industry**

<table>
<thead>
<tr>
<th>Field of work</th>
<th>Central purpose / scope</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dairy products</td>
<td>• Milk quality parameters, including particularly compositional quality and nutritional attributes of dairy products subjected to repetitive thermal processes. Useful study on both the proper nutrition of the domestic market and as a support to compete in more demanding overseas consumers.</td>
</tr>
<tr>
<td>quality</td>
<td></td>
</tr>
<tr>
<td>Domestic Market</td>
<td>• Consumer behaviour, including current and expected demand trends and preferences, according essentially to level of household income vs. dairy products prices. Assess the Chilean society predisposition to environmentally friendly production (organic or biodynamic products).</td>
</tr>
</tbody>
</table>
| Environmental care | • Preliminary assessment regarding level of knowledge, approximate and commitment of dairy farmers to environmental care, alternative energy sources, efficient water usage and sustainable production.  
• Foreign environmental models collection and a pre-evaluation to determine best prototypes for the Chilean environmental situation. |
| Efficiency/ Productivity | • Lower cost and productivity stimulator feeding systems, considering constraints in grain production and incorporating environmental friendly practices in line with a sustainable and profitable production.  
• Studies that explore other milk production systems according to the central regions climate conditions. It is suggested to research on milk farms running in the USA, particularly in California, whose climate conditions, environment, water allocation, etc. shows certain resemblances with areas less suitable for grazing. |
| Smallholder dairy | • Assessment on small milk farmers’ current situation and trends regarding productive capacity, value chain integration, costs and profitability, milk quality and aseptic conditions, skills and training on farm and business management. This study might be a significant input to support a prospective governmental policy in order to assist small farmers in major integration, boosting artisanal production local market oriented, or assisting in moving to a production reconversion. |

Some research and development projects previously conducted by the Universidad Austral, along with others currently under supervision of the Dairy Consortium, form the basis for future innovation. As for many agriculture-based industries, milk production competitiveness requires the support and commitment of research activities, particularly because of the potential in adding value to milk production and dairy products. The target of research funding becomes a permanent challenge. The research budget ought to be devoted to basic and applied research. According to some Australian experts on milk
production and economics, the ratio between applied and basic research should be close to 75:25, but this varies through time with countries and industries. Deeper investigation will contribute to advance towards mechanisms and technologies for enhancing milk production with the purpose of strengthening the Chilean dairy value chain and consolidate Chilean agriculture as an emerging contributor for international competition and food security purposes.
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